# Petition for NMFS Incidental Take Regulation
# Hilcorp Alaska Oil and Gas Activities
# Cook Inlet, Alaska

February 2025
Rev. 2

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# ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| % | percent |
| ~ | approximately |
| > | greater than |
| < | less than |
| 2D | two-dimensional |
| 3D | three-dimensional |
| 4MP | Marine Mammal Monitoring and Mitigation Plan |
| µPa | microPascal(s) |
| ADF&G | Alaska Department of Fish and Game |
| AFSC | Alaska Fisheries Science Center |
| AHT | anchor handling tug |
| AKR | Alaska Region |
| AOGCC | Alaska Oil and Gas Conservation Commission |
| Apache | Apache Alaska Corporation |
| APDES | Alaska Pollutant Discharge Elimination System |
| AUD INJ | auditory injury |
| BIA | biologically important area |
| BMP | Best Management Practice |
| BOEM | Bureau of Ocean Energy Management |
| BOP | Blowout preventer |
| CA-OR-WA | California-Oregon-Washington |
| CFR | Code of Federal Regulations |
| CIBW | Cook Inlet beluga whale(s) |
| CIPL | Cook Inlet Pipeline |
| CIRI | Cook Inlet Region, Inc. |
| cm | centimeter(s) |
| CPA | closest point of approach |
| CV | coefficient of variation |
| CZ | clearance zone |
| dB | decibel(s) |
| dB re 1 µPa | decibels referenced to 1 microPascal |
| dB re 1 µPa$^2$ s | decibels referenced to 1 microPascal squared second |
| dB/λ | decibel(s) per wavelength |
| DIP | demographically independent population |
| DPS | Distinct Population Segment |
| DV | Dolly Varden |
| ESA | Endangered Species Act |
| ESCA | Endangered Species Conservation Act |
| FR | Federal Register |
| ft | foot (feet) |
| g/cm$^3$ | gram(s) per cubic centimeter |
| Harvest Alaska | Harvest Alaska, LLC |

# ACRONYMS AND ABBREVIATIONS (CONTINUED)

| | |
|---|---|
| HF | high-frequency |
| Hilcorp | Hilcorp Alaska, LLC |
| hp | horsepower |
| hr | hour(s) |
| Hz | hertz |
| in | inch(es) |
| ITR | Incidental Take Regulation |
| JASCO | JASCO Applied Sciences |
| kg | kilogram(s) |
| kHz | kilohertz |
| km | kilometer(s) |
| $km^2$ | square kilometer(s) |
| km/hr | kilometer(s) per hour |
| kt | knot(s) |
| lb | pound(s) |
| LF | low-frequency |
| LOA | Letter of Authorization |
| m | meter(s) |
| m/s | meter(s) per second |
| MBSF | meter(s) below sea floor |
| MCI | middle Cook Inlet |
| MF | mid-frequency |
| MGS | Middle Ground Shoal |
| MHHW | mean higher high water |
| MLLW | mean lower low water |
| mi | mile(s) |
| $mi^2$ | square mile(s) |
| min | minute(s) |
| MML | Marine Mammal Laboratory |
| MMM | Marine Mammals Management |
| MMPA | Marine Mammal Protection Act |
| MSD | marine sanitation device |
| MTR | Marine Terminal Redevelopment |
| N/A | not applicable |
| nm | nautical mile(s) |
| $nmi^2$ | square nautical mile(s) |
| NMFS | National Marine Fisheries Service |
| NMML | National Marine Mammal Laboratory |
| NOAA | National Oceanic and Atmospheric Administration |
| NVD | night-vision device(s) |
| OPR | Office of Protected Resources |

# ACRONYMS AND ABBREVIATIONS (CONTINUED)

| | |
|---|---|
| OW | *Otariid-pinnipeds* in water |
| P&A | plug and abandonment |
| PCT | petroleum and cement terminal |
| Petition | Incidental Take Regulation Petition |
| pk | peak sound pressure level |
| POA | Port of Anchorage |
| POC | plan of cooperation |
| psi | pound(s) per square inch |
| PSO | Protected Species Observer |
| PTS | permanent threshold shift |
| PVS | portable visual search |
| PW | *Phocid-pinnipeds* in water |
| PWS | Prince William Sound |
| r | threshold distance |
| re | referenced to |
| rms | root mean square |
| SAE | SAExploration |
| SCADA | supervisory control and data acquisition |
| SEL | sound exposure level |
| SFSC | Southwest Fisheries Science Center |
| SLR | SLR Consulting (Canada) |
| SPL | sound pressure level |
| SPLASH | Structure of Populations, Levels of Abundance, and Status of Humpback Whales |
| SSV | sound source verification |
| SZ | shutdown zone(s) |
| TB | Trading Bay |
| TL | transmission loss |
| TTS | temporary threshold shift |
| UME | Unusual Mortality Event |
| U.S. | United States |
| USCG | United States Coast Guard |
| USFWS | United States Fish and Wildlife Service |
| UTM | Universal Transverse Mercator |

# 1. INTRODUCTION

Hilcorp Alaska, LLC (Hilcorp) hereby petitions the National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) to issue regulations pursuant to Section 101(a)(5)(A) of the Marine Mammal Protection Act (MMPA), 16 U.S.C. § 1371(a)(5)(A), for the non-lethal, unintentional taking of small numbers of marine mammals incidental to oil and gas exploration, development, production, and decommissioning activities in Cook Inlet, AK, for an approximate 5-year period beginning . Year 1 will begin August 15, 2025, and end December 31, 2025. Years 2-5 will coincide with the calendar year (January 1 to December 31). This Incidental Take Regulation (ITR) Petition (Petition) provides all information required under 50 C.F.R. § 216.104. Additionally, Hilcorp is an applicant for the Endangered Species Act (ESA) Section 7 consultation. Under this ITR, Hilcorp will apply for either an annual LOA, a three-year LOA, a five-year LOA or any combination therein during the Petition period.

## 1.1 BACKGROUND AND LOCATION

The class of activities in this ITR Petition encompasses all currently reasonably foreseeable oil and gas exploration, development, production and decommissioning activities in Cook Inlet, AK, including:

- Tugs towing, holding, or positioning a jack-up rig in support of production drilling at existing platforms in middle Cook Inlet and Trading Bay;
- Pile driving in support of production well development at the Tyonek platform in middle Cook Inlet;
- Tugs towing, holding, or positioning a jack-up rig and pile driving in support of exploration drilling at two locations in the Middle Ground Shoal (MGS) Unit in middle Cook Inlet; and one location between the Anna and Bruce platforms on the northern border of Trading Bay; and
- Pipeline replacement/installation, involving either pipe pulling or anchor handling or a combination of both, at up to two locations in middle Cook Inlet and/or Trading Bay.

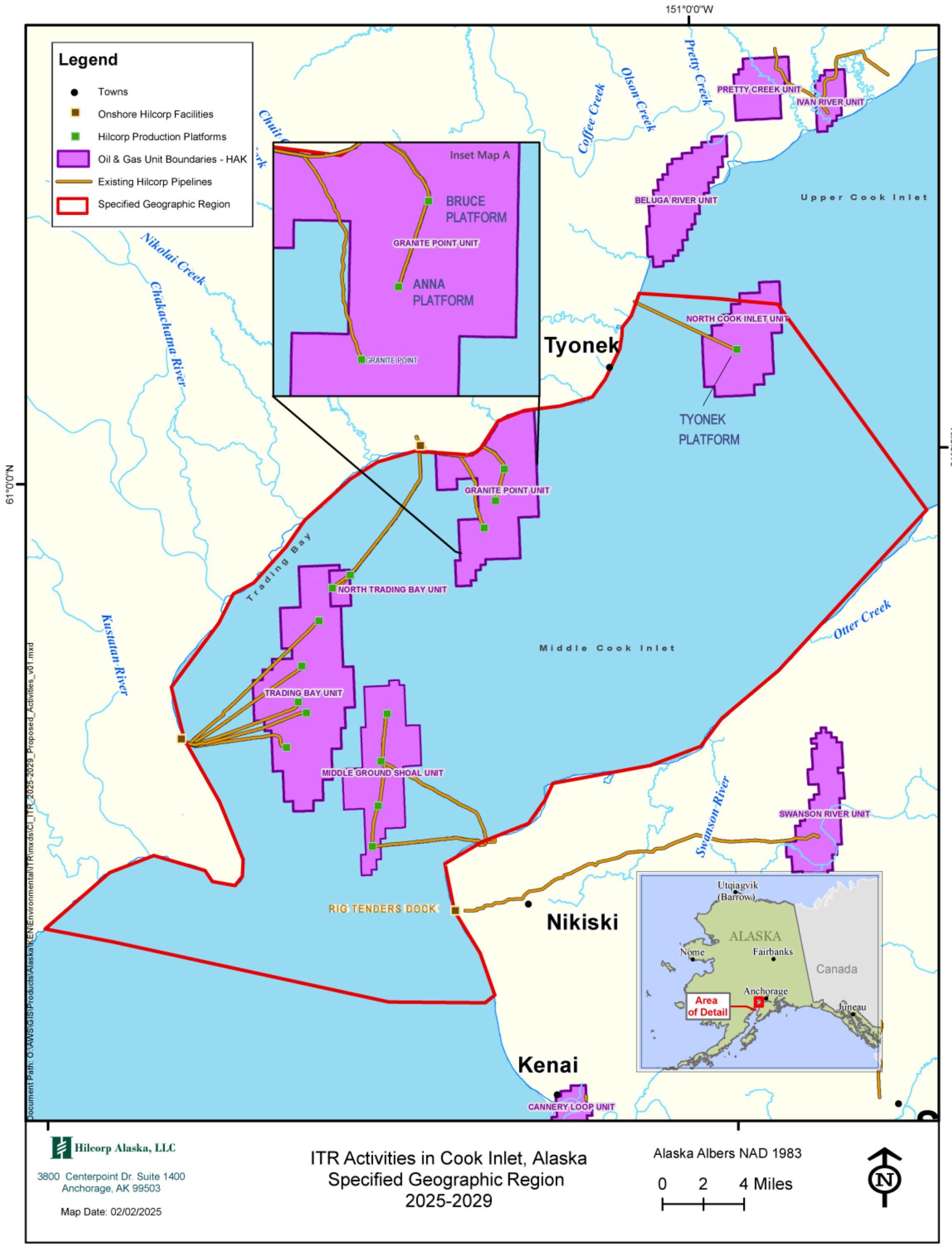
As discussed further in this Petition, these activities produce sound in the marine environment that has potential to affect local marine mammals.

Figure 1 displays the specific geographic region in which the class of activities will occur, along with existing Hilcorp assets and locations of planned activities. All Hilcorp's planned activities will occur in middle Cook Inlet and Trading Bay. The specific geographic area extends north from a point on the eastern shoreline ~12 km (7.5 mi) south of the East Foreland to an point approximately (~) 16 kilometers (km) (10 miles [mi]) south of Point Possession on the west side, to the northernmost production platform in middle Cook Inlet (Tyonek, located in the North Cook Inlet Unit) to a point that is 3.5 km (2.2 mi) north of the village of Tyonek near the mouth of the Chuitna River. Then it extends south to a point along the western shoreline ~15 km (9.3 mi) south of the West Foreland, and across the inlet back to a point on the eastern shoreline ~12 km (7.5 mi) south of the East Foreland. The geographic area of all activity covers a total of ~1,865 square kilometers ($km^2$) (460,850 acres) within Cook Inlet in State of Alaska waters.

For the purpose of this document, middle Cook Inlet refers to waters north of the East and West Forelands and south of Threemile River in the west and Point Possession in the east, and Trading Bay refers to waters from approximately Granite Point in the north to the West Foreland in the south. Upper Cook Inlet refers to waters north and east of Beluga River in the west and Point Possession in the east. The class of activities would occur in marine waters that support several marine mammal species. Based on the timing and duration of the activities, they may result in incidental, unintentional taking by harassment of marine mammals.

This Petition will identify permissible methods of non-lethal take, measures to ensure the least practicable adverse impact on the species and on the availability of these species for subsistence uses, and the requirements for monitoring and reporting.

# Figure 1. Specified Geographic Region



## 1.2 DESCRIPTION OF ACTIVITIES

*A detailed description of the specific activity or class of activities that can be expected to result in incidental taking of marine mammals.*

The class of activities covered by this Petition includes four stages of activity: exploration, development, production, and decommissioning activities within the Petition's specified geographic area (Figure 1). Table 1 summarizes the planned activities within the geographic scope of this Petition and the following text describes these activities in more detail.

## Table 1. Summary of Planned Activities Included in ITR Petition Request

| Project Name | Cook Inlet Region | Seasonal Timing | Year(s) Planned[1] | Anticipated Duration of Sound-producing Activity per Year | Anticipated Sound Sources |
|---|---|---|---|---|---|
| Tugs under Load with a Jack-Up Rig in support of Production Drilling | Middle Cook Inlet | April – December | Year 1–Year 5 (2025–2029) | 12 days (Years 1, 3, 5)<br>10 days (Year 2)<br>8 days (Year 4) | 3 to 4 tugs towing, holding, and positioning a jack-up rig |
| Pile Driving in Support of Production Well Development at the Tyonek Platform | Middle Cook Inlet | Mid-November – Mid-April | Year 1–Year 5 (2025–2029) | 14 days (7 days per pile, 2 piles per year) | Pile driving |
| Tugs under Load with a Jack-Up Rig and Pile Driving in Support of Exploratory Drilling[2] | Trading Bay (between Anna and Bruce platforms) | April – December | Year 2 (2026) | 2 days tugs under load with a jack-up rig; 6 days pile driving (one well) | Pile driving, 3 to 4 tugs towing, holding, and positioning a jack-up rig |
| | Middle Cook Inlet (MGS Unit) | April – December | Year 4 (2028) | 4 days tugs under load with a jack-up rig; 12 days pile driving (two wells) | Pile driving, 3 to 4 tugs towing, holding, and positioning a jack-up rig |
| Pipeline Replacement/ Installation[3] | Middle Cook Inlet/Trading Bay | April – November | Year 2 (2026) | *Scenario 1*: 11 days using lay barge methods<br>*Scenario 2*: 22 days using lay barge methods (11 days per project, 2 projects) | *Scenario 1*: Anchor handling<br>*Scenario 2*: Anchor handling |
| | | April – November | Year 4 (2028) | *Scenario 1*: 8 days using pipe pull methods<br>*Scenario 2*: no pipeline replacement/installation | *Scenario 1:* 2 tugs engaged in pipe pulling, bottom impact sounds of pipe connecting with seafloor<br>*Scenario 2*: none |

**Notes:**

[1] The specific years activities are analyzed to occur may or may not coincide with the actual year of execution, therefore, Hilcorp will be requesting up to the annual maximum number of takes per year depending upon the activities planned. For further details, these potential combinations of activities across the five-year action period are analyzed in the *Scenario 1* and *Scenario 2* tab in the Excel workbook submitted in tandem with this ITR.

[2] To determine maximum annual exposure estimates, one exploratory well between Anna and Bruce is analyzed to occur in Year 2 and two exploratory wells in the MGS Unit are analyzed to occur in Year 4; however, the exploratory wells may be developed in any separate years during the Petition period.

[3] To determine maximum annual exposure estimates, two pipeline scenarios are analyzed to occur: *Scenario 1* comprises one project using lay barge methods in Year 2 and one project using pipe pull methods in Year 4; *Scenario 2* comprises two projects using lay barge methods in Year 2 and no additional projects thereafter. A maximum of two pipeline projects will occur during the Petition period. Pipeline projects may occur simultaneously in any one year or in separate years year during the Petition period however, only lay barge methodology can be utilized in the same year (i.e., *Scenario 2*). The greatest potential estimated exposure to beluga whales results from the following activities in Year 2: two lay barge projects *(Scenario 2)*, winter pile driving at the Tyonek, tugs under load with a jack-up rig, and exploratory drilling (one well) between the Anna & Bruce platforms. The greatest potential estimated exposure to all other marine mammals results from the following activities in Year 4: exploratory drilling (two wells) in the MGS Unit, tugs under load with a jack-up rig, winter pile driving at Tyonek, and pipe pulling *(Scenario 1)*. These two combinations of activities are used to calculate the maximum annual take authorization requests for each species. Alternative combinations of activities result in fewer estimated exposures, thereby supporting the use of these combinations.

### 1.2.1 Production Drilling

The following text outlines the type of activities associated with production drilling and anticipated dates and durations in the middle Cook Inlet region (Figure 1).

Hilcorp routinely conducts production drilling activities at offshore platforms to meet production needs; all Hilcorp platforms have the potential for production drilling activity. Drilling activities are accomplished by using conventional drilling equipment from a variety of rig configurations and occur through existing well slots or wellbores located in legs of the existing platforms.

Hilcorp plans to conduct production drilling in middle Cook Inlet and Trading Bay during the open water season, which generally runs from April to November, however, may extend into December depending on ice conditions. Drilling activities will span up to 240 days, with tugboats towing, holding, or positioning a jack-up rig (i.e., the sound-producing activity) for up to 12 days in Years 1, 3, and 5, up to 10 days in Year 2, and up to 8 days in Year 4. The *Spartan 151* (or a similar jack-up rig) will be used for production drilling and will be towed using three ocean-going tugs. Additionally, a fourth tug will be on standby in the event of mechanical issues and may be engaged for an estimated 1 hour (hr) during jack-up rig positioning.

In addition to Year 1 through Year 5 (2025-2029) production drilling activities, 10 drilling conductor pipes (piles) will be driven into the sediment to support future well slots for production well development on the Tyonek platform at an installation rate not to exceed two per year. Pile driving will occur intermittently between mid-November and mid-April. This activity is further discussed in Section 1.2.1.2.

Tug use required to tow, hold, and position the jack-up rig in Years 1 through 5 and pile driving in Years 1 through 5 at the Tyonek platform are the only sound-generating activities associated with production drilling and production well development for which take authorization is being requested. The acoustic characteristics of tugs towing, holding, or positioning a jack-up rig and pile driving are described in Section 6. A summary of these sound-producing activity durations can be found in Section 2. Further operational details are found in the subsequent sections.

#### 1.2.1.1 Tugs under Load with a Jack-Up Rig in Support of Production Drilling

##### *1.2.1.1.1 Jack-Up Drilling Rig*

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

Hilcorp proposes to conduct production drilling using the *Spartan 151* jack-up drill rig (or similar). *Spartan 151* is a 150 H class independent-leg, cantilevered jack-up drill rig with a drilling depth capability of 7,620 meters (m) (25,000 feet [ft]) that can operate in maximum water depths up to 46 m (151 ft). To maintain safety and work efficiency, the jack-up rig will be equipped with the following:

- Either a 5,000-, 10,000-, or 15,000-pound-per-square-inch (psi) blowout preventer (BOP) 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 (151 ft) 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.

***Oil Field Support Services***

The jack-up rig will be stocked with most of the drilling supplies required to complete a full summer program each year, including both production and exploratory drilling. Deliveries of the remaining items, including crew transfers, will be performed by support vessels and helicopters. The majority of the oilfield support services contractors have offices, shops, and additional equipment located in Anchorage, Kenai, and Nikiski that will support their remote field operations. The tugs used to mobilize or move the jack-up rig will be released once the rig is in place and workboat(s) will be staged at Rig Tenders Dock in Nikiski or at the Homer Dock in Homer for supporting operations.

***Fuel***

Jack-up rig equipment will use diesel fuel or electricity from generators. Personnel associated with fuel delivery, transfer, and handling will be knowledgeable of Industry Best Management Practices (BMPs) related to fuel transfer and handing, drum labeling, secondary containment guidelines, and the use of liners/drip trays.

The jack-up rig will take on a maximum fuel load prior to operations to reduce fuel transfers during production or exploratory drilling. The jack-up rig has a diesel burn rate of ~9,464 liters (~2,500 gallons) per day. The jack-up rig will need to be refueled on location one time per well via an ISO tank or directly from a supply boat. Commercial tank farms in the Nikiski or Kenai area will supply fuel transported by workboats as needed. The Rig Barge Master will oversee re-fueling and fluid transfers between the rig and fuel workboats, and subsequent transfers between tanks on the rig.

##### *1.2.1.1.2 Tugs and Rig Transport*

Three tugs will be used to safely pull the *Spartan-151* (or similar jack-up rig) to drilling locations and to position the jack-up rig to appropriately secure it on the sea floor. A fourth tug will be available on standby in the event that mechanical issues occur with one of the tugs. Additionally, the fourth tug may be used minimally (for ~1 hr) to help with positioning the jack-up rig. The horsepower (hp) of each of the tugs may range between 4,000 and 8,000. Details of the proposed tugs, or similar, are provided in Table 2, and example tug specifications are provided in Appendix A for tugs that would be comparable in size and power to those used to support production drilling activities.

The jack-up rig will be moved in a manner to minimize any potential safety risks as well as cultural or environmental impacts. While under tow to the well site, rig operations will be monitored by Hilcorp and the drilling contractor. Very High Frequency radio, satellite, and cellular phone communication systems will also be used while the jack-up rig is under tow. Helicopter transport will be available to move personnel to and from the rig and platforms.

## Table 2. Description of Tugs Used for Towing, Holding, and Positioning the Jack-Up Rig

| Tug | Primary Activity | Specifications |
|---|---|---|
| *Bering Wind* (or similar) | Towing, holding, and positioning the jack-up rig. | 22-m length by 10-m breadth (72 ft by 33 ft)<br>144 gross tonnage |
| *Stellar Wind* (or similar) | Towing, holding, and positioning the jack-up rig. | 32-m length by 11-m breadth (105 ft by 36 ft)<br>160 gross tonnage |
| *Glacier Wind* (or similar) | Towing, holding, and positioning the jack-up rig. | 37-m length by 11-m breadth (121 ft by 36 ft)<br>196 gross tonnage |
| *Dr. Hank Kaplan* (or similar) | Standby tug used for positioning the jack-up rig, if needed. | 23-m length by 11-m breadth (75 ft by 36 ft)<br>176 gross tonnage |

**Notes:** This is not intended to be a specific list of tugs. Rather, tugs would be the same or similar such that potential effects of their use would be commensurate with what is presented in this Petition.

The amount of time that tugs are under load transiting and holding or positioning the jack-up rig in Cook Inlet is tide-dependent. The amount of operational effort (e.g., power output) the tugs use for transiting depends on whether the tugs are towing with or against the tide and can vary across a tide cycle as the current increases or decreases in speed over time. The tug operators make every effort to maximize transit with the tide (which requires lower power output) and minimize transit against the tide (which requires higher power output).

To mobilize the jack-up rig each year, a high slack tide is necessary for the tugs to approach close enough to shore to attach and pull the jack-up rig off Rig Tenders Dock. The same is required for demobilization when the jack-up rig is returned to Rig Tenders Dock at the end of the open water season. The potential for four additional location-to-location transfers before returning to Rig Tenders exists, totaling up to six annual jack-up rig moves in support of production drilling.

A high slack tide is needed 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 fine movements necessary to safely position the jack-up rig within several feet of the platform. Positioning and securing the jack-up rig is generally performed at high slack tide rather than low slack tide to pin the legs down (jack the legs down onto the sea floor) at an adequate height to ensure the hull of the jack-up rig remains above the water level of the subsequent incoming high tide.

Because 12 hr elapse between each high slack tide, regardless of the distance the tugs travel, they are generally under load for those 12 hr as high slack tides are preferred to attach and detach the jack-up rig from the tugs.

Once the tugs are on location with the jack-up rig at high slack tide (12 hr from the previous departure), a 1-to-2-hr window occurs when the tide is slow enough (1 to 2 knots [kt]) for the tugs to initiate positioning of the jack-up rig and pin the legs to the sea floor on location. The tugs are estimated to be under load, generally at half-power conditions or less, for up to 14 hr, from the time of departure through the initial positioning attempt of the jack-up rig. One additional tug may engage during positioning activities to assist with fine movements necessary to place the jack-up rig. The fourth tug is estimated to engage with the three tugs during a positioning attempt for up to 1 hr at half power.

If the first positioning attempt takes longer than anticipated, the increasing current speed (~3 to 4 kt) will prevent the tugs from safely positioning the jack-up rig on location. If the first positioning attempt is not successful, the jack-up rig will be pinned down at a nearby location and the tugs will be released from the jack-up rig. The tugs will remain nearby, generally floating with the current. Tugs will reattach to the jack-up rig and reattempt positioning, typically over a period of 2 to 3 hr, ~ 1 hr before the next high slack tide. Positioning activities are generally performed at half power. If a second attempt is needed, the duration of time the tugs would be under load holding or positioning the jack-up rig on the second day would be up to 5 hr. Typically, the jack-up rig can be successfully positioned over the platform in one or two attempts.

During a location-to-location transport (e.g., platform-to-platform) in middle Cook Inlet or Trading Bay, the tugs will move with the tide. In a north-to-south transit, the tugs tow the jack-up rig with the outgoing tide and can usually arrive at their next location to position the jack-up rig on the low slack tide, requiring half power or a lower power output during the transport.

In a transport from a southern platform to a northern platform, the tug operators prefer to pull the jack-up rig from the platform on a low slack tide to begin transiting north following the incoming tide. This maximizes their control over the jack-up rig and requires half power or a lower power output.

During a location-to-location transport, the tugs will transport the jack-up rig traveling with the tide in nearly all circumstances, except in situations that threaten the safety of humans and/or infrastructure. The tugs pulling the jack-up rig begin transiting with the tide to their next location may miss the tide window to safely set the jack-up rig on the platform or pin it nearby. In this case, the tugs would have to transport the jack-up rig against the tide to a safe harbor. Additionally, if large pieces of ice or extreme wind events threaten the stability of the jack-up rig on the platform, tugs may need to transport the jack-up rig against the tide.

Scenarios in which power output may be greater than (>) 50 percent (%) could include small periods of time (i.e., minutes [min]) during positioning to counteract the tide (up to 90% power output) (Durham Pers. Comm. 2022). Although the variability in power output from the tugs can range from an estimated 20 to 90% throughout the hours under load with the jack-up rig, as described above, the majority of operations (transiting, holding, and positioning) will occur at half power or less. See Section 6.2.1 for power output assumptions as they relate to sound modeling for tugs towing a jack-up rig.

Level B acoustic harassment associated with sound produced by tugs towing a jack-up rig has potential to occur and the resultant request for incidental take authorization is discussed in Section 6.4. Level A harassment is not expected to occur, and authorization for such take is not requested for tugs towing, holding, or positioning a jack-up rig. Interactions with gear or equipment, vessel strikes, or other encounters are not anticipated as a result of production drilling activities. No other interactions are anticipated.

#### 1.2.1.2 Production Well Development (Pile Driving) at Tyonek Platform

Hilcorp plans to install ten 76.2-centimeter (cm; 30-inch [in]) diameter (or smaller) steel piles immediately adjacent to three of the four existing legs of the Tyonek platform in middle Cook Inlet in Year 1 through Year 5. The piles will be delivered to the platform via a supply vessel from Nikiski and pile driving operations will be conducted using an existing crane on the Tyonek platform. Each pile will be arranged in a concentric configuration around the outside of legs 1, 2, and 3. Each leg will have up to three piles with a maximum of 10 piles total between all three legs. Pile driving will be discontinuous with pauses to weld additional pile sections onto the driven pile every ~12.2 m (~40 ft). The target depth for the piles is still under review but once installation is complete, each pile will extend either ~53 m (~175 ft) or ~91 m (~300 ft) below the mudline. The piles will be driven to target depth using an APE 20-5 hydraulic impact hammer with a ram weight of 18,144 kilograms (kg; 40,000 pounds [lb]) or an APE D80-42 single acting diesel impact hammer with a ram weight of 18,144 kg (40,000 lbs) or a similar impact hammer. Impact hammering is anticipated to occur intermittently over weeks for 8 hr per day for up to seven days per pile, and a total of up to 14 days per season. Operations will occur between mid-November and mid-April.

A summary of Tyonek well development durations can be found in Section 2.

### 1.2.2 Exploratory Drilling

The following text outlines the type of activities associated with exploratory drilling and anticipated dates and durations in the middle Cook Inlet and Trading Bay region (Figure 1).

Hilcorp plans to drill one exploratory well between the Anna and Bruce platforms near the northern border of Trading Bay and two exploratory wells in the MGS Unit in middle Cook Inlet, based on mapping of subsurface structures from previously collected two-dimensional (2D) and three-dimensional (3D) seismic data and historical well information. The exploration well in Trading Bay is analyzed to occur between April and December in Year 2 (2026); the exploration wells in the MGS Unit are analyzed to occur between April and December in Year 4 (2028). However, they may occur in any separate years during the ITR period. All combinations of activities have been analyzed to determine the highest potential estimated exposures to marine mammals and are used in take authorization request calculations (i.e., the maximum potential exposure estimate is used for the maximum take request). Refer to the Excel workbook submitted in tandem with this Petition.

For all three wells, drilling will begin after the jack-up rig has already mobilized to middle Cook Inlet and before it has demobilized back to Rig Tenders Dock. See Section 1.2.1.1 for additional information about the jack-up rig. The exact start dates for drilling the wells are currently unknown and are dependent upon availability of the jack-up rig. It is expected each well will take ~40 to 60 days to drill and test with 2 days of tugs towing a jack-up rig, and 6 days of pile driving. After testing, the wells will undergo plug and abandonment (P&A) for the following 14 to 90 days. See Section 1.2.2.2.2 for more information on P&A.

Acoustic sources associated with exploratory drilling for which incidental take authorization is requested include tugs towing, holding, and positioning a jack-up rig and pile driving and are analyzed to occur in Years 2 and 4. The acoustic characteristics of tugs towing, holding, or positioning a jack-up rig and pile driving are described in Section 6. A summary of these sound-producing activity durations can be found in Section 2. Further operational details are found in the subsequent sections.

#### 1.2.2.1 Tugs under Load with a Jack-Up Rig in Support of Exploratory Drilling

The description for tugs towing, holding, or positioning a jack-up rig in support of exploratory drilling is consistent Section 1.2.1.1. In Year 2, tugs will tow, hold, or position the jack-up rig for up to 2 days at one exploratory well site between the Anna and Bruce platforms. In Year 4, tugs will tow, hold, or position the jack-up rig for up to 4 days at two exploratory well sites within the MGS Unit.

#### 1.2.2.2 Drilling Program and Well Operations

The drilling program for one exploratory well between the Anna and Bruce platforms and for two wells in the MGS Unit will be described in detail in the request for a Permit to Drill submitted to the Alaska Oil and Gas Conservation Commission (AOGCC). The request for a Permit to Drill will present information on the drilling mud program, casing design, formation evaluation program, cementing programs, and other engineering information. After rig-acceptance by Hilcorp, the well will be spudded and drilled to a bottom-hole depth of ~2,100 to 4,900 m (~7,000 to 16,000 ft), depending upon the well's geological characteristics.

##### *1.2.2.2.1 Blowout Prevention (BOP) Program and Equipment*

All operating procedures on the jack-up rig, whether automated or controlled by company or contractor personnel, are specifically designed to prevent a loss of well control. The primary method of well control utilizes the hydrostatic pressure exerted by a column of drilling mud of sufficient density to prevent an undesired flow of formation fluid into the well bore. In the unlikely event primary control is lost, surface BOP equipment would be used for secondary control. For each of the wells, Hilcorp will use a 5,000, 10,000 or 15,000 psi BOP stack depending on anticipated formation pressures to be encountered and offset well information.

##### *1.2.2.2.2 Plugging and Abandonment of Exploratory Wells*

When planned and permitted operations are completed, the wells will be suspended according to State of Alaska regulations. The well casings will be landed in a mudline hanger after each hole section is drilled. When the well is abandoned, the production casing will be sealed with mechanical plugging devices and cement to prevent the movement of any reservoir fluids between various strata. The casing string will then be cut off below the surface and sealed with a cement plug. A final shallow cement plug will be set to ~3.05 m (~10 ft) below the mudline. At this point, the surface casing, conductor, and drive pipe will be cut off, and the three cut-off casings and the mudline hanger will be pulled to the deck of the jack-up rig for final disposal. The P&A procedures are part of the request for a Permit to Drill and are reviewed by AOGCC prior to permit issuance.

##### *1.2.2.2.3 Drilling Waste Management Program*

All drilling waste, wastewater, recyclables, hazardous waste, and municipal solid waste will be stored, transported, and disposed of in accordance with local, state, and federal regulations.

##### *1.2.2.2.4 Drilling Fluids and Cuttings*

Drilling waste from each well includes drilling fluids, mud, and rock cuttings will be circulated from downhole to the jack-up mud pit system. Non-hydrocarbon-based drilling wastes will be discharged to Cook Inlet under an approved Alaska Pollutant Discharge Elimination System (APDES) general permit or sent to an approved waste disposal facility. Hydrocarbon-based drilling wastes which will be delivered to an onshore permitted location for disposal. Hilcorp will follow BMPs and all stipulations of the applicable permits for this activity.

##### *1.2.2.2.5 Drive Pipe and Conductor Installation*

A drive pipe is a relatively short, large-diameter pipe driven into the sediment prior to the drilling of oil wells. The drive pipe serves to support the initial sedimentary part of the well, preventing the loose surface layer from collapsing and obstructing the wellbore. Drive pipes (piles) for each well will be installed using pile driving techniques. At each well site, Hilcorp proposes to drive a 76.2-cm (30-in) diameter pile to ~120 m (~394 ft) using an APE Model 15-4 hydraulic impact hammer (or similar) with a Ram weight of 13,608 kg (30,001 lb). Pile driving will be discontinuous and average 0.3 m (1 ft) per min with a 1-hr break for cooling and maintenance after every ~40 min. For each well, the assumed maximum impact hammering in one 24-hr period is ~12 hr and is anticipated to last up to 6 days at each well site, although actual hammering of the pile will occur intermittently over the whole period.

Once piles are installed and ready for drilling, smaller diameter conductor pipes will be inserted into the 76.2-cm (30-in) diameter piles to transport drill cuttings to the surface. These small diameter pipes will be drilled not hammered, and the drilling sounds will not be in direct contact with the water column. As a result, there are no concerns related to sound associated with their installation.

### 1.2.3 Pipeline Installation and/or Replacement

The following text outlines the type of activities associated with pipeline replacement/installation and anticipated dates and durations in the middle Cook Inlet and/or Trading Bay region (Figure 1).

Hilcorp proposes to execute two pipeline replacement or installation projects in any year between 2025 and 2029. For the purpose of analysis, two pipeline scenarios have been analyzed for Year 2 and Year 4.

In *Scenario 1*, one pipeline project will occur in Year 2 (2026) by lay barge method and one pipeline project will occur in Year 4 (2028) by pipe pull method. In *Scenario 2*, both pipeline projects will occur in Year 2 and use lay barge methodology, and no pipeline project would occur in Year 4.

All combinations of activities have been analyzed to determine the highest potential estimated exposures to marine mammals and are used in take authorization request calculations (i.e., the maximum potential exposure estimate is used for the maximum take request). Refer to the Excel workbook submitted in tandem with this Petition. The combination of activities with the greatest potential Exposure Estimate to marine mammals is used to calculate exposure estimates and represents the annual maximum take request; however, one scenario resulted in the greatest for beluga whales and one resulted in the greatest for all other marine mammals. The greatest potential estimated exposure to beluga whales resulted from the following activities in Year 2: exploratory pile driving at one well site between the Anna & Bruce platform, two pipeline projects using lay barge methodology (*Scenario 2*), tugs under load with a jack-up rig, and winter pile driving at the Tyonek. The greatest potential estimated exposure to all other marine mammals resulted from the following activities in Year 4: exploratory pile driving at two well sites within the MGS Unit, one pipeline project using pipe pull methodology (*Scenario 1*), tugs under load with a jack-up rig, and winter pile driving at the Tyonek. *Scenario 2* results in the greatest potential estimated exposures to beluga whales while *Scenario 1* has the greatest potential estimated exposures to all other marine mammals. Accordingly, *Scenarios 1 and 2* are both used to inform maximum annual take authorization requests (see Excel Exposure Estimate workbook submitted in tandem with this Petition).

The project timelines are subject to weather conditions and equipment readiness. Each project's scope entails the installation or replacement of pipeline in either middle Cook Inlet or Trading Bay or a combination of both. The specific methodology of the pipeline replacement or installation is pending finalization, with both methods—pipe pulling and lay barge positioning—under consideration for implementation. Both methods include replacing or installing ~2,286 m (7,500 ft) of pipeline. Detailed information is presented in subsequent sections and Table 3 provides a summary of activities, purposes, durations, and anticipated sound sources. A summary of pipeline project durations can be found in Section 2.

Pipeline replacement and installation is driven by the need to mitigate corrosion, pipeline fatigue, and abrasion leaks, ensuring alignment with requirements of the Pipeline and Hazardous Materials Safety Administration. Installation of new gas pipelines also addresses the growing consumer demand for natural gas in Southcentral Alaska by allowing larger quantities of natural gas to be extracted for use.

The acoustic sources associated with pipeline replacement/installation activities for which incidental take authorization is requested include tugs engaged in anchor handling and pipe pulling in Years 2 and 4 respectively, and anchor handling in Year 2. The acoustic characteristics of these activities are described in

Section 6. A summary of these sound-producing activity durations can be found in Section 2. Further operational details are found in the subsequent sections.

### Table 3. Summary of Pipeline Activities, Purposes, Durations, and Anticipated Sound Sources

| Activity | Purpose | | Duration per Project | Anticipated Sound Sources |
|---|---|---|---|---|
| **Lay Barge Method** | | | | |
| Anchor Setting | Set 8-point anchor system | | 2 days | 2 AHTs, 1 assist tug |
| Pipelay | Lay out pipeline: | 2,286 m (7,500 ft) | 8 days | 2 AHTs |
| Anchor Recovery | Recover 8 anchors | | 1 day | 2 AHTs |
| **Pipe Pull Method** | | | | |
| Pipelay | Pull out pipeline: | 2,286 m (7,500 ft) | 8 days | 1 installation tug, 1 assist tug, seafloor bottom impact sounds |

**Notes:** AHT – anchor-handling tug; m – meter; ft – feet

#### 1.2.3.1 Pipeline Replacement Activities Using Lay Barge Methodology

Hilcorp is considering employing lay barge methods for pipeline replacement/installation during the 2025 to 2029 ITR period. This approach involves using anchor handling tugs (AHTs) and anchor systems to maintain the optimal stability and alignment of a specialized vessel, referred to as a lay barge, while laying pipeline on the seafloor. Additional pre-mobilization needs for replacement/installation activities using lay barge methods include procurement and transport to the worksite of project materials and vessels. For detailed examples of vessels being considered for use in this project, refer to Table 4. All activities involving sound generation in the day-to-day activities, such as anchor handling and pipelaying, will follow uniform procedures for both pipeline replacement and installation as detailed in the subsequent sections.

##### *1.2.3.1.1 Subsea Pipeline Operations*

The pipelay barge will be towed by an AHT to the initial anchor setting location. To anchor the barge, eight anchors will be set, one at a time using one AHT during slack tide. During anchor setting, a tug will handle each anchor, one at a time. Setting each anchor during slack tide may require ~1 hr each, intermittently, over a two-day period (i.e., 4 hr per day for all eight anchors). During an incoming or outgoing tide, anchors would not be set, rather one AHT and one assist tug would hold the pipelay barge in a stationary position until the next slack tide (i.e., 4 to 5 hr).

Pipeline segments would be installed every ~305 m (~1,000 ft) from the pipelay barge along the proposed routes. To lay the pipeline in place, the pipelay barge would be moved in a sequence along the pipeline route by moving the eight anchors one at a time to shift the position of the barge forward. To move anchors, two AHTs would operate one at a time in sequence and move a single anchor at a time (i.e., a single tug would move an individual anchor).

Laying pipe from the lay barge engages a U-shaped stinger roller assembly affixed to the pipelay barge and guides the pipeline into the water. This assembly is specifically engineered to regulate the curvature of the pipeline during the laying process and safely lay pipe while preventing damage from excessive bending. On the deck of the pipelay barge, segments of pipeline would be inspected and hydrotested and coatings would be verified prior to installation in the water.

#### *1.2.3.1.2 Anchor Setting*

To secure the pipelay barge, each of the eight anchors would be set one at a time using one tug (C. Burvee, Blackfin, Pers. Comm., March 13, 2023). Setting one anchor will take ~1 hr during slack tide. There are four slack tides per day; therefore, four anchors would be set in 1 day. Setting all eight anchors is expected to take 2 days (i.e., during each of the four slack tides per day). Based on information from the NOAA Tides and Currents webpage[1], there are ~4 to 5 hr[2] between slack tides (i.e., between low tide and high tide).

During an incoming or outgoing tide, an assist tug would work simultaneously with an AHT to hold the pipelay barge in place against the tide. During this 4-to-5-hr period, the two tugs would average 50% power output (C. Burvee, Blackfin, Pers. Comm., March 13, 2023). During an incoming or outgoing tide, the other AHT would be idle. Therefore, during a 24-hr period of setting four anchors, a single AHT would operate at an average of 50% power for 4 hr (during each slack tide) to set anchors, followed by a 4-to-5-hr period when the assist tug and the second AHT would operate at an average of 50% power holding the barge between each slack tide. This pattern will continue until all eight anchors are set over 2 days. During anchor setting, only one tug would be anchor handling at a time, operating at 50% power. Once all eight anchors are set, the assist tug would depart the pipelay site, leaving only the two AHTs for pipelay. Setting an anchor requires the tug captain to aim for an X, Y coordinate on the seafloor. Due to the strong tides and currents in Cook Inlet and the need to aim for a specific location, setting anchors is more complex and requires more time than anchor retrieval.

#### *1.2.3.1.3 Pipelaying*

Once all eight anchors are set, the barge would be moved every 305 m (1,000 ft) along the pipeline route. Each time that the barge needs to be repositioned, a single tug would be used at half power (50%) (see Table 4 for tug specifications) for anchor handling. Each of the eight anchors would be repositioned in the new location, one anchor at a time. Two bow anchors would typically be repositioned first (one at a time), then each set of port and starboard anchors (i.e., two on each side) would be repositioned one at a time, finishing with the two stern anchors one at a time to move the barge. The two tugs would work in sequence to relocate a single anchor at a time to “crawl” the barge into the new position ~305 m (~1,000 ft) from the previous position. To execute this, the bow anchor cables of the pipelay barge are tightened to slowly pull it to the new position as the stern anchors are slowly released. It is estimated it will take 8 days to complete the pipelaying portion of replacement/ installation activity using the lay barge method.

Each anchor weighs 9,071 kg (20,000 lb) and has ~4.6 m (~15 ft) of chain and 915 m (3,002 ft) of wire cable. All wire cables would be under tension when in the water. During pipelay, each anchor move takes about 15 min and would be an intermittent process as each anchor is moved individually.

[1] https://tidesandcurrents.noaa.gov/noaatidepredictions.html?id=9455920&units=standard&bdate=20230501&edate=20230501&timezone=LST/LDT&clock=12hour&datum=MLLW&interval=hilo&action=dailychart; Accessed January 11, 2023.

[2] For the purpose of estimating marine mammal exposures, this period is estimated to be 4.5 hr in duration for each cycle.

#### *1.2.3.1.4 Anchor Retrieval*

Anchor retrieval is only possible during slack tides. The process involves pulling eight anchors one by one using a single tug from a fixed, stationary position. While one tug is engaged in retrieving an anchor, the second tug remains idle. Between slack tides, when the tide is either incoming or outgoing, both AHTs hold the barge in place for ~4 to 5 hr, operating at an average power output of 50%. The process of retrieving anchors is swifter compared to the initial anchoring procedure due to the relative ease of lifting the anchor from its fixed position on the seafloor as detailed in the previous section. Within one slack tide period, two anchors can be successfully retrieved. Consequently, all eight anchors can be pulled up within a 24-hr span.

### 1.2.3.2 Pipeline Replacement Activities Using Pipe Pull Methodology

Hilcorp is also considering implementing a pipe pull method for pipeline replacement/installation during the 2025 to 2029 ITR period. In this approach, the pipeline is assembled on land in 305-m (1000-ft) sections and subsequently towed to sea one section at a time along the seafloor. This process is executed by an installation tug with assistance from an assist tug. For detailed examples of vessels being considered for use in this project, refer to Table 5.

#### *1.2.3.2.1 Pipelay Operations Using Pipe Pulling Methods*

During the initial phases of pipe-pulling, a pull wire is connected to the winch on the installation tug; the tug then pulls the pipe towards its stern while remaining on anchor. As the towing of the pull wire begins, buoyancy assemblies will be installed from shore along the pull wire to lift the wire out of the mud. This added buoyancy will act to reduce drag and will also reduce the pull force required by the installation tug. Onshore, the pull wire will be attached to the buoyed pull head of the first pipeline spool and the first pipeline segment will be pulled into the water during high tide.

After the installation tug has pulled the pipeline, placing the tailhead about 91 m (300 ft) offshore, it will stop pulling and continue to release wire as it moves to a specified location farther offshore. Once it reaches this new location, the tug will resume pulling the pipeline segment using the attached pull wire and remove the buoyancy assemblies as the pull wire is reeled in.

Next, the pipeline segment will be guided into position within a predetermined 3 m by 3 m (10 ft by 10 ft) target area near the platform; the installation vessel will then detach the pull wire and attach a buoy to a 45.7-m (150-ft) pennant secured at the front of the pipeline.

Following positioning of the first pipeline spool, the process will be repeated by pulling the second spool within a 3-m-by-3-m (10-ft-by-10-ft) target area at the tailhead of the first spool, and then pull the third spool within a 3-m-by-3-m (10-ft-by-10-ft) target area at the tailhead of the second spool and so on until all spools are laid out 2,286 m (7,500 ft). The assist tug will help keep the installation tug on the correct bearing throughout each pull and will assist in final positioning of the spools. The estimated duration to position all the spools is approximately 8 days, with one spool being pulled per day. The total anticipated tug operation time, operating at 50% to 85% power, is expected to be 3 hr per day.

### 1.2.3.3 Vessels for Pipeline Replacement/Installation Activities

The vessels described in the following sections serve as examples of the preferred hp, size, and vessel-type for pipeline replacement and installation activities. It is important to note their availability may not be guaranteed once project timelines are finalized. In such cases, a comparable vessel would be chosen for the intended activity.

#### *1.2.3.3.1 Vessels Using Lay Barge Methods*

Pipeline activities utilizing lay barge methods require support from two AHTs, a pipelay barge, and one assist tug as shown in Table 4. The two AHTs would be involved in replacement/installation operations, specifically during anchor handling. An assist tug from within Cook Inlet (*Bering Wind* or *Dr. Hank Kaplan*, or similar) will hold the barge between slack tides along with one of the AHTs.

## Table 4. Example Type of Tugs and Barges Used in Lay Barge Operations

<table>
<tr><th>Vessel[1]</th><th colspan="2">Length[2]</th><th>Breadth[2]</th><th>hp</th><th>Operational Use</th></tr>
<tr><td colspan="6">Barge</td></tr>
<tr><td rowspan="2">Ninilchik</td><td>m</td><td>79</td><td>22</td><td rowspan="2">N/A</td><td rowspan="2">Lay barge to be positioned and anchored by tugs using up to eight anchors and serve as an above-water work platform.</td></tr>
<tr><td>ft</td><td>260</td><td>72</td></tr>
<tr><td colspan="6">Assist Tugs[3]</td></tr>
<tr><td rowspan="2">Bering Wind</td><td>m</td><td>22</td><td>10</td><td rowspan="2">5,080</td><td rowspan="4">Assist tug used to assist the AHTs in holding the pipelay barge in place against an incoming or outgoing tide during initial barge positioning.</td></tr>
<tr><td>ft</td><td>73</td><td>34</td></tr>
<tr><td rowspan="2">Dr Hank Kaplan</td><td>m</td><td>24</td><td>11</td><td rowspan="2">5,380</td></tr>
<tr><td>ft</td><td>80</td><td>36</td></tr>
<tr><td colspan="6">AHTs[3]</td></tr>
<tr><td rowspan="2">Denise Foss</td><td>m</td><td>37</td><td>12</td><td rowspan="2">7,268</td><td rowspan="4">AHTs used to hold the barge in place during incoming or outgoing tides when anchor setting or retrieving; re-position anchors along the pipeline route; and operate in tandem during pipelay.</td></tr>
<tr><td>ft</td><td>123</td><td>41</td></tr>
<tr><td rowspan="2">Resolve Pioneer</td><td>m</td><td>63</td><td>12</td><td rowspan="2">5,750</td></tr>
<tr><td>ft</td><td>207</td><td>40</td></tr>
</table>

**Notes:** [1] This is not intended to be a specific list of vessels. Rather, vessels would be the same or similar such that potential effects of their use would be commensurate with what is presented in this Petition; [2] Rounded to the nearest whole number; [3] Tugs may range in power from 2,000 to 8,000 hp; hp – horsepower; m – meters; ft – feet; N/A – not applicable

#### *1.2.3.3.2 Vessels Using Pipe Pull Methods*

Sound sources associated with pipeline activities using the pipe pulling method include one installation tug and one assist tug. A large tug will tow the project spools into position. A local Cook Inlet tugboat will help the installation tug maintain the planned route during tidal changes. A shallow-water support vessel will ferry the messenger rope[3] from the installation tug to the beach and assist in any onshore to offshore operations. Divers will remove the 45.7-m (150-ft) pennant wire and buoy from the pull head, flood each pipeline segment, and assist with post tie-in operations. See Table 5 for vessel size and function details.

[3] The messenger rope is a wire which is used to transfer the larger pull wire from/to the floating asset to/from the beach. This is a light, usually floating line, that can be messengered by a small craft. Messenger wire is only needed if the weight, due to length or required diameter, of the actual pulling wire would be unmanageable by a small craft. It is included in the event in case it is needed.

## Table 5. Example Types of Tugs Used in Pipe Pull Operations

| Vessel Types[1] | Length[2] | | Breadth[2] | hp | Operational Use |
|---|---|---|---|---|---|
| **Installation Tug[3]** | | | | | |
| *Resolve Pioneer* | m | 63 | 12 | 5,750 | Main tug for installation and is responsible for pulling spools into position. |
| | ft | 207 | 40 | | |
| **Assist Tug[3]** | | | | | |
| *Steller Wind* | m | 26 | 9 | 3,500 | Assist tug supports the *Resolve Pioneer*, or similar, in maneuvering the spool of pipe to its designated seabed position, particularly when contending with tidal currents. |
| | ft | 85 | 30 | | |

**Notes**:[1] This is not intended to be a specific list of tugs. Rather, tugs would be the same or similar such that potential effects of their use would be commensurate with what is presented in this Petition; [2] Rounded to the nearest whole number; [3] Tugs may range in power from 2,000 to 8,000 horsepower; hp – horsepower; m – meters; ft – feet

# 2. DATES, DURATION, AND REGION OF ACTIVITY

*The dates and duration of such activity and the specific geographical region where it will occur.*

The class of activities included in this Petition are oil and gas exploration, development, production, and decommissioning activities within the Petition's specified geographic region (Figure 1) for the period of 5 years beginning August 15, 2025, extending through December 31, 2029.

The geographic area of activity covers ~1,865 $km^2$ (~460,850 acres) of water in Cook Inlet is under the jurisdiction of the State of Alaska (Figure 1). It extends from the northernmost production platform in middle Cook Inlet (located in the North Cook Inlet Unit) to a point that is 3.5 km (2.2 mi) north of Tyonek near the mouth of the Chuitna River (61º 5' 51" N, 150º 6' 53" W) along the west side of Cook Inlet and to a point that is 16 km (10 mi) south of Point Possession on the east side (60º 57' 36" N, 150º 39' 18" W). The southern end of the geographic area extends from a point along the west shoreline ~15 km (9.3 mi) south of the West Foreland (60º 39' 37" N, 151º 57' 22" W) across the inlet to a point on the eastern shoreline ~12 km (7.5 mi) south of the East Foreland (60º 37' 07" N, 151º 21' 46" W).

Figure 1 presents the specific geographic region for the class of activities. Timing, duration, and region for each activity is summarized Table 6.

## Table 6. Approximate Timing, Location, and Durations of Sound-Producing Activity

| Sound-Producing Activity | | Year[1] | Location of Activity | Duration of Sound-Producing Activity |
|---|---|---|---|---|
| **Production Drilling and Well Development** | | | | |
| 3-4 Tugs Towing, Holding, or Positioning a Jack-Up Rig | | 1 | MCI/TB | 12 days (2 days each: 1 mobilization, 4 location-location moves, 1 demobilization) |
| | | 2 | | 10 days (2 days each: 1 mobilization, 3 location-location moves, 1 demobilization) |
| | | 3 | | 12 days (2 days each: 1 mobilization, 4 location-location moves, 1 demobilization) |
| | | 4 | | 8 days (2 days each: 1 mobilization, 2 location-location moves, 1 demobilization) |
| | | 5 | | 12 days (2 days each: 1 mobilization, 4 location-location moves, 1 demobilization) |
| Tyonek Well Development | Pile Driving using an Impact Hammer | 1 | MCI (Tyonek Platform) | 7 days per pile (intermittent); 8 hours per day; 2 piles per year; |
| | | 2 | | 7 days per pile (intermittent); 8 hours per day; 2 piles per year; |
| | | 3 | | 7 days per pile (intermittent); 8 hours per day; 2 piles per year; |
| | | 4 | | 7 days per pile (intermittent); 8 hours per day; 2 piles per year; |
| | | 5 | | 7 days per pile (intermittent); 8 hours per day; 2 piles per year; |
| **Exploratory Drilling[2]** | | | | |
| 3-4 Tugs Towing, Holding, or Positioning a Jack-Up Rig | | 2 | TB (Between Anna and Bruce Platforms) | 2 days (1 location-location move) (1 well) |
| 3-4 Tugs Towing, Holding, or Positioning a Jack-Up Rig | | 4 | MCI (MGS Unit) | 4 days (2 location-location moves) (2 wells) |
| Impact Hammer Pile Driving (1-well) | | 2 | TB (Between Anna and Bruce Platforms) | 6 days (intermittent) (1 well) |

## Table 6. Approximate Timing, Location, and Durations of Sound-Producing Activity (Continued)

| Sound-Producing Activity | Year[1] | Location of Activity | Duration of Sound-Producing Activity | |
|---|---|---|---|---|
| Impact Hammer Pile Driving (2-wells) | 4 | MCI (MGS Unit) | 12 days (intermittent) (2 wells) | |
| **Pipeline Replacement/Installation[3]** | | | | |
| Anchor Handling | 2 | MCI/TB | Lay Barge Method | 11 days per project (maximum of 22 days) |
| Pipe Pulling | 4 | MCI/TB | Pipe Pull Method | 8 days |

**Notes:**
[1] The specific years activities are analyzed to occur may or may not coincide with the actual year of execution, therefore, Hilcorp will be requesting up to the annual maximum number of takes per year depending upon the activities planned. For further details, these potential combinations of activities across the five-year action period are analyzed in the *Scenario 1* and *Scenario 2* tab in the Excel workbook submitted in tandem with this ITR.
[2] To determine maximum annual exposure estimates, one exploratory well between Anna and Bruce is analyzed to occur in Year 2 and two exploratory wells in the MGS Unit are analyzed to occur in Year 4; however, the exploratory wells may be developed in any separate years during the Petition period.
[3] To determine maximum annual exposure estimates, two pipeline scenarios are analyzed to occur: *Scenario 1* comprises one project using lay barge methods in Year 2 and one project using pipe pull methods in Year 4; *Scenario 2* comprises two projects using lay barge methods in Year 2 and no additional projects thereafter. A maximum of two pipeline projects will occur during the Petition period. Pipeline projects may occur simultaneously in any one year or in separate years year during the Petition period however, only lay barge methodology can be utilized in the same year (i.e., *Scenario 2*). The greatest potential estimated exposure to beluga whales results from the following activities in Year 2: two lay barge projects *(Scenario 2)*, winter pile driving at the Tyonek, tugs under load with a jack-up rig, and exploratory drilling (one well) between the Anna & Bruce platforms. The greatest potential estimated exposure to all other marine mammals results from the following activities in Year 4: exploratory drilling (two wells) in the MGS Unit, tugs under load with a jack-up rig, winter pile driving at Tyonek, and pipe pulling *(Scenario 1)*. These two combinations of activities are used to calculate the maximum annual take authorization requests for each species. Alternative combinations of activities result in fewer estimated exposures, thereby supporting the use of these combinations.
MCI – middle Cook Inlet
TB – Trading Bay

# 3. TYPE AND ABUNDANCE OF MARINE MAMMALS IN PETITION AREA

*The species and numbers of marine mammals likely to be found within the activity area.*

In the cases of marine mammals for which separate stocks have been delineated, description and evaluation of potential effects is focused on those stocks that may occur within the Cook Inlet region. However, information on the biological species is integrated if it enhances the understanding of the relevant stock(s) or aids in evaluation of the significance of any potential effects on the stock that occurs within or near the Cook Inlet region.

Table 7 presents the twelve marine mammal species and stocks known to occur in the specified geographic region of the class of activities, along with respective population estimates and ESA listing status. Each species is described in detail in Section 4.

## Table 7. Species, Conservation Status, Stock, and Abundance Estimates of Marine Mammals in the Petition Area

| Species | Conservation Status | Stock | Population Estimate |
|---|---|---|---|
| Fin whale (*Balaenoptera physalus*) | ESA – Endangered | Northeastern Pacific | 2,554[1] |
| Humpback whale (*Megaptera novaeangliae*) | ESA –Threatened | Mexico North Pacific | 918[2] |
| | ESA – Not Listed | Hawai'i | 11,278[2] |
| | ESA – Endangered | Western North Pacific | 1,084[2] |
| Minke whale (*Balaenoptera acutorostrata*) | ESA – Not Listed | Alaska | 1,233[3] |
| Gray whale (*Eschrichtius robustus*) | ESA – Not Listed | Eastern Pacific | 14,526[4] |
| Beluga whale (*Delphinapterus leucas*) | ESA – Endangered | Cook Inlet DPS | 331[5] |
| Killer whale (*Orcinus orca*) | ESA – Not Listed | Alaska Resident | 1,920[2] |
| | ESA – Not Listed | Alaska Transient | 587[1] |
| Harbor porpoise (*Phocoena phocoena*) | ESA – Not Listed | Gulf of Alaska | 31,046[6] |
| Dall's porpoise (*Phocoenoides dalli*) | ESA – Not Listed | Alaska | 83,400[7] |
| Pacific white-sided dolphin (*Lagenorhynchus obliquidens*) | ESA – Not Listed | North Pacific | 26,880[8] |
| Harbor seal (*Phoca vitulina*) | ESA – Not Listed | Cook Inlet/Shelikof | 28,411[2] |
| Steller sea lion (*Eumetopias jubatus*) | ESA – Endangered | Western United States | 49,837[9] |
| California sea lion (*Zalophus californianus*) | ESA – Not Listed | United States | 257,606[10] |

**Notes:** Sources:
[1] Muto et al. 2021
[2] Young et al. 2023
[3] Zerbini et al. 2006
[4] Eguchi et al. 2023
[5] Goetz et al. 2023
[6] Muto et al. 2019
[7] Muto et al. 2022
[8] Muto et al. 2020
[9] Young et al. 2024
[10] Carretta et al. 2020
ESA – Endangered Species Act

# 4. DESCRIPTION OF MARINE MAMMALS IN PETITION AREA

*A description of the status, distribution, and seasonal distribution of the affected species or stocks of marine mammals likely to be affected by such activities.*

Twelve marine mammal species are known to occur in the specific geographic region (see Figure 1) of the class of activities within Cook Inlet (Young et al. 2023). Several of these species (gray whales, minke whales, and fin whales) have geographic ranges that reach the southern portions of Cook Inlet but are less likely to extend north of the Forelands into middle Cook Inlet and Trading Bay. Three marine mammal species are common throughout the specific geographic region: beluga whales (*Delphinapterus leucas*), harbor seals (*Phoca vitulina*), and harbor porpoises (*Phocoena phocoena*) (Rugh et al. 2010; Hobbs and Waite 2010; Shelden et al. 2013; Lomac-MacNair et al. 2014). Killer whales (*Orcinus orca*), Steller sea lions (*Eumetopias jubatus*), and Pacific white-sided dolphin (*Lagenorhynchus obliquidens*) may occur less frequently in middle Cook Inlet (Shelden et al. 2003). Humpback whales (*Megaptera novaeangliae*) and Dall's porpoises (*Phocoenoides dalli*) are observed more frequently near the mouth of lower Cook Inlet but do occasionally occur north of the Forelands in middle Cook Inlet. California sea lions (*Zalophus californianus*), while rarely observed in Cook Inlet, are known to have a small population in Alaska.

Recent sighting results from Hilcorp's Cook Inlet activities and other projects in Cook Inlet are incorporated into the following species distribution sections.

## 4.1 FIN WHALE

### 4.1.1 Distribution

Fin whales are found worldwide in polar, temperate, and subtropical waters with evidence of an equatorial hiatus between 20 degrees north and south (Edwards et al. 2015). The distribution and population structure of fin whales in the North Pacific is not well understood, as they were the targets of widespread commercial hunting in the 20$^{th}$ century. However, most fin whales are thought to feed in high-latitude waters during spring and summer, before migrating to lower-latitude waters in fall and winter to breed (Mizroch et al. 1984 and 2009).

In U.S. Pacific waters, fin whales are seasonally found in the Gulf of Alaska and Bering Sea and as far north as the northern Chukchi Sea (Muto et al. 2021). In coastal waters of the Aleutians and the Alaska Peninsula, they are found primarily from the Kenai Peninsula to the Shumagin Islands, with a higher abundance near the Semidi Islands and Kodiak Island (Zerbini et al. 2006). An opportunistic survey in the Gulf of Alaska revealed fin whales were concentrated west of Kodiak Island, in Shelikof Strait, and in the southern Cook Inlet region, with smaller numbers observed over the shelf east of Kodiak to Prince William Sound (Alaska Fisheries Science Center [AFSC] 2003). Muto et al. (2021) reported visual sightings and acoustic detections in the northeastern Chukchi Sea have been increasing, suggesting that the stock may be re-occupying habitat used prior to large-scale commercial whaling. Delarue et al. (2013) also detected fin whale calls in the northeastern Chukchi Sea from July through October in a 3-year acoustic study.

Fin whales in the northern North Pacific and Bering Sea tend to aggregate along frontal boundaries or mixing zones between coastal and oceanic waters that correspond with the shelf edge (NMFS 2010). Escajeda et al. (2020) found these whales repeatedly travel through the Bering Sea to the Chukchi Sea to forage on seasonally dense prey. Abundance estimates for fin whales in the Bering Sea indicate that their distribution is likely driven by preferred prey availability, with higher estimates in cold years than in warm years (Friday et al. 2012 and 2013; Muto et al. 2021). Instruments moored in the southeastern Bering Sea detected calls over the course of 1 year and found peaks from September to November as well as in February and March (Stafford et al. 2010). Delarue et al. (2013) detected calls in the northeastern Chukchi Sea from moored instruments between July and October of 2007 through 2010. Moore et al. (1998 and 2006), Watkins et al. (2000), and Stafford et al. (2007) documented high rates of fin whale calling along the Alaska coast beginning in August and September and lasting through February. Fin whales are regularly observed in the Gulf of Alaska during summer, even though calls are seldom detected during this period (Stafford et al. 2007). Fin whales were the most commonly sighted large whale during transect surveys in 2009 and 2013, with more than 171 sightings (456 individuals), and were the second most commonly sighted during transect surveys in 2015 (69 individuals) (Rone et al. 2017).

Fin whale range includes lower Cook Inlet and would be considered extralimital in middle Cook Inlet.

#### 4.1.1.1 Distribution in Cook Inlet

Fin whales' range extends into lower Cook Inlet (Figure 2); however, sightings are infrequent, and they are mostly spotted near the Inlet's entrance. Shelden et al. (2013, 2015, and 2017) and Rugh et al. (2005) collated data from NMFS aerial surveys conducted between 1993 and 2022 and documented 10 sightings of 28 individual fin whales in lower Cook Inlet during June and/ or July 2001, 2003, 2004, 2005, 2014, and 2016. No fin whales were observed during subsequent surveys in 2018, 2021, or 2022 (Shelden et al. 2015 and 2022; Shelden and Wade 2019). Additionally, no fin whales were observed in 2018 during Harvest Alaska, LLC (Harvest Alaska)'s Cook Inlet Pipeline (CIPL) Extension Project Acoustic Monitoring Program in middle Cook Inlet (Sitkiewicz et al. 2018). In September and October 2019, Castellote et al. (2020) detected fin whales acoustically in lower Cook Inlet during 3D seismic surveys, which coincided with the Hilcorp lower Cook Inlet seismic survey. During this period, 8 sightings of 23 individual fin whales were reported, indicating that the offshore waters of lower Cook Inlet may be more heavily used by fin whales than previously believed, especially during fall (Fairweather Science 2020).

### 4.1.2 Abundance and Trends

For management purposes, three stocks of fin whales are currently recognized in U.S. Pacific waters: Alaska (Northeast Pacific), California-Oregon-Washington (CA-OR-WA), and Hawai'i (Young et al. 2023). Mizroch et al. (2009) suggest that the fin whale population structure should be reviewed and updated, as six populations of fin whales were identified based on sighting and catch data including: two that are migratory (eastern and western North Pacific) and two to four more that are resident year-round in peripheral seas such as the Gulf of California, the Sea of Japan, the East China Sea and Sanriku-Hokkaido. However, a lack of dependable data on the past and present population sizes of the fin whale stock across the Northeast Pacific prevents this. Although various studies offer insights into the distribution and frequency of fin whales in this region as well as estimates of their abundance in specific areas within the stock's range, most of these findings are more than a decade old and no survey covers their full range. As a result, there are no current reliable estimates of fin whale abundances for the entire Northeast Pacific stock (Muto et al. 2021). A minimum population estimate of 2,554 whales was calculated based on 2013 data; however, this was considered an underestimate as it was only based on a portion of the stock's range (Young et al. 2023).

Zerbini et al. (2006) estimated the population of fin whales in coastal waters south of the Alaska Peninsula increased by 4.8% annually between 1987 and 2003. This finding represents the first available estimate for North Pacific fin whales and aligns with other estimates of population growth rates for large whales; however, the initial population estimate in 1987 and uncertainties regarding the population structure of fin whales in the area cast doubt on the reliability of this estimate. Additionally, the study examined only a small fraction of the Northeast Pacific stock's range, so it may not be appropriate to generalize the findings to a broader range (Muto et al. 2021).

### 4.1.3 Status

Fin whales were listed as "endangered" in 1970 (35 Federal Register [FR] 18319) and protected under the MMPA in 1973. Further protection measures were afforded to the species in 1973 when fin whales were listed as endangered under the ESA and depleted under the MMPA. Commercial whaling for fin whales ended in 1976 in the North Pacific, 1976 through 1977 in the Southern Ocean, and 1987 in the North Atlantic. Subsistence hunts continue in Greenland under the Aboriginal subsistence whaling scheme managed by the International Whaling Commission (NMFS 2010). The population declined dramatically as a result of 20$^{th}$ century commercial whaling, and the Northeast Pacific stock is currently categorized as a strategic stock.

### 4.1.4 Prey and Foraging

Fin whales forage in spring and summer in colder high-latitude waters. Their diet consists primarily of euphausiids and large copepods as well as small schooling fish, including herring, capelin, and sand lance (Flinn et al. 2002; Nemoto 1970). In Alaska, these species are observed feeding in the Gulf of Alaska, Prince William Sound, the Aleutian Islands, and Kodiak Island. Further, a biologically important area (BIA) for fin whale feeding has been recognized around Kodiak Island extending into the mouth of Cook Inlet (Wild et al. 2023). Most foraging activity occurs in highly abundant upwelling zones where cold nutrient-rich water supports high levels of productivity (Mizroch et al. 2009).

### 4.1.5 Acoustics

Fin whale calls, which have the lowest frequency and highest source levels of all cetaceans (Richardson et al. 1995), are indicative of long-distance communication (Payne and Webb 1971, Edds-Walton 1997). Some speculation suggests that these sounds could aid in navigation purposes, such as locating large geographic features (Tyack 1999).

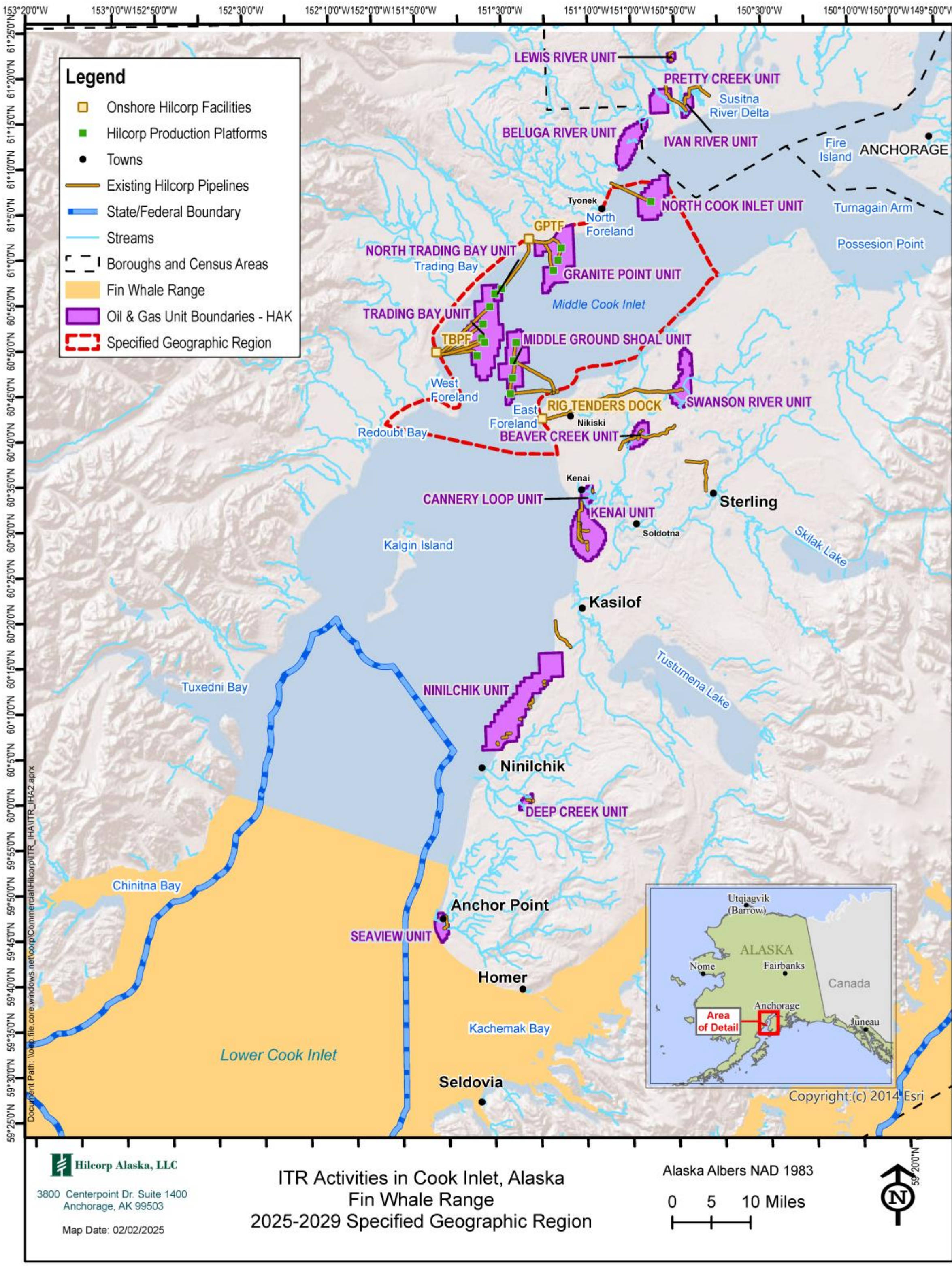
The vocal sequences of fin whales are also some of the most powerful and are highly stereotyped. They can reach intensities up to 186 decibels (Db) referenced to 1 microPascal (µPa) (dB re 1 µPa) at 1 m but have the lowest frequency of all cetaceans and are produced in roughly the same bandwidth, from 15- to 30-hertz (Hz) fundamental frequencies (Mellinger et al. 2007; Charif et al. 2002). The most common calls, made only by males and referred to as "20-Hz calls," are known to proliferate at the beginning of the reproductive season, suggesting they play a role in breeding behaviors as displays of male reproductivity (Croll et al. 2002; Watkins et al. 1987). Širović et al. (2013) revealed the detection of a distinct "40-Hz call" in known feeding grounds, first observed by Watkins et al. (1981). The intensity of this call has been found to increase reciprocally with prey biomass, indicating its importance as a foraging function (Romagosa et al. 2021).

Fin whales are categorized as low-frequency (LF) cetaceans and have a generalized hearing frequency range between 7 Hz and 36 kilohertz (kHz) based on their vocalizations; however, no direct data exists on fin whale hearing (NMFS 2024). Inner ear anatomy suggests they have LF hearing abilities. Synthetic audiograms indicate a hearing range of 0.02 to 10.00 kHz for calves, with maximum sensitivities between 1 and 2 kHz (Cranford and Krysl 2015). However, it is important to note this is an inferred hearing range based on the frequencies of their vocalizations and anatomical studies of their inner ear, rather than direct measurements of hearing sensitivity. Further research is needed to better understand the hearing abilities of fin whales.

### 4.1.6 Critical Habitat

No critical habitat has been designated or proposed for the fin whale in the North Pacific stock.

# Figure 2. Fin Whale Range within Cook Inlet



# 4.2 GRAY WHALE

## 4.2.1 Distribution

There are two Pacific Ocean stocks of gray whales: the western Pacific stock and the eastern Pacific stock. Historically, the western Pacific stock migrated along the coasts of Russia, Korea, Japan, and China. However, commercial whaling decimated this stock prior to the 1970s to the extent that it was thought to be extinct until small numbers of whales were discovered in the 1990s off Sakhalin Island, Russia (Burdin et al. 2017). Currently, a significant portion of the 240 animals comprising the western Pacific stock migrate across the Bering Sea and Gulf of Alaska to Mexico before returning to Russia in spring.

Gray whales in the eastern Pacific stock are mostly found in the Chukchi, Beaufort, and Bering Seas in summer and fall. Prior to sea ice moving in over their Alaskan feeding grounds, most of the eastern Pacific gray whales begin an 8,047 to 11,265 km (5,000 to 7,000 mi) migration to one of several warm, shallow lagoons in Mexico where they give birth, mate, and nurse their young (Calambokidis et al. 2017). Typically, pregnant females lead the southward migration, followed by males and other adult females and juveniles. Along the migratory route to Mexico's Baja Peninsula, gray whales generally stay within 4.0 km (2.5 mi) of the coastline. Beginning in January, the first whales start their long migration back to their summer feeding grounds. Mothers and their calves typically remain in the warm lagoons for 1 to 2 months longer than other gray whales so calves can gain strength and increase their blubber before their long journey north.

### 4.2.1.1 Distribution in Cook Inlet

Gray whales' range includes lower Cook Inlet (Figure 3). They tend to approach lower Cook Inlet in late spring to early summer as they return to their northern feeding grounds and again in late fall during their southward migration to Mexico (Consiglieri et al. 1982; Rice and Wolman 1971). A small subset of whales chooses to overwinter in select coastal areas in the Pacific Northwest, including lower Cook Inlet near Kodiak Island, rather than migrating south to Mexican waters (Moore et al. 2007). Though most gray whales migrate past Cook Inlet, some gray whales have been observed by fishers near Kachemak Bay and along the coastline north of Anchor Point (Bureau of Ocean Energy Management [BOEM] 2015). During NMFS aerial surveys conducted in June 1994, 2000, 2001, 2005, and 2009, gray whales were observed in Cook Inlet near Port Graham and Elizabeth Island as well as near Kamishak Bay, with one gray whale observed as far north as the Beluga River (Shelden et al. 2013). Gray whales were also observed offshore of Cape Starichkof in 2013 by marine mammal observers monitoring Buccaneer's Cosmopolitan drilling project (Owl Ridge 2014) and in middle Cook Inlet in 2014 during the 2014 Apache 2D seismic survey (Lomac-MacNair et al. 2015). Several projects performed in Cook Inlet in recent years reported no observations of gray whales. These project activities included the SAE seismic survey in 2015 (Kendall and Cornick 2015), the 2018 CIPL Extension Project (Sitkiewicz et al. 2018), and the 2019 Hilcorp seismic survey in lower Cook Inlet (Fairweather Science 2020).

Protected Species Observers (PSOs) observed three separate sightings of a single gray whale near the POA on the POA Modernization Project (61 N Environmental 2021, 2022). NMFS's 2021 POA Visual Monitoring Project reported one gray whale observed in August near Point Woronzof (Easley-Appleyard and Leonard 2022). The greatest densities of gray whales occur in lower Cook Inlet from November through January and March through May; the former are southbound; the latter are northbound (Ferguson et al. 2015).

### 4.2.2 Abundance and Trends

Abundance estimates of Pacific coast feeding group whales increased from 1998 through 2004, remained stable from 2005 to 2010, then steadily increased from 2011 to 2015 (Calambokidis et al. 2017). In January 2019, elevated numbers of gray whales in poor body condition began stranding along the U.S. West Coast between Mexico and Alaska, prompting NOAA Fisheries to define it as a UME (NOAA 2022b). The UME continued through the 2021-2022 winter, during which a 2021 to 2022 survey was completed by NOAA's Southwest Fisheries Science Center (SFSC) and estimated the eastern Pacific stock to contain ~16,650 whales (Eguchi et al. 2023; NOAA 2022b). Since 1967, the SFSC has been collecting data that informs abundance estimates for eastern gray whales. The most recent survey conducted by the SFSC (2022-2023) shows an even further decline to a population of 14,526 whales (Eguchi et al. 2023). Necropsies of a subset of the stranded whales indicated that nutritional stress was suspected as a leading cause of the strandings (NOAA 2020). It should be noted that similar declines have occurred in the recent past, including a UME that occurred in 1999 through 2000 (NOAA 2022b). Following these past declines, the gray whale population has rebounded, demonstrating resilience to natural pressures faced by the whales in a changing environment. The western Pacific stock is currently estimated to contain only 240 individuals (Marine Mammal Commission 2023).

### 4.2.3 Status

The western Pacific stock of gray whales is listed as endangered under the ESA, whereas the eastern Pacific stock was delisted from the ESA in 1994. Both stocks, however, remain listed as depleted under the MMPA.

### 4.2.4 Prey and Foraging

Gray whales feed by swimming along the seafloor, rolling on their sides, and sucking food into their mouths. They mainly feed on amphipods and mysids but are known to be opportunistic feeders that also feed on ghost shrimp, polychaete worms, red crabs, squid, baitfish, herring eggs, and various other larvae and bottom-dwelling invertebrates found on or near the sea floor. Since gray whales are primarily bottom feeders not known to dive deeper than 120 m (395 ft), they tend to forage mainly in shallower coastal areas. Female gray whales give birth to a single calf every 2 or more years after reaching sexual maturity and nurse the calf for 7 to 8 months on milk that is 53% fat. Throughout summer and fall, most whales in the eastern North Pacific stock feed in the Chukchi, Beaufort, and northwestern Bearing Seas, while a small population known as the "Pacific Coast Feeding Group" feeds and summers along the Pacific Coast between Kodiak Island, AK, and northern California (Darling 1984; Calambokidis et al. 2017). During their 16,093 km (10,000 mi) (or greater) migration from Alaska to the lagoons of Mexico and back, gray whales rarely feed. It is thought that a decrease in sea ice due to climate change may open up additional feeding grounds for gray whales. In the past, high sea ice coverage in foraging areas has been linked to a decline in calf survival (Perryman et al. 2002). While additional foraging areas could open up due to climate change, increases in ocean acidification could reduce the abundance of shell-forming organisms that are an essential part of the gray whale diet (Hall-Spencer et al. 2008).

### 4.2.5 Acoustics

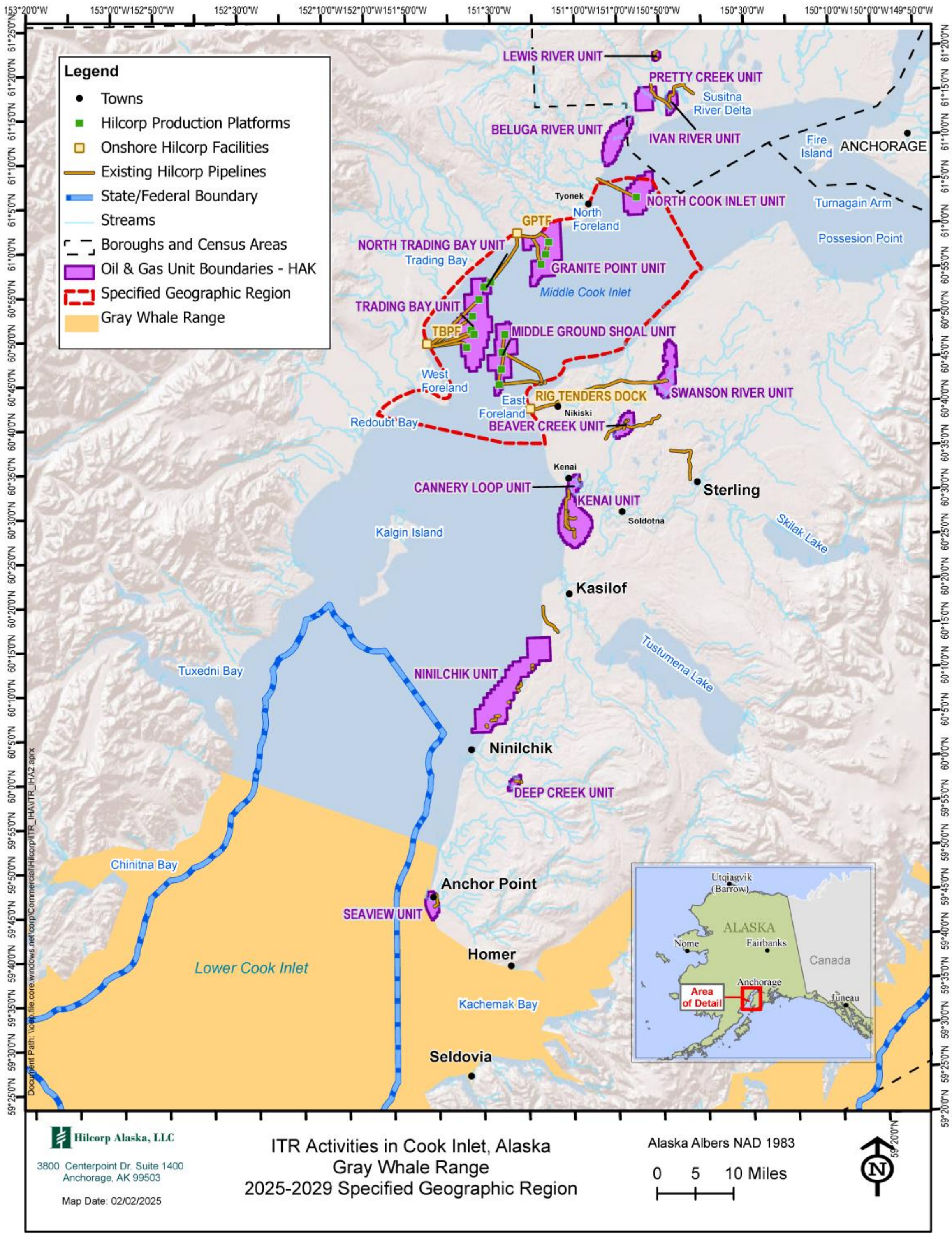
All baleen whales are categorized as LF cetaceans, and no studies to date have directly measured the sound sensitivity of baleen whales. Instead, hearing sensitivities have been extrapolated from the frequencies at which whales vocalize, their behavioral responses to sounds at various frequencies, predictive models, and inner ear anatomy studies. According to NMFS, gray whales fall in the LF cetacean functional hearing group and have a generalized hearing range between 7 Hz and 36 kHz (NMFS 2024).

Gray whale vocalizations are in the LF range, occurring between 100 Hz and 2,000 Hz, while functional hearing sensitivity is believed to extend to at least 21 kHz, based on responses to 21 to 25 kHz active sonar signals (Frankel and Stein 2020). Unlike some other baleen whales, such as fin and North Atlantic right whales, gray whales have a limited number of calls (six distinct calls) and do not alter the frequency of the calls during times of elevated ambient sound (NOAA 2016).

### 4.2.6 Critical Habitat

There is currently no critical habitat area designated for gray whales.

# Figure 3. Gray Whale Range within Cook Inlet



## 4.3 HUMPBACK WHALE

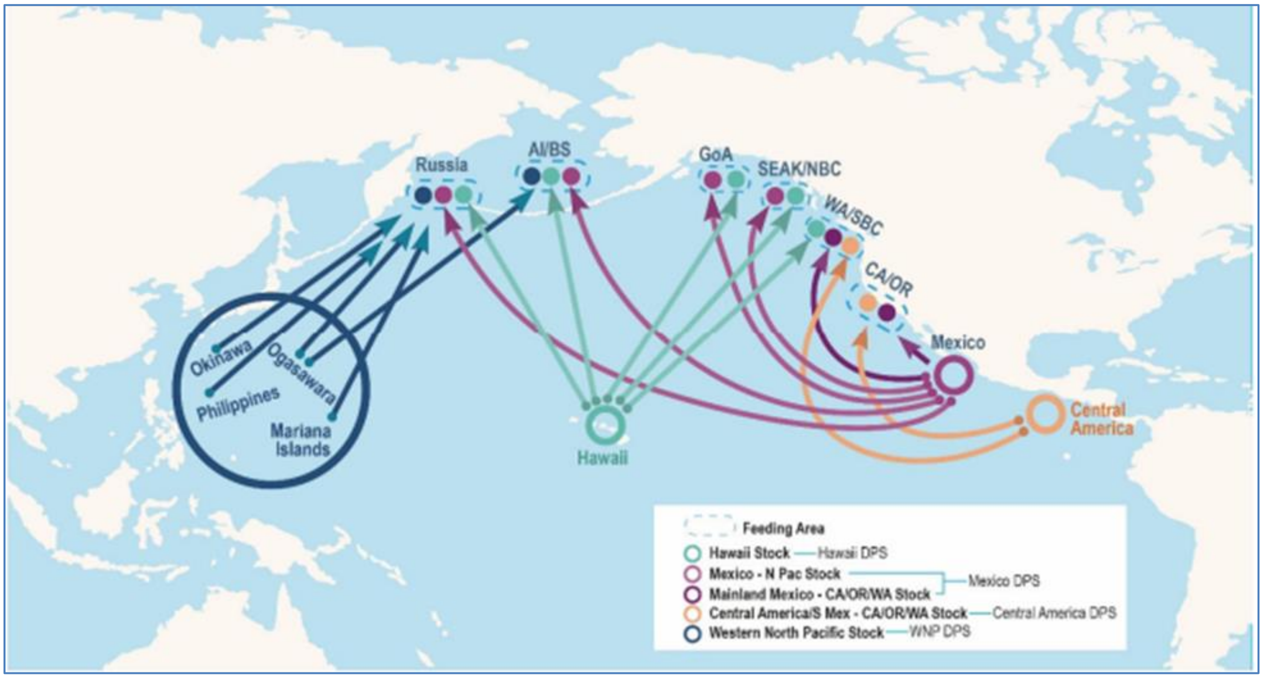
### 4.3.1 Distribution

Humpback whales are distributed throughout the world's oceans and are divided into 14 separate Distinct Population Segments (DPSs) established under the ESA. Within the North Pacific Ocean, NMFS Stock Assessment Reports recognize five separate stocks of humpback whales based on genetic and photographic identification studies: the Central America/Southern Mexico – CA-OR-WA stock, the Mainland Mexico – CA-OR-WA stock, the Mexico – North Pacific stock, the Hawai'i stock, and the Western North Pacific Stock (Young et al. 2023) (Figure 4). The newly redefined stocks are based on delineation of demographically independent populations (DIPs) and units that comprise the four DPSs of the North Pacific subspecies of humpback whales (81 FR 62259; Young et al. 2023). The Central America/Southern Mexico stock winters off the Pacific coast of Nicaragua, Honduras, El Salvador, Guatemala, Panama, Costa Rica, and southern coastal Mexico and migrates to the U.S. waters of CA-OR-WA during summer (Young et al. 2023). The Mainland Mexico – CA-OR-WA stock winters off the coast of mainland Mexico and migrates north to CA-OR-WA, Southern British Columbia, Alaska, and the Bering Sea. The Mexico-North Pacific stock winters off the coast of Mexico and the Revillagigedo Archipelago and summers primarily in Alaska waters. The Hawai'i stock winters off the coast of Hawai'i and largely summers in Southeast Alaska and Northern British Columbia (Wade et al. 2021). Another faction of this stock migrates between Hawai'i and Russia, western Alaska, and central Alaska. The Western North Pacific stock winters off the coast of Asia and migrates primarily to Russia and the Bering Sea/Aleutian Islands in summer (Young et al. 2023).

The Hawai'i DPS includes the Hawai'i stock (Young et al. 2023). The Mexico DPS is comprised of the Mainland Mexico – CA-OR-WA DIP and the Mexico – North Pacific stocks (Young et al. 2023). The Hawai'i DPS was removed from listing under the ESA, whereas the Mexico DPS was listed as threatened and the Western North Pacific DPS was listed as endangered (Young et al. 2023).

Humpbacks in Alaska congregate primarily in summer months in Southeast Alaska, Prince William Sound, Kodiak, the Bering Sea and adjacent to the Aleutian Islands (Wild et al. 2023) as well as offshore in the Gulf of Alaska over the continental shelf (Wade et al. 2021) and there are even some individuals who do not leave Alaskan waters.

**Figure 4. Wintering Areas and Summer Feeding Areas of Five Humpback Whale Stocks**




Source: NOAA 2022a

#### 4.3.1.1 Distribution in Cook Inlet

Humpback whales are regularly observed during marine mammal surveys conducted in Cook Inlet; however, their presence is largely confined to lower Cook Inlet/Gulf of Alaska (Figure 5). From 1993 to 2022, NMFS CIBW aerial surveys were conducted throughout much of Cook Inlet and recorded 97 sightings of 211 individual humpback whales; all of which occurred in lower Cook Inlet (Shelden et al. 2013, 2015, 2022). Aerial surveys from 2001 to 2004 observed humpback whales on a regular basis near Kachemak Bay, Port Graham, Elizabeth Island, and north of the Barren Islands during June (Rugh et al. 2005). Additionally, anecdotal observations of humpback whales occurring near Anchor Point during summer have been reported (Owl Ridge 2014). Three humpback whales were observed in Cook Inlet during SAExploration (SAE)’s seismic study in 2015: two near the Forelands and one in Kachemak Bay (Kendall and Cornick 2015). North of the Forelands, two humpback whales were sighted during marine mammal monitoring in May and June 2015 (Jacobs Engineering Group 2017). Two humpback whale sightings occurred near the mouth of Ship Creek during monitoring efforts in September 2017. They two were noted to likely be the same individual (ABR 2017). PSOs in 2018 observed three humpback whales near Ladd Landing during monitoring efforts (Sitkiewicz et al. 2018). Hilcorp’s lower Cook Inlet 3D seismic survey in 2019 reported 14 sightings comprising 38 individual humpback whales between Anchor Point and Iniskin Peninsula, ~100 km (~62 mi) or more south of the action area (Fairweather Science 2020). One humpback was observed during transitional dredging at the Port of Anchorage (POA) in July 2022 (61 North Environmental 2022b). They are not expected to be commonly observed north of Anchor Point but may be an infrequent visitor to middle Cook Inlet.

### 4.3.2 Abundance and Trends

Individuals from the Mexico DPS, Hawai’i DPS, and Western North Pacific DPS may occur in the project area. Within the Mexico DPS, the stock likely to occur in Cook Inlet is the Mexico – North Pacific stock.

To develop an abundance estimate of Mexico – North Pacific stock of humpback whales, NOAA multiplied the abundance estimate determined during Structure of Population, Levels of Abundance, and Status of Humpback Whales study (SPLASH) in 2004 to 2006 by the probability of movement between each feeding area and the Mexican wintering area (Wade 2021) then added them together (Young et al. 2023). The resulting abundance estimate for summer areas, including Cook Inlet, is 918 animals (Coefficient of variation [CV]=0.217) (Young et al. 2023). The current minimum population estimate for the Mexico – North Pacific overall stock is 2,241 individuals, and abundance estimates suggested the Mexico-North Pacific stock is increasing at a rate of ~6.9% annually over 1990s estimates; however, a decline in encounter rate and number of calves (Arimitsu et al. 2021) and a large whale Unusual Mortality Event (UME) in 2015 to 2016 (Savage 2017) introduce uncertainty of the current stock population trend (Young et al. 2023).

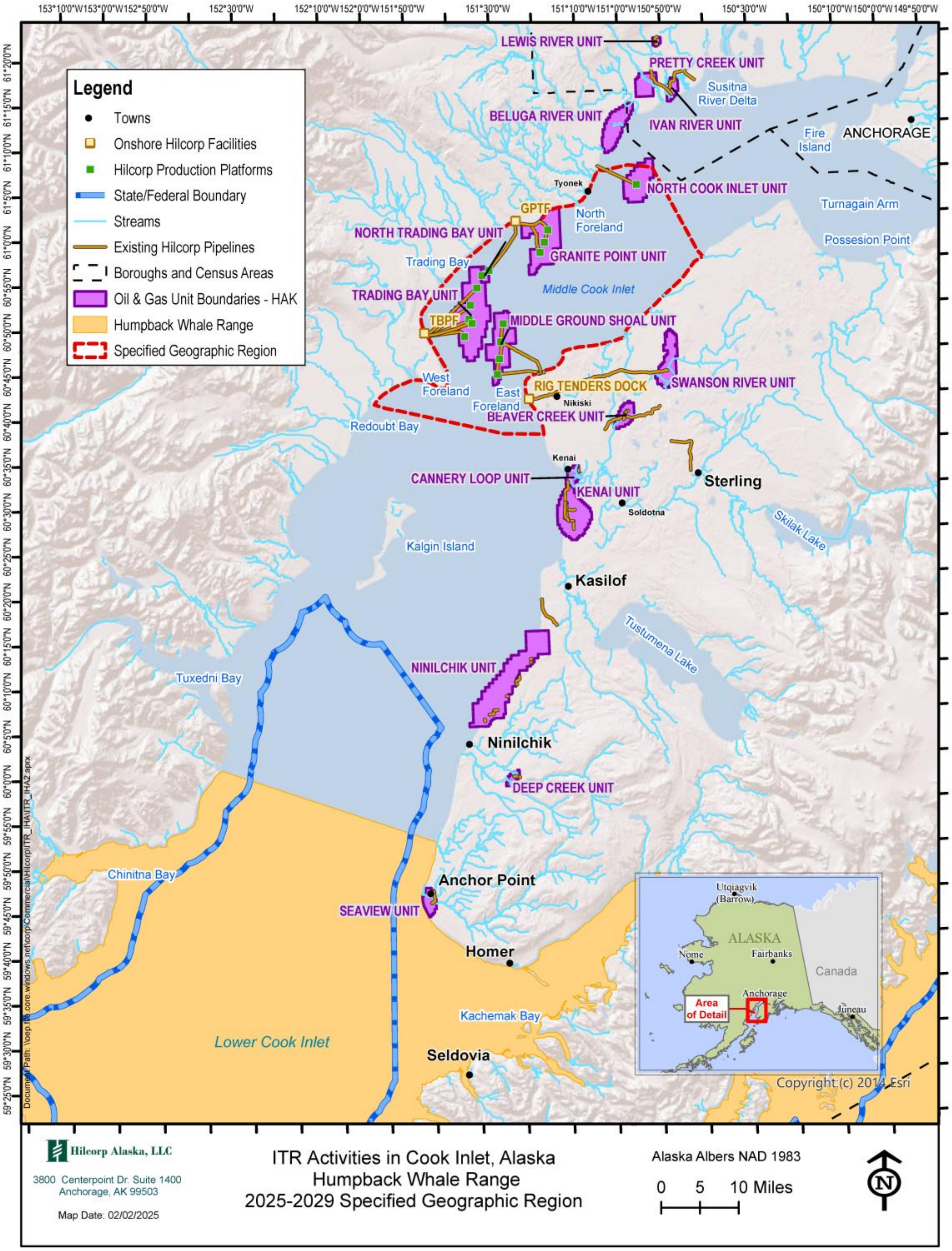
Within the Hawai'i DPS, one stock is identified – the Hawai'i stock. The most reliable abundance estimate of the Hawai'i stock of humpback whales is 11,278 animals (CV=0.56) for the Gulf of Alaska based on a winter survey (Winter Hawaiian Islands Cetacean and Ecosystem Assessment Survey) which was conducted within offshore waters around the main Hawaiian Islands from January to March 2020.

The Western North Pacific DPS has been estimated to have a population of 1,084 whales (CV=0.088) based on a recent reanalysis of SPLASH data from surveys conducted in wintering areas in Japan, the Babuyan Islands, and the Philippines using a multi-strata analysis for 2004 through 2006 (Young et al. 2023). A preliminary mark-recapture abundance estimates of ~1,000 whales was estimated from the "Asia" study using multi-strata analysis (Wade et al. 2016; Wade 2021). These data, however, did not include the Mariana Archipelago and may be underestimating the total population size. The portion of this stock that utilizes summer feeding areas in U.S. waters is estimated to be ~127 animals (CV=0.741) based on estimated stock abundance and movement probabilities as published in Wade (2021).

### 4.3.3 Status

In 1970, humpback whales were designated as "endangered" under the Endangered Species Conservation Act (ESCA). They continued to be listed as endangered in 1973 when the ESA replaced the ESCA. In 2016, the ESA listing was revised for humpback whales based on the identification of 14 DPSs worldwide. Of the 14 DPSs, four are currently listed as endangered, one is currently listed as threatened, and nine are not listed. Three of the humpback whale DPSs occur in Alaska: the Western North Pacific DPS is listed as endangered, the Mexico DPS is listed as threatened, and the Hawai'i DPS is not listed.

## Figure 5. Humpback Whale Range within Cook Inlet



### 4.3.4 Prey and Foraging

Humpback whales typically feed on euphausiids and small schooling fishes, such as juvenile walleye pollock, capelin, and Pacific sand lance, which occur in shallow, cold, productive coastal waters during summer. Humpback whales are known for concentrating prey in open waters by releasing air to create a "bubble net" and then lunging open-mouthed to the surface through the center of the "net." They use their baleen plates to filter out their prey as they force water out of their mouth. For humpbacks, feeding rarely occurs during migrations or during winter in tropical waters. Instead, the whales feed almost exclusively during summer in the productive waters of the arctic and then live off fat reserves the remainder of the year. Western North Pacific DPS whales primarily migrate from waters off the coast of Asia to summer feeding grounds in Russia and the Bering Sea/Aleutian Islands (Muto et al. 2018). Movements of humpbacks have been documented between Japan and British Columbia (Darling et al. 1996), the Kodiak Archipelago in the central Gulf of Alaska (Calambokidis et al. 2008 and 2001), and the Shumagin Islands in the western Gulf of Alaska (Witteveen et al. 2004). Most whales from the Mexico DPS forage in waters that extend from southern British Columbia to California (Wade et al. 2016); however, some migrate farther north to Alaska to feed. The percentage of Mexico DPS humpback whales in Alaskan waters is thought to be low, ranging from 7 to 11% of the total population in the state (Wade et al. 2021).

Four seasonal BIAs for feeding were delineated by Ferguson et al. (2015) for humpback whales in the Gulf of Alaska. This was later revised by Wild et al. (2023) using more recent data from the last 7 years. The updated BIA list for Southeast Alaska includes the waters around Kodiak Island, Prince William Sound, Berners Bay, Sitka Sound, Glacier Bay, Fredericks Sound, Chatham Strait, Stephens Passage, and Southern southeast Alaska. The BIAs encompassing waters around Kodiak Island, which had historically been a target of commercial whalers based out of Port Hobron, AK, (Witteveen et al. 2007) were graded a 2 on a scale of 1 to 3 by Wild et al. (2023) based on the intensity of the feeding and the reliability of foraging success. The area is considered active from May through September (Wild et al. 2023). Aerial surveys from 1999 to 2013 detected humpback whales in the Kodiak area every month of the year, with the majority of whales observed from July to September, moderate numbers from October through December, and few whales from January through June (Ferguson et al. 2015).

### 4.3.5 Acoustics

All baleen whales are categorized as LF cetaceans. No studies to date have directly measured the sound sensitivity of baleen whales instead, hearing sensitivities have been extrapolated from the frequencies at which whales vocalize, their behavioral responses to sounds at various frequencies, predictive models, and inner ear anatomy studies. Estimation of hearing ability based on inner ear morphology was completed for the humpback whale (700 Hz to 10 kHz) (Houser et al. 2001). Humpbacks are categorized by NMFS as LF cetaceans and have a generalized hearing range between 7 Hz and 36 kHz (NMFS 2024). Humpback whale vocalizations generally range from 20 Hz to 10 kHz depending on the behavior as the time of vocalizing. Mating groups of humpbacks are varied in the sound output ranging from 20 Hz to 10 kHz (Tyak 1981; Silber 1986). Singing males during this time reach intensities upwards of 181 dB (Payne 1970; Winn et al. 1970; Thompson et al. 1986). Aggressive males in competition vocalize between 50 Hz and 10+ kHz (Tyak and Whitehead 1983; Silber 1986). Humpbacks in feeding groups vocalize in ranges from 20 Hz to 2 kHz resulting in source levels of 175-192 dB (Thompson et al. 1986).

### 4.3.6 Critical Habitat

Critical habitat comprising ~59,411 square nautical miles ($nmi^2$) of marine habitat in the North Pacific Ocean was designated for the Mexico, Central America, and Western North Pacific DPSs of humpback whales on April 21, 2021 (86 FR 21082). The designation was based on prey within humpback whale feeding areas as the essential feature of the habitat (FR notice). This essential feature was defined as follows for each of the ESA-listed DPSs:

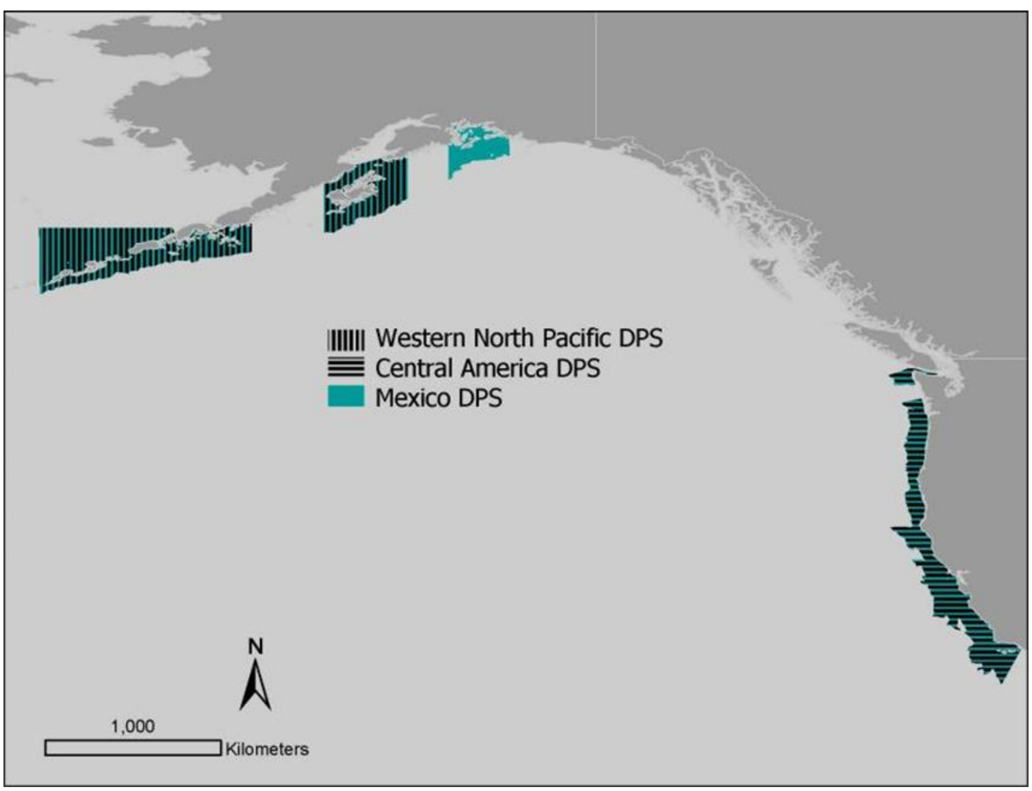
*Mexico DPS* – Prey species, primarily euphausiids (*Thysanoessa*, *Euphausia*, *Nyctiphanes*, and *Nematoscelis*) and small pelagic schooling fishes, such as Pacific sardine (*Sardinops sagax*), northern anchovy (*Engraulis mordax*), Pacific herring (*Clupea pallasii*), capelin (*Mallotus villosus*), juvenile walleye pollock (*Gadus chalcogrammus*), and Pacific sand lance (*Ammodytes personatus*) of sufficient quality, abundance, and accessibility within humpback whale feeding areas to support feeding and population growth.

*Central America DPS* – Prey species, primarily euphausiids (*Thysanoessa*, *Euphausia*, *Nyctiphanes*, and *Nematoscelis*) and small pelagic schooling fishes, such as Pacific sardine (*Sardinops sagax*), northern anchovy (*Engraulis mordax*), and Pacific herring (*Clupea pallasii*), of sufficient quality, abundance, and accessibility within humpback whale feeding areas to support feeding and population growth.

*Western North Pacific DPS* – Prey species, primarily euphausiids (*Thysanoessa* and *Euphausia*) and small pelagic schooling fishes, such as Pacific herring (*Clupea pallasii*), capelin (*Mallotus villosus*), juvenile walleye pollock (*Gadus chalcogrammus*) and Pacific sand lance (*Ammodytes personatus*) of sufficient quality, abundance, and accessibility within humpback whale feeding areas to support feeding and population growth.

Figure 6 displays critical habitat for humpback whales; no critical habitat for humpback whales occurs within the proposed action area or within Cook Inlet.

**Figure 6. Critical Habitat for the Western North Pacific DPS, Mexico DPS and Central America DPS of the Humpback Whale**




**Source: NMFS 2022a**

## 4.4 MINKE WHALE

### 4.4.1 Distribution

Minke whales are distributed throughout the world's oceans and are one of the most abundant rorqual whales in the world. Two stocks occur within U.S. waters: Alaska and CA-OR-WA (Muto et al. 2022). The Alaskan stock of minke whales is considered migratory, as they are speculated to migrate seasonally from the Bering and Chukchi seas in fall to areas of the central North Pacific Ocean (Delarue et al. 2013). Although they are likely migratory in Alaska, minke whales have been observed off Cape Starichkof and Anchor Point year-round (Muto et al. 2017) (Figure 7).

#### 4.4.1.1 Distribution in Cook Inlet

Minke whales are most abundant in the Gulf of Alaska during summer, where they occupy localized feeding areas (Zerbini et al. 2006). Concentrations of minke whales have been observed along the northern coast of Kodiak Island and the southern coast of the Alaska Peninsula (Zerbini et al. 2006). The current estimate for minke whales between Kenai Fjords and the Aleutian Islands is 1,233 individuals (Zerbini et al. 2006). In 18 aerial surveys of Cook Inlet conducted by the National Marine Mammal Laboratory (NMML) between 2000 and 2022, four observations of minke whales were recorded. The most recent sighting of minke whales was in 2021 when three whales were sighted in June near Anchor Point in lower Cook Inlet (Shelden et al. 2022).

In other Cook Inlet surveys, several minke whales were recorded off Cape Starichkof in early summer 2013 during exploratory drilling (Owl Ridge 2014), and in 2014 during an Apache Alaska Corporation (Apache) 3D seismic survey, a total of two minke whale groups comprising three individuals were observed: one sighting southeast of Kalgin Island and another sighting near Homer (Lomac-MacNair et al. 2014). Eight sightings of minke whales were reported in the 2019 Hilcorp lower Cook Inlet seismic survey during fall (Fairweather Science 2020). This higher number of minke whales suggests the offshore waters of lower Cook Inlet may be used by minke whales in greater numbers than previously estimated, particularly during fall. No minke whales were observed during the 2018 CIPL Extension Project (Sitkiewicz et al. 2018). One sighting of one minke whale was recorded during Hilcorp's spring marine vibrator seismic survey offshore from Anchor Point in April 2024 (Hanks et al. 2024). The range of minke whales extends into the lower Cook Inlet region; their presence in middle Cook Inlet would be considered extralimital.

### 4.4.2 Abundance and Trends

Although no population estimates are available for the number of minke whales in the North Pacific, estimated populations are available for certain regions of Alaska. Results from cetacean surveys from 2002, 2008, and 2010 provisionally estimated minke whale populations of 389 (CV=0.52), 517 (CV=0.69), and 2020 (CV=0.73), respectively, along the Bering Sea shelf. The estimates were not corrected for animals missed along the trackline, animals submerged when the ship passed, or animals that moved away in response to the ship's proximity (Friday et al. 2013). In a 2001 through 2003 survey from the Kenai Fjords to the central Aleutian Islands, minke whale abundance was estimated to be 1,233 (CV=0.34), with no correction made for whales that were missed on the trackline. It should be noted that most of the sightings of minke whales were in the Aleutian Islands and were in water that was less than (<) 200 m (656 ft) deep (Zerbini et al. 2006). Three offshore cetacean studies conducted in the Gulf of Alaska in 2009, 2013, and 2015 observed so few minke whales a population estimate for that region could not be determined (Rone et al. 2017). As a result of the limited information on minke whale abundance in Alaska, no population trends are known at this time.

### 4.4.3 Status

Minke whales are not designated as depleted under the MMPA, nor are they listed as threatened or endangered under the ESA. However, they remain protected throughout their range under the MMPA.

### 4.4.4 Prey and Foraging

Minke whales feed by side-lunging into schools of prey comprising crustaceans, plankton, and small schooling fish, such as anchovies, dogfish, capelin, cod, herring, mackerel, salmon, sand lance, and saury (NOAA 2023e). They engulf a huge amount of water while feeding, then filter out prey using the hairs on their baleen plates. Researchers at University of California Santa Cruz have noted Antarctic minke whales feeding on krill have a foraging rate at night that is two to five times higher than their day rate and speculate minke whales are the minimum size for whales that lunge-feed (University of California, Santa Cruz 2023).

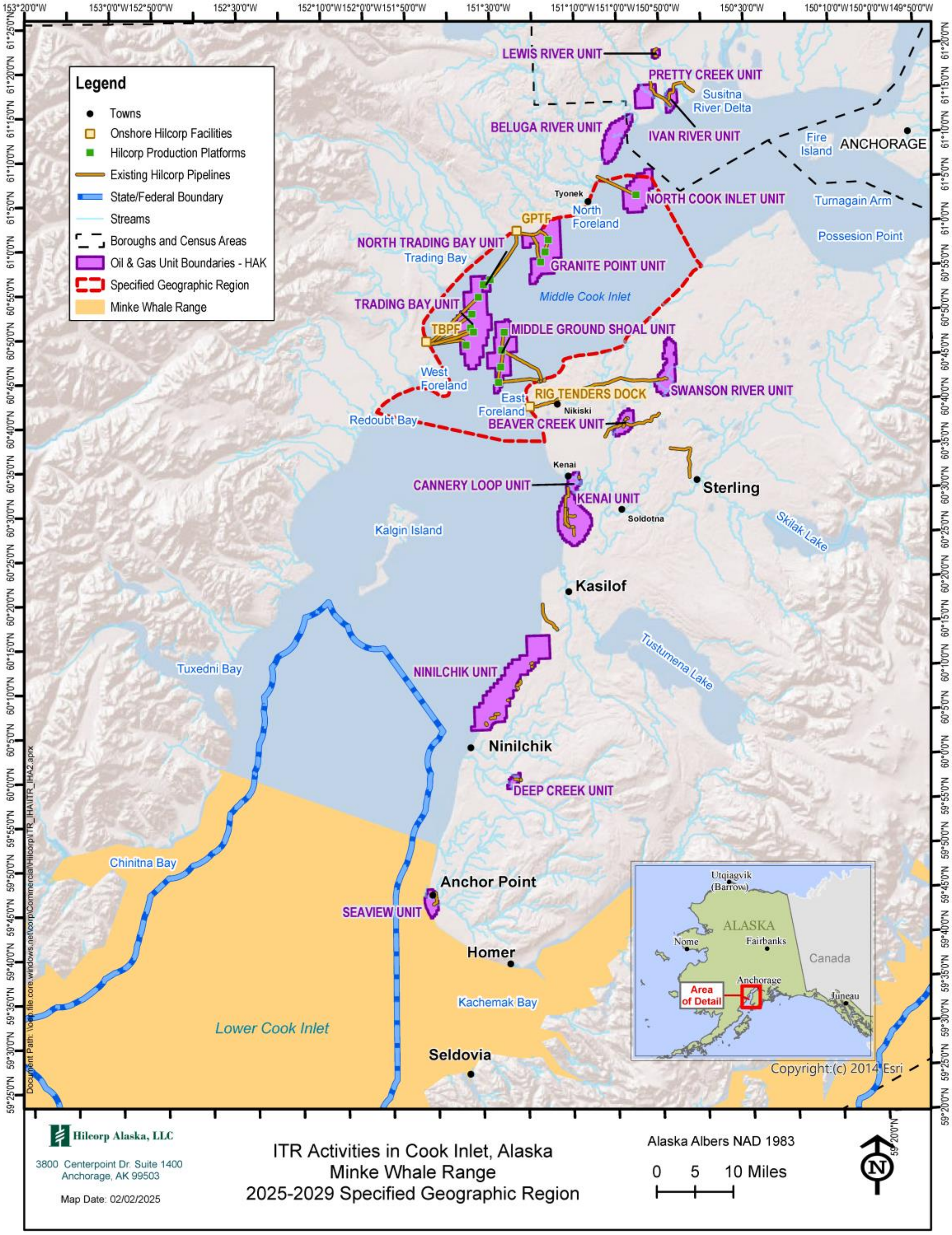
### 4.4.5 Acoustics

NMFS categorizes minke whales as LF cetaceans with a generalized hearing range of 7 Hz to 36 kHz (NMFS 2024). However, minke whales are believed to hear best between the frequencies of 17 Hz and 35 kHz with their most sensitive hearing between 1 and 5 kHz based on model audiograms using anatomical and biomedical engineering techniques (Exploration and Production Sound and Marine Life Program 2023). A controlled exposure experiment was used in Iceland to determine whether minke whale behavior would be modified by an acoustic deterrent device (Boisseau et al. 2021). In this study, video-range tracking was used to monitor minke whale behavior in response to a 14.6 kHz tone with a source level of 198 dB re 1 µPa at 1 m root-mean-square (rms) emitted at various depths. In results from all deployments, minke whales moved away from the sound source immediately after activation and typically increased their horizontal speed and extended their dives. The study provides evidence that minke whales react strongly to sound signals at the upper limit of their hearing sensitivity.

### 4.4.6 Critical Habitat

No critical habitat is currently designated for minke whales.

# Figure 7. Minke Whale Range within Cook Inlet



## 4.5 KILLER WHALE

### 4.5.1 Distribution

Killer whales are ubiquitous across the world's oceans, although they typically occur in greater densities at higher latitudes in colder, more productive waters (Leatherwood and Dalheim 1978). Although sometimes reported in the open ocean, killer whales are most abundant within 800 km (497 mi) of the continent (Heyning and Dahlheim 1988). Killer whales are identified as resident, transient, or offshore ecotypes based on their morphology, ecology, genetics, and behavior. They have been observed both seasonally and year-round along the entire Alaskan coastline (Bigg et al. 1990; Baird and Dill 1995; Ford et al. 1998; Hoelzel et al. 1998; Ford and Ellis 1999; Barrett-Lennard 2000; Dahlheim et al. 2008). Recent studies have documented movements of Alaska Resident killer whales from the Bering Sea into the Gulf of Alaska as far north as southern Kodiak Island (Muto et al. 2017).

#### 4.5.1.1 Distribution in Cook Inlet

Between 1975 and 2002, killer whale sightings were relatively frequent in lower Cook Inlet, with at least 100 sightings reported (Shelden et al. 2003). However, in middle and upper Cook Inlet, north of Kalgin Island, sightings were infrequent, particularly before 1990, with only 18 sightings reported in 27 years (Shelden et al. 2003). According to Shelden et al. (2003), an increase has occurred in anecdotal reports of killer whales feeding on belugas in middle and upper Cook Inlet since the 1990s. This increase could be due to a decline in sea lion and harbor seal prey in other areas, as prey availability largely determines where killer whales occur (Saulitis et al. 2000).

According to Shelden et al. (2003), 12 killer whale strandings were reported in Turnagain Arm, occurring in three distinct clusters: 6 in May 1991, 5 in August 1993, and 1 in September 2000. In a more recent study, Shelden et al. (2013) reported eight killer whale sightings over a nearly 20-year period (1993 through 2012), in which NMFS conducted annual summer beluga whale aerial surveys over Cook Inlet for one month. In total, 80 individual killer whales were sighted, occurring in several locations, including Kamishak Bay (1994), Kachemak Bay (1997, 2005, and 2012), Port Graham (2001), mid-inlet Iniskin Bay (2005), Elizabeth and Augustine Islands (2010) and mid-inlet Kachemak Bay (2012) (Rugh et al. 2005; Shelden et al. 2013). No killer whales were sighted in subsequent surveys by Shelden et al. (2015, 2017, and 2019) until 2022, when a group of 20 to 30 whales was observed just outside of Kachemak Bay. In 2009, a group of five to six transient killer whales was acoustically detected and sighted in the Beluga River and the entrance of Turnagain Arm. This instance was the only killer whale occurrence in the 5-year study (Castellote et al. 2016). One killer whale group of two individuals was observed during the 2015 SAE seismic program near the North Foreland (Kendall and Cornick 2015). No killer whales were observed during the 2018 4-month CIPL Extension Project in middle Cook Inlet (Sitkiewicz et al. 2018). Six sightings of 21 killer whales were observed in the 2019 Hilcorp lower Cook Inlet seismic fall survey (Fairweather Science 2020). One killer whale was observed during Hilcorp's pilot marine vibroseis seismic survey in lower Cook Inlet in October of 2023. During the 2024 marine vibroseis seismic survey, a group of four individuals was recorded nearshore Clam Gulch (Hanks et al. 2024).

Corkeron and Conner (1999) suggested that beluga whales in the Bering Sea adapted their distribution to avoid killer whale predation. Building on this idea, Shelden et al. (2003) and McGuire et al. (2020) proposed that the turbid waters of upper Cook Inlet may serve as a refuge from killer whales; therefore, it is expected that killer whales will be infrequently observed in upper Cook Inlet but may be more commonly found in middle and lower Cook Inlet. Figure 8 depicts the killer whale range in relation to the specific geographic region.

### 4.5.2 Abundance and Trends

Eight killer whale stocks are recognized within the U.S. Pacific. Exclusive Economic Zone based on data regarding association patterns, acoustics, movements, and genetic differences. Two different stocks of killer whales inhabit the Cook Inlet region of Alaska: the Alaska Resident stock and the Gulf of Alaska, Aleutian Islands, Bering Sea Transient stock (Muto et al. 2017). Both ecotypes overlap in the same geographic area but maintain social and reproductive isolation and feed on different prey species.

The Alaska Resident stock includes killer whales from southeastern Alaska to the Aleutian Islands and Bering Sea. The number of uniquely identified individual whales in the Gulf of Alaska is 921, with the estimates for different pods occurring in different years ranging from 2005 to 2019 (Young et al. 2023). The only available number of uniquely identified individuals for the Aleutian Islands and Bering Sea is 999 from 2001 to 2010; combining those two counts results in a total of 1,920 resident killer whales in Alaska (Young et al. 2023).

The Gulf of Alaska, Aleutian Islands, and Bering Sea Transient stock occurs mainly from Prince William Sound through the Aleutian Islands and Bering Sea. Although no official abundance estimate exists for this stock because of incomplete surveys of the range, a minimum population estimate for the Gulf of Alaska, Aleutian Islands, and Bering Sea Transient stock was estimated to be 587 individuals (Muto et al. 2021).

### 4.5.3 Status

The Alaska Resident stock and the Gulf of Alaska, Aleutian Islands, Bering Sea Transient stock of killer whales are not designated as depleted under the MMPA or listed as threatened or endangered under the ESA. Reliable data on population trends for these killer whale stocks are unavailable (Muto et al. 2021).

### 4.5.4 Prey and Foraging

Killer whales feed on a variety of animals, including cephalopods, marine mammals, and fish. North Pacific whales show specialization in prey types and are categorized as such. Resident killer whales are known to forage on fish, especially salmonids (Saluitis et al. 2000; Ford and Ellis 2006). Transient killer whales strictly consume marine mammals, specifically beluga whales, in Cook Inlet. Additionally, other prey species including seals, porpoises, sea lions, otters and baleen whales have been documented as targets for transient killer whales (Saulitis et al. 2000; Shelden et al. 2003).

### 4.5.5 Acoustics

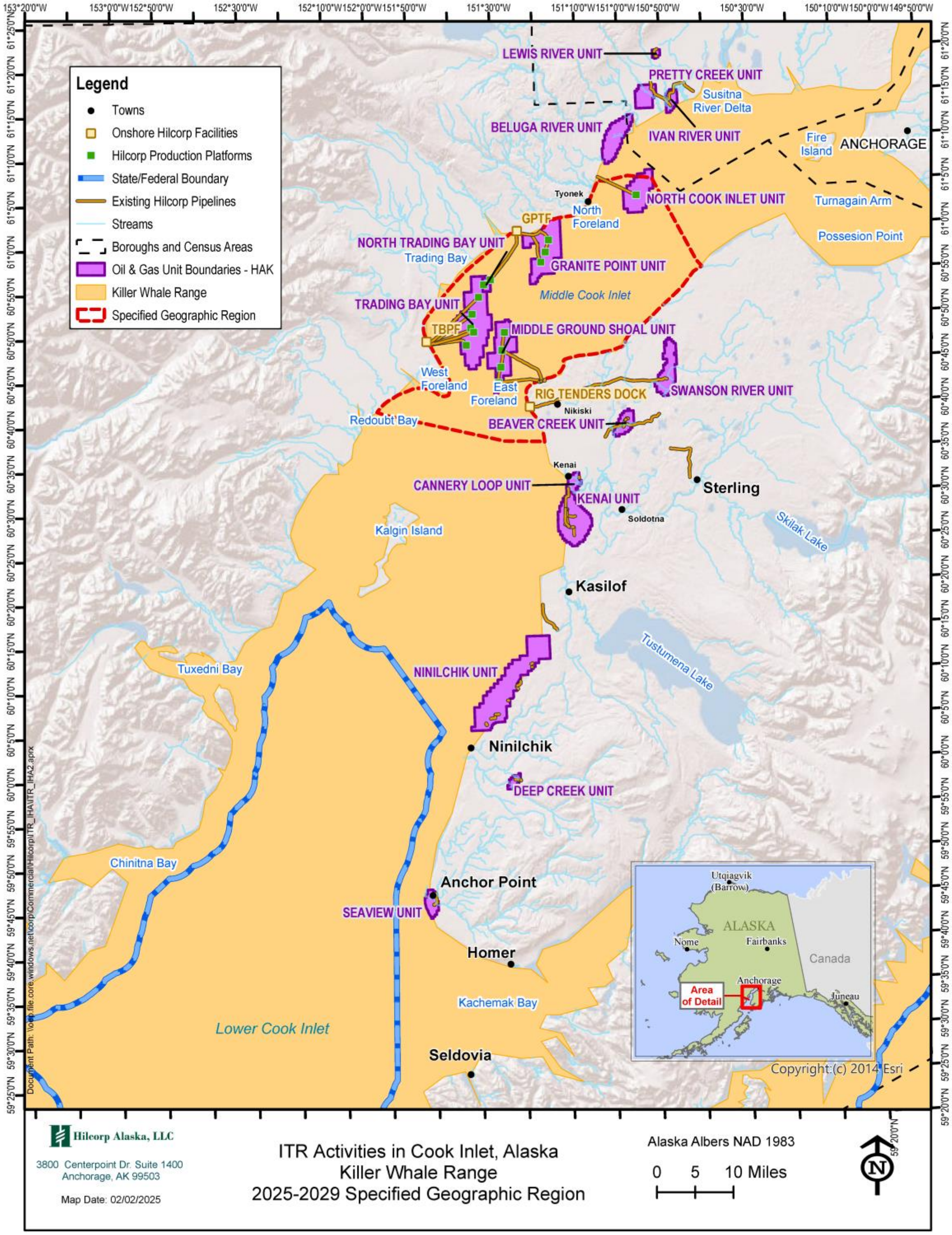
Killer whale hearing is similar to other delphinids, with good hearing (i.e., within 20 dB of best sensitivity) at ~5 to 81 kHz (the lowest threshold [49 dB re 1 μPa] of ~34 kHz and low- and high-frequency hearing cutoffs [> 100 dB re 1 μPa] of 600 Hz and 114 kHz, respectively) (Branstetter et al. 2017).

Killer whales are classified by NMFS as high-frequency (HF) cetaceans with a generalized hearing range of 150 Hz to 160 kHz (NMFS 2024). The hearing of killer whales is well developed. Szymanski et al. (1999) found that they responded to tones between 1 and 120 kHz, with the most sensitive range between 18 and 42 kHz. Their greatest sensitivity is at 20 kHz, which is less than many other odontocetes, but it matches peak spectral energy reported for killer whale echolocation clicks. Killer whales use vocalizations in a variety of ways. Each pod employs a unique set of sounds, including clicks, whistles, and calls, for echolocation during foraging, communication with other pod members, and navigation (Myers et al. 2021).

### 4.5.6 Critical Habitat

Critical habitat for killer whales in Alaska is not designated as they are not listed as threatened or endangered under the ESA.

# Figure 8. Killer Whale Range within Cook Inlet



## 4.6 COOK INLET BELUGA WHALE

### 4.6.1 Distribution

The CIBW whale is a small geographically isolated population that remains within Cook Inlet (Figure 9) year-round and is genetically distinct from the other four beluga whale stocks in Alaska (O'Corry-Crowe et al. 2002; Hobbs et al. 2005, 2008; Rugh et al. 2010; Goetz et al. 2012a, 2012b; and Shelden et al. 2015). In recent years, their range has contracted primarily to the upper reaches of Cook Inlet likely due to optimal habitats, increased prey availability, and potential shelter in the rivers from predators like killer whales (Rugh et al. 2010). During summer and fall months CIBWs are generally found in shallow coastal waters near the Susitna River mouth, Knik Arm, Turnagain Arm, and Chickaloon Bay (Shelden et al. 2015; Castellote et al. 2016). When the upper inlet is limited by ice in winter months, beluga whale distribution moves further south from Point Possession and North Foreland to Kalgin Island in lower Cook Inlet (Ezer et al. 2013).

Since 1993, NMFS has conducted annual aerial surveys in June, July, or August to document beluga whale distribution and abundance within Cook Inlet. These surveys consistently show belugas near river mouths along the northern shores of middle and upper Cook Inlet, particularly in the Susitna River Delta, Knik Arm, and Chickaloon Bay. Small groups have also been recorded farther south in Kachemak Bay, Redoubt Bay (Big River), and Trading Bay (McArthur River) prior to 1996, but very rarely thereafter. Since the mid-1990s, most beluga whales (96 to 100%) have been concentrated in shallow areas near river mouths north and east of Beluga River and Point Possession (Hobbs et al. 2008). Based on these aerial surveys, the concentration of beluga whales in the northernmost portion of Cook Inlet appears to be consistent from June to October (Rugh et al. 2000, 2004a, 2004b, 2005, 2006, and 2007).

As late as October, beluga whales tagged with satellite transmitters continued to use Knik Arm, Turnagain Arm, and Chickaloon Bay, with some ranging from lower Cook Inlet south to Chinitna Bay, Tuxedni Bay, and Trading Bay (McArthur River) during fall (Hobbs et al. 2005). Data from NMFS aerial surveys, opportunistic sighting reports, and satellite-tagged beluga whales confirm that they are more widely dispersed throughout Cook Inlet during winter (November to April), with whales found between Kalgin Island and Point Possession. In November, beluga whales moved between Knik Arm, Turnagain Arm, and Chickaloon Bay, similar to patterns observed in September (Hobbs et al. 2005). By December, beluga whales were distributed throughout Upper and middle Cook Inlet. From January through February and into March, they moved as far south as Kalgin Island and slightly beyond in central offshore waters. Beluga whales also made occasional excursions into Knik Arm and Turnagain Arm in February and March despite ice cover > 90% (Hobbs et al. 2005).

Recent studies by McGuire et al. (2014 and 2020) identified large groups of beluga whales in the Susitna River Delta, with sizes ranging from 200 to 300 individuals and including a mix of adults, juveniles, and neonates. Acoustic studies by Castellote et al. (2016) further confirm that the Susitna Delta is a crucial habitat for CIBWs, especially during the summer and fall months. An acoustic recorder in the Little Susitna River detected peak CIBW activity from late May to early June and again from July through August. In the Beluga River, three peaks in activity were recorded: the first from mid-February to early April, the strongest peak from June to mid-July, and a third peak from mid-November to mid-December. The bimodal distribution of these detections is thought to be related to the known availability of the two main anadromous summer prey species for CIBWs, eulachon and Pacific salmon. From 2018 through 202, BOEM-funded aerial surveys recorded CIBWs in the Kenai and Kasilof rivers, Tuxedni Bay, and in the vicinity of Kalgin Island in early spring and late fall (NMFS 2022c).

CIBWs have been observed during marine mammal monitoring efforts in support of industry and research projects. Apache's seismic test program in 2011 reported 33 beluga whales along the western coast of Redoubt Bay (Lomac-MacNair et al. 2013) and the following year a total of 151 sightings of ~1,463 individuals were reported in middle Cook Inlet (Lomac-MacNair et al. 2014). During SAE's 2015 seismic program observers visually identified a total of ~33 individual beluga whales and acoustically identified two beluga whales in upper Cook Inlet (Kendall and Cornick 2015). Additionally, 143 beluga whale sightings (814 individuals) were recorded from May through September during the 2018 CIPL Extension Project on the western side of Cook Inlet, between Ladd Landing and the Tyonek platform (Sitkiewicz et al. 2018). Aerial surveys during Hilcorp rig moves in June 2021 and June and September 2022 reported sightings of 11, 25+, and 20 individual beluga whales respectively; some were within the aerial survey area and some outside. Rig moves also occurred in June and July of 2023; aerial observers reported 37 sightings of 281 individuals observed both in and out of the survey area (Horsley and Larson 2023). No beluga whales were sighted from vessel-based PSOs during these rig moves. In May 2024 during Hilcorp's jack-up rig move, two opportunistic sightings of ~25 beluga whales were recorded outside of the designated aerial survey area. No additional observations were recorded by aerial or vessel-based PSOs (Horsley and Larson 2024). Furthermore, three additional beluga whales were observed near the Tyonek platform by vessel-based PSOs during the pre-clearance monitoring period for Hilcorp's October 2024 jack-up rig move (Horsley et al. 2024). In November 2024, no sightings of beluga whales were reported during the rig move conducted under the operatorship of Furie Operating Alaska, LLC (S. Vercelline, pers. comm., December 9, 2024).

### 4.6.2 Abundance and Trends

The CIBW is estimated to have declined from 1,300 animals in the 1970s (Calkins 1989) to ~331 animals in 2022 (Shelden et al. 2015; Goetz et al. 2023). The most recent population estimate is 331 animals based on surveys conducted in 2021 and 2022 (Goetz et al. 2023). The decline documented in the mid-1990s was attributed mainly to unsustainable subsistence practices by Alaska Native hunters (which harvested more than 50 whales per year) (Mahoney and Shelden 2000). In 1999, beluga hunters agreed to a moratorium on hunting to protect the species, with one take per year allowed from 2000 through 2005. Although no Cook Inlet belugas have been harvested by subsistence users since 2006 (Shelden et al. 2021), the beluga population has continued to slowly decline in Cook Inlet. Prior to the 2021 and 2022 aerial surveys, CIBWs experienced a decline of ~2.3% per year (95% Prediction Interval: −4.1% to −0.6%) between 2008 and 2018 (Wade et al. 2019; Goetz et al. 2023).

### 4.6.3 Status

NMFS listed the CIBW population as depleted in 2000 and as endangered under the ESA in 2008 (65 FR 34590). In April 2011, NMFS designated a critical habitat (Figure 9) for the CIBW under the ESA (76 FR 20180) and finalized the Conservation Plan for the CIBW in 2008 (NMFS 2008b). The Recovery Plan for CIBW was finalized in 2016 (NMFS 2016).

### 4.6.4 Prey and Foraging

CIBWs primary prey species include Chinook, sockeye, chum and coho salmon, Pacific cod, Pacific eulachon, walleye pollock, saffron cod, and yellowfin sole; however, they also forage on benthos species and at river mouths. CIBWs typically switch from consuming eulachon once other lipid-rich species (e.g., Pacific salmon) begin to migrate to the rivers in late spring and summer (Abookire and Piatt 2005; Litzow et al. 2006). Recent research by University of Fairbanks scientists indicates that CIBWs may have shifted their diet over the last few decades from saltwater prey to fish and crustaceans influenced by freshwater (Nelson et al. 2018). Analysis of isotopes in beluga whale teeth and bones indicate that, in the past, beluga whales fed almost exclusively on saltwater prey, whereas, currently, CIBWs feed in areas where freshwater rivers flow into marine habitats (Nelson et al. 2018).

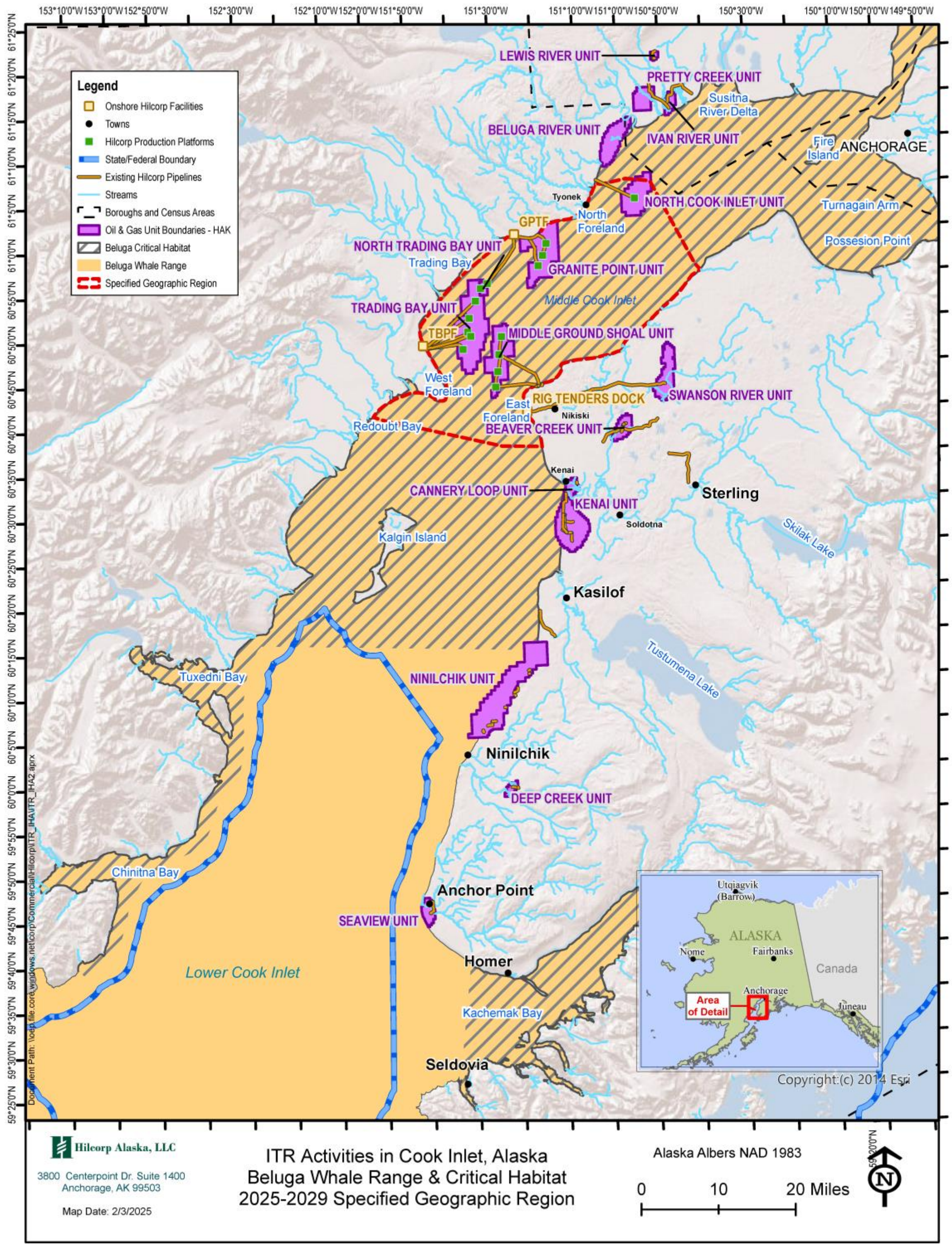
### 4.6.5 Acoustics

Beluga whales are known vocalists in the ocean soundscape. They produce a variety of sounds ranging from trills, whistles, and squeals to clucks, chirps, mews, and even bell-like tones (Castellote et al. 2014). During social interactions vocalization frequencies start at 0.2 kHz and reach 7 kHz (Garland et al. 2015). Belugas whales hit peak frequencies of 40-120 kHz which are used in echolocation (Au 2000). Several studies (Johnson et al. 1989; Klishin et al. 2000; Finneran et al. 2002a, 2002b, 2005a, and 2005b; Erbe 2008; White et al. 1978; Awbrey et al. 1988; Ridgway et al. 2001; Castellote et al. 2019) describe beluga whale hearing capabilities. One study on beluga whales captured and released in Bristol Bay, AK, measured hearing ranges at 4 to 150 kHz, with the greatest variation between individuals at the high end of the auditory range in combination with frequencies near the maximum sensitivity (Castellote et al. 2014). All animals tested heard frequencies of up to 128 kHz, with two individuals hearing up to 150 kHz (Castellote et al. 2014). Beluga whales are included in the NMFS-identified HF functional hearing group with a generalized hearing range of 150 Hz to 160 kHz (NMFS 2024).

### 4.6.6 Critical Habitat

In 2011, NMFS designated two areas comprising 7,809 $km^2$ (3,016 square miles [$mi^2$]) of marine and estuarine environments as critical habitat for the CIBW (76 FR 20179) (Figure 9). Area 1 of the CIBW critical habitat encompasses all marine waters of Cook Inlet north of a perimeter extending from Point Possession (61°02.1’ N, 150°24.3’ W) and the mouth of Threemile Creek (61°08.5’ N, 151°04.4 W), encompassing waters of the Susitna, Little Susitna, and Chickaloon Rivers below mean higher high water (MHHW). Area 2 includes all marine waters of Cook Inlet south of a boundary extending from the mouth of Threemile Creek to Point Possession and north of 60°15.0′ N, including waters within 3.7 km (2 nautical miles [nm]) seaward of MHHW along the western shoreline of Cook Inlet between 60°15.0′ N and the mouth of the Douglas River (59°04.0′ N, 153°46.0′ W); all waters of Kachemak Bay east of 151°40.0′ W; and waters of the Kenai River below the Warren Ames bridge at Kenai, AK (76 FR 20179).

## Figure 9. Beluga Whale Range and Critical Habitat within Cook Inlet



## 4.7 HARBOR PORPOISE

### 4.7.1 Distribution

Harbor porpoises are found in inland and coastal waters throughout the northern hemisphere. In the eastern North Pacific Ocean, they range from Point Barrow and offshore areas of the Chukchi Sea, along the Alaska coast, and down the western coast of North America to Point Conception, CA (Gaskin 1984). Harbor porpoises primarily frequent coastal waters of the Gulf of Alaska and Southeast Alaska, typically occurring in waters < 100 m (328 ft) (Dahlheim et al. 2000 and 2009; Hobbs and Waite 2010). Porpoises found in Cook Inlet belong to the Gulf of Alaska stock and their range includes the entire Cook Inlet, Shelikof Strait, and Gulf of Alaska.

#### 4.7.1.1 Distribution in Cook Inlet

Shelden et al. (2014) summarized harbor porpoise distribution across upper, middle, and lower Cook Inlet from systematic annual surveys performed in 1993 through 2012. Over this period, between April and October, ~306 sightings of harbor porpoises (~600 individuals) were detected. Porpoises were reported in solitary or small groups throughout inlet waters, except when none were observed in December and January. Peak detections tended to coincide with eulachon and smelt runs up to Knik Arm (Houghton et al. 2005; Shelden et al. 2014). Over the past two decades, sightings of harbor porpoises in upper Cook Inlet have increased (Shelden et al. 2014). Prevel-Ramos et al. (2008) extended the Nemeth et al. (2007) marine mammal survey in 2007 in upper Cook Inlet at Ladd Landing where 345 harbor porpoise individuals were reported between July and October. Brueggeman et al. (2007 and 2008) executed two 1-month surveys during seismic operations: one near Beluga River in spring and one near Granite Point in fall. Fourteen harbor porpoises were observed from mid-April to mid-May. Between late September and late October, 12 individuals were observed (Brueggeman et al. 2007 and 2008). During this same period, Prevel-Ramos et al. (2008) recorded 129 harbor porpoises between Granite Point and the Susitna River.

Reports of harbor porpoises in lower Cook Inlet include sightings between Cape Douglas and the West Foreland, Kachemak Bay, and offshore (Rugh et al. 2005). Aerial surveys have frequently observed harbor porpoises in Cook Inlet, but most sightings involve single animals that are concentrated in Chinitna and Tuxedni bays on the western side of lower Cook Inlet as well as in the upper Cook Inlet (Rugh et al. 2005).

Harbor porpoises have been detected during passive acoustic monitoring efforts throughout Cook Inlet, with detections especially prevalent in lower Cook Inlet. In 2009, Castellote et al. (2016) recorded harbor porpoises nearly daily at the Beluga River (upper Cook Inlet) between July and October through passive acoustic monitoring. There were no further porpoise detections from November to the end of January, following a single detection in mid-November. By the end of November, upper Cook Inlet is typically partially frozen, and the absence of porpoise detections suggest that porpoises may have seasonal movements to avoid the ice (Mulherin et al. 2001; Castellote et al. 2016).

During Apache's 2012 seismic program, 137 sightings (190 individuals) were observed between May and August (Lomac-MacNair et al. 2013). Lomac-MacNair et al. (2014) identified 13 groups of harbor porpoises totaling 77 individuals during Apache's 2014 Cook Inlet seismic survey, both from vessels and aircraft, in May. In June 2012, Shelden et al. (2015) documented 65 sightings of 129 individual harbor porpoises during an aerial survey, none of which were in upper Cook Inlet. During SAE's 2015 seismic survey, 52 sightings of 65 individuals were observed north of the Forelands (Kendall and Cornick 2015). Shelden et al. (2017, 2019, and 2022) also conducted aerial surveys in June and July over Cook Inlet in 2016, 2018, 2021, and 2022 and recorded 65 individuals in middle and lower Cook Inlet with a majority in Kachemak Bay. In total, 29 sightings (44 individuals) were observed north of the Forelands from May to September during the CIPL Extension Project (Sitkiewicz et al. 2018). There were two sightings of three harbor porpoises observed during the 2019 Hilcorp lower Cook Inlet seismic survey in fall (Fairweather Science 2020). The Petroleum and Cement Terminal (PCT) Construction Project PSO program reported 15 harbor porpoise sightings of 18 individuals and 22 harbor porpoise sightings (27 individuals) in upper Cook Inlet across their 2020 and 2021 field season respectively (61 North Environmental 2021, 2022). During jack-up rig moves in 2021, a PSO observed an individual harbor porpoise in middle Cook Inlet in July and another in October (Horsley and Larson 2023). During a jack-up rig move in June 2023, a PSO also observed an individual harbor porpoise in middle Cook Inlet (Horsley and Larson 2023). In 2023 Hilcorp conducted a pilot marine vibroseis seismic survey in October where two sightings of two harbor porpoises were recorded offshore from Clam Gulch. In April, the survey was conducted once again and one harbor seal sighting of one individual was reported in the same area (Hanks et al. 2024). Recent passive acoustic research in Cook Inlet by Alaska Department of Fish and Game (ADF&G) and NMML have indicated harbor porpoises occur more frequently than expected, particularly in the West Foreland area in spring, although overall numbers are unknown at this time (Castellote et al. 2016).

Figure 10 depicts the range of harbor porpoises within Cook Inlet and the specified geographic region of the class of activities.

### 4.7.2 Abundance and Trends

In Alaskan waters, harbor porpoises are currently divided into three stocks: Southeast Alaska, Gulf of Alaska, and Bering Sea stocks (Muto et al. 2021). Porpoises found in Cook Inlet belong to the Gulf of Alaska stock, distributed from Cape Suckling to Unimak Pass and most recently estimated to be 31,046 individuals (Muto et al. 2021). Surveys conducted in the early 1990s estimated densities of harbor porpoise in Cook Inlet at 7.2 per 1,000 $km^2$, (386 $mi^2$) with an abundance estimate of 136 (Dahlheim et al. 2000). From aerial beluga surveys in the late 1990s, Hobbs and Waite (2010) estimated harbor porpoise densities in Cook Inlet at 13 per 1,000 $km^2$ (386 $mi^2$). Neither of these surveys included coastlines, which are extensively used by harbor porpoises (Shelden et al. 2014).

### 4.7.3 Status

Harbor porpoises are neither designated as depleted under the MMPA nor listed as threatened or endangered under the ESA.

### 4.7.4 Prey and Foraging

Harbor porpoises are opportunistic foragers that eat a variety of fish and cephalopods. Prey species in Alaska include crangon shrimp, walleye pollock, saffron cod, Pacific sand lance, Pacific sandfish, surf smelt, eulachon, and Pacific herring (Quakenbush et al. 2015). In Cook Inlet, high densities of harbor porpoise detections coincide with spring eulachon and smelt runs (Shelden et al. 2014).

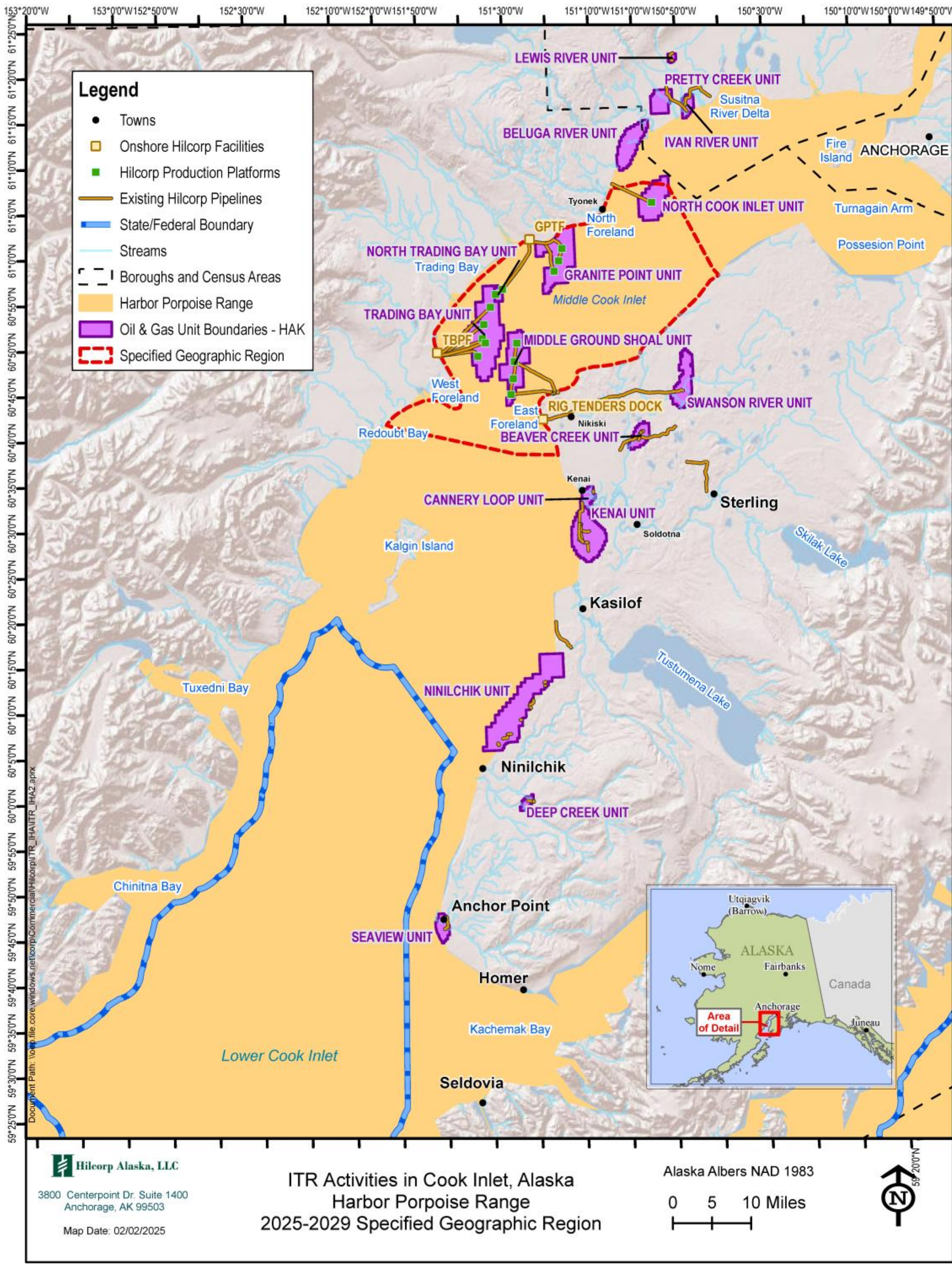
### 4.7.5 Acoustics

Harbor porpoises have the highest upper-frequency limit of all researched odontocetes, emitting intense ultrasonic pulses that are narrow in bandwidth and high in frequency (Sørensen et al. 2018). A study by Kastelein et al. (2014) reported that harbor porpoises’ range of best hearing is from 16 to 140 kHz, with a reduced sensitivity around 64 kHz. Maximum sensitivity (about 33 dB re 1 µPa) fell between 100 and 140 kHz, corresponding with the peak frequency of echolocation pulses (120 to 130 kHz) (NMFS 2018). The harbor porpoise is categorized by NMFS as belonging to the very high-frequency (VHF) hearing group with a generalized hearing range of 200 Hz to 165 kHz (NMFS 2024).

### 4.7.6 Critical Habitat

No critical habitat has been designated for harbor porpoises.

# Figure 10. Harbor Porpoise Range within Cook Inlet



## 4.8 DALL'S PORPOISE

### 4.8.1 Distribution

The Dall's porpoise can be found inhabiting the North Pacific Ocean's continental shelf, slope, and pelagic waters between 28° N and 62° N (Jefferson 1988). Distribution is strongly influenced by their preference for cooler sea surface temperatures (< 18 degrees Celsius), leading to their common presence in the Gulf of Alaska, Bearing Sea, Okhotsk Sea, and the Sea of Japan (East Sea) (Ferrero et al. 2002). During unseasonably cold-water events, they have also been observed as far south as Scammon's Bay, Baja California (Houck and Jefferson 1998). They are known to demonstrate seasonality with onshore-offshore movements along the West Coast of the continental U.S. and winter movements out of areas with ice, like Prince William Sound (Loeb 1972; Leatherwood and Fielding 1974; Muto et al. 2017). Muto et al. (2021) noted distribution gaps in upper Cook Inlet and the shallow eastern flats of the Bering Sea.

#### 4.8.1.1 Distribution in Cook Inlet

Dall's porpoises are found throughout Alaskan waters and their range extends into the lower Cook Inlet (Muto et al. 2021). Figure 11 shows the range of Dall's porpoise within Cook Inlet and the specific geographic region. Although they have occasionally been observed in middle and upper Cook Inlet, most of the more recent observations of Dall's porpoise have occurred in lower Cook Inlet, including Kachemak Bay and near Anchor Point (Owl Ridge 2014). Shelden et al. (2013) and Rugh et al. (2005) collated data from aerial surveys conducted between 1993 and 2012 and documented 9 sightings of 25 individuals in the lower Cook Inlet during June and/or July 1997, 1999, and 2000. No Dall's porpoises were observed on subsequent surveys in June and/or July 2014, 2016, 2018, 2021, and 2022 (Shelden et al. 2015, 2017, and 2022; Shelden and Wade 2019). During Apache's 2014 seismic survey, two groups of three Dall's porpoises were observed in Upper and middle Cook Inlet (Lomac-MacNair et al. 2014). Similarly, SAE sighted one individual in August 2015 north of Nikiski in middle Cook Inlet (Kendall and Cornick 2015). No Dall's porpoises were observed during the 2018 CIPL Extension Project Acoustic Monitoring Program in middle Cook Inlet (Sitkiewicz et al. 2018); however, 30 individuals in 10 groups were sighted during a lower Cook Inlet seismic project in 2019 (Fairweather Science 2020). During Hilcorp's 2023 jack-up rig move in June, one Dall's porpoise was sighted by a PSO in middle Cook Inlet, just offshore from Rig Tenders Dock (Horsley and Larson 2023). These sightings suggest Dall's porpoise may use portions of middle Cook Inlet in greater numbers than previously expected but would still be considered infrequent in middle and upper Cook Inlet.

### 4.8.2 Abundance and Trends

The current assessment of Alaska stock only accounts for Dall's porpoise in the northwestern Gulf of Alaska, which is a small fraction of its overall range. A survey estimate from the 1980s, which includes other areas, such as the Bering Sea and Southeast Alaska, approximated the total population at 83,000 animals, making Dall's porpoise one of the more frequent cetaceans in Alaskan waters (Muto et al. 2021); however, because those surveys are more than 8 years old, the abundance estimate is no longer considered reliable (Muto et al. 2022). Three vessel surveys conducted between 2009 and 2015 found Dall's porpoise to be the most abundant cetacean in the Gulf of Alaska, confirming its prevalence in Alaskan waters (Rone et al. 2017).

### 4.8.3 Status

Dall's porpoises are not listed as depleted under the MMPA or designated as endangered or threatened under the ESA (Muto et al. 2021).

### 4.8.4 Prey and Foraging

Dall's porpoises are opportunistic hunters. Their main diet consists of cephalopods and small schooling fish such as anchovies, herring, and hake (Nichol et al. 2013). Generally, foraging occurs during their prey's nightly migration to the surface; however, they are known to alter feeding strategies when prey behavior or densities change (Moran et al. 2018).

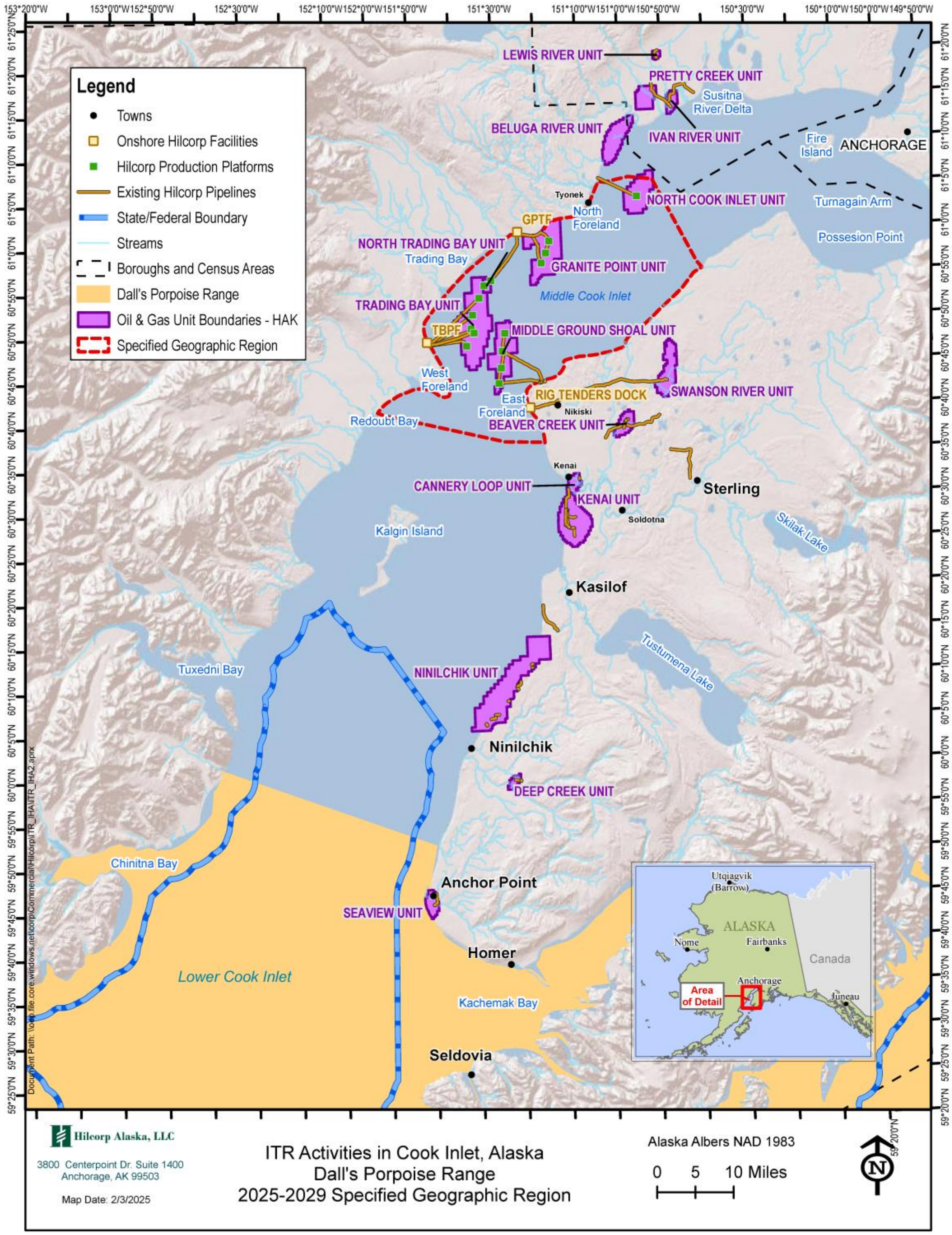
### 4.8.5 Acoustics

Dall's porpoises emit HF narrow-band clicks that are important for both echolocating prey and communication. Peak frequencies of Dall's porpoise clicks range from 119 to 143 kHz (Kyhn et al. 2013). VHF cetaceans generally possess a higher upper-frequency limit and better sensitivity at high frequencies compared to HF cetacean species (NMFS 2018, 2024). NMFS categorizes Dall's porpoise into a VHF hearing group with a generalized hearing range between 200 Hz and 165 kHz (NMFS 2024).

### 4.8.6 Critical Habitat

No critical habitat has been designated for Dall's porpoises.

# Figure 11. Dall's Porpoise Range within Cook Inlet



## 4.9 PACIFIC WHITE-SIDED DOLPHIN

### 4.9.1 Distribution

The Pacific white-sided dolphin is found throughout the temperate North Pacific Ocean from Mexico through the Gulf of Alaska and Aleutian Islands (NOAA 2018). The Pacific white-sided dolphin is divided into three stocks within U.S. waters. The North Pacific stock includes the coast of Alaska, including the project area. The species is common in the high seas and along continental margins, and inshore passes of Alaska, British Columbia, and Washington (NOAA 2018; Ferrero and Walker 1996).

Pacific white-sided dolphins are very sociable and are often seen traveling in multi-species herds of ten to several thousand animals. Most commonly they are found in groups of several hundred animals. The North Pacific stock may include migrants from the CA-OR-WA stock in summer.

#### 4.9.1.1 Distribution in Cook Inlet

Data specific to the Pacific white-sided dolphin in the Cook Inlet are lacking. Pacific white-sided dolphins are typically observed off the coast or near inlets to the open ocean. During Hilcorp's 3D seismic survey in 2019, Pacific white-sided dolphins were briefly acoustically detected near Iniskin Bay in Cook Inlet based on vocalizations (Castellote et al. 2020). Large groups of Pacific white-sided dolphins have not been reported within Cook Inlet. Figure 12 depicts the range of the Pacific white-sided dolphin within Cook Inlet.

### 4.9.2 Abundance and Trends

Within the Gulf of Alaska, there is an estimated population of 26,880 Pacific white-sided dolphins based on a 1993 survey (Buckland et al. 1993). Small cetacean aerial surveys in the Gulf of Alaska during 1997 sighted one group of 164 Pacific white-sided dolphins off Dixon entrance, and similar surveys in Bristol Bay in 1999 recorded 18 sightings (188 individuals with possible repeat sightings) off Port Moller (NOAA 2018).

Because of the age of the survey data and the survey areas overlapping the stocks, no reliable information on current trends in abundance for the northern stock of Pacific white dolphins is available (NOAA 2018).

### 4.9.3 Status

Pacific white-sided dolphins are not designated as depleted under the MMPA or listed as threatened or endangered under the ESA. The North Pacific stock of Pacific white-sided dolphins is not classified as a strategic stock (NOAA 2018).

### 4.9.4 Prey and Foraging

The Pacific white-sided dolphin diet consists of a variety of small schooling fish, such as anchovies and hake, as well as squid. Evidence that they use cooperative foraging techniques and feed mostly on midwater concentrations of marine animals has been observed.

### 4.9.5 Acoustics

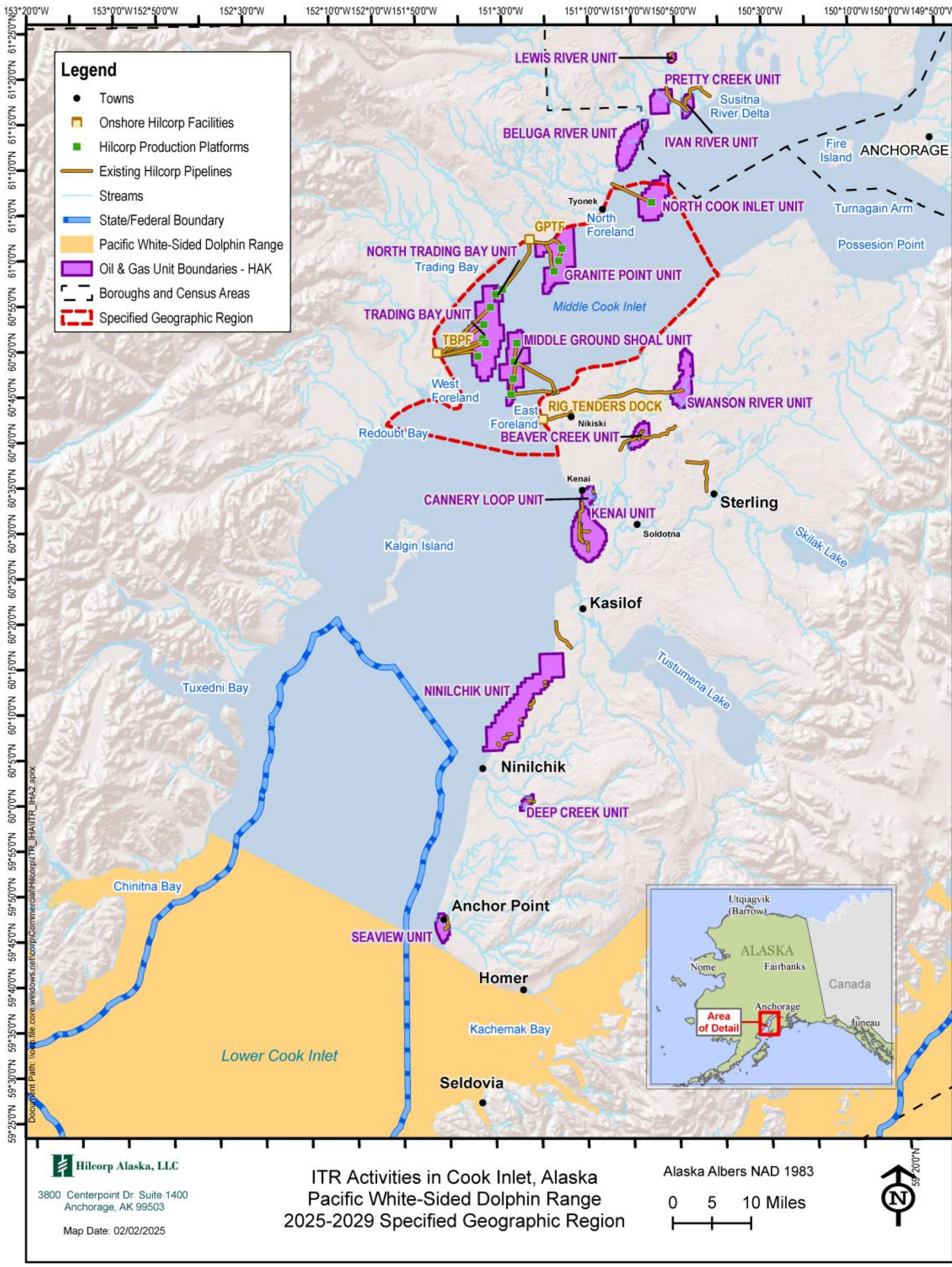
Pacific white-sided dolphins use echolocation to locate prey. Both Pacific and Atlantic white-sided dolphins use HF whistle vocalizations to communicate (University of Rhode Island and Inner Space Center 2023). Pacific white-sided dolphin clicks range in frequency from 19.0 to 29.7 kHz. Categorized by NMFS as

VHF cetaceans, these dolphins have a generalized hearing range between 200 Hz and 165 kHz (NMFS 2024).

### 4.9.6 Critical Habitat

No critical habitat has been designated for the Pacific white-sided dolphin.

# Figure 12. Pacific White-Sided Dolphin Range within Cook Inlet



## 4.10 HARBOR SEAL

### 4.10.1 Distribution

Harbor seals occupy a wide variety of habitats in freshwater and saltwater in protected and exposed coastlines and range from Baja California north along the western coasts of CA-OR-WA, British Columbia, Southeast Alaska, and north in the Bering Sea. NOAA Fisheries has identified 16 stocks of harbor seals. Twelve of these stocks are in Alaska, and the other four can be found off the CA-OR-WA coastline (NOAA 2023c). Harbor seals are found throughout the entire lower Cook Inlet coastline, hauling out on beaches, islands, and mudflats and at the mouths of rivers where they whelp and feed (Muto et al. 2017). Harbor seals frequent rivers feeding into upper Cook Inlet when prey species are migrating in those areas (NOAA 2023c). Harbor seals haulout on rocks, reefs, beaches, and drifting glacial ice.

#### 4.10.1.1 Distribution in Cook Inlet

The major haul-out sites for harbor seals are found in lower Cook Inlet. The presence of harbor seals in middle and upper Cook Inlet is seasonal and based on prey availability (Figure 13). In Cook Inlet, seal use of western habitats is greater than use of the eastern coastline (Boveng et al. 2012). NMFS has documented a strong seasonal pattern of coastal areas used during spring and summer for breeding, pupping, and molting as well as more wide-ranging seal movements within and outside of Cook Inlet during winter (Boveng et al. 2012).

Seal movement into and out of Cook Inlet has been monitored using capture and track studies (Boveng et al. 2012; London et al. 2012). The results of these studies have shown that some seals expand their use of the northern portion of Cook Inlet; however, in general, seals that were captured and tracked in the southern portion of Cook Inlet remained south of the Forelands (Boveng et al. 2012). Small-scale patterns of movement occur within Cook Inlet (Boveng et al. 2012). Montgomery et al. (2007) recorded over 200 haulout sites in lower Cook Inlet, but only a few dozen to a few hundred seals seasonally occur in upper Cook Inlet (Rugh et al. 2005). Their presence in upper Cook inlet primarily correlates with spring eulachon and summer salmon runs (Nemeth et al. 2007; Boveng et al. 2012). In 2018 Harvest Alaska conducted marine mammal monitoring in middle Cook Inlet within the same geographic area as this Petition and reported 313 sightings comprised of 316 harbor seal individuals (Sitkiewicz et al. 2018). During the PCT Construction Project in 2020 and 2021, 524 groups of 560 individual harbor seals were observed in upper Cook Inlet near the POA (61 N Environmental 2021, 2022a). During Hilcorp's June 2023 jack-up rig move, PSOs observed two separate sightings of harbor seals in middle Cook Inlet: one just north of Nikiski, and the other closer to the Tyonek platform (Horsley and Larson 2023). Two separate sightings of harbor seals in middle Cook Inlet also occurred during Hilcorp's May 2024 jack-up rig move, one occurring near the Tyonek platform and the other approximately halfway between the Tyonek platform and OSK Dock (Horsley and Larson 2024).

### 4.10.2 Abundance and Trends

Harbor seals are the most common marine mammal along U.S. coasts (NOAA 2023c). In Alaska, state-sanctioned hunting of seals lasted until 1960. Over the past 8 years, most of the 12 harbor seal stocks in Alaska appear stable or are increasing, but seals in the Aleutian Islands, Glacier Bay, and Icy Strait regions have likely declined (NOAA 2023c). The Cook Inlet/Shelikof Strait had a population of 28,411 in 2018 (Muto et al. 2020) with a probability of 0.609 that the stock is decreasing. During SAE's 2015 seismic survey, 823 sightings (1,680 individuals) were recorded north of and between the Forelands (Kendall and Cornick 2015).

### 4.10.3 Status

No harbor seal stocks in Alaska are designated as depleted under the MMPA or listed as threatened or endangered under the ESA (Muto et al. 2017). Harbor seals are common in Alaskan waters with statewide abundance estimates at 243,938 animals (Boveng et al. 2019). The Cook Inlet/Shelikof stock, ranging approximately from Anchorage down along the southern side of the Alaska Peninsula to Unimak Pass, is estimated at a stable 28,411 animals (Young et al. 2023).

In 2010, NMFS and their co-management partners, the Alaska Native Harbor Seal Commission, defined 12 separate stocks of harbor seals based largely on genetics. The harbor seal stocks present in or near the specified geographic region of the class of activities include the Cook Inlet/Shelikof stock. In 2006, the estimated abundance of this stock was 22,900 animals with a minimum population estimate of 21,896 animals (Muto et al. 2017). Prey species of the harbor seal include capelin, eulachon, cod, pollock, flatfish, shrimp, octopus, and squid. Threats to and vulnerabilities of harbor seals include natural and anthropogenic factors, such as climate change, shipping, and tour vessel traffic (Muto et al. 2021).

### 4.10.4 Prey and Foraging

Harbor seals haulout onto rocks, reefs, beaches, and drifting glacial ice to regulate their body temperature, molt, interact with other seals, give birth, and nurse their pups. They often haulout in groups to avoid predators. Harbor seals complete both shallow and deep dives while hunting, depending on the availability of their main prey: fish, shellfish, and crustaceans.

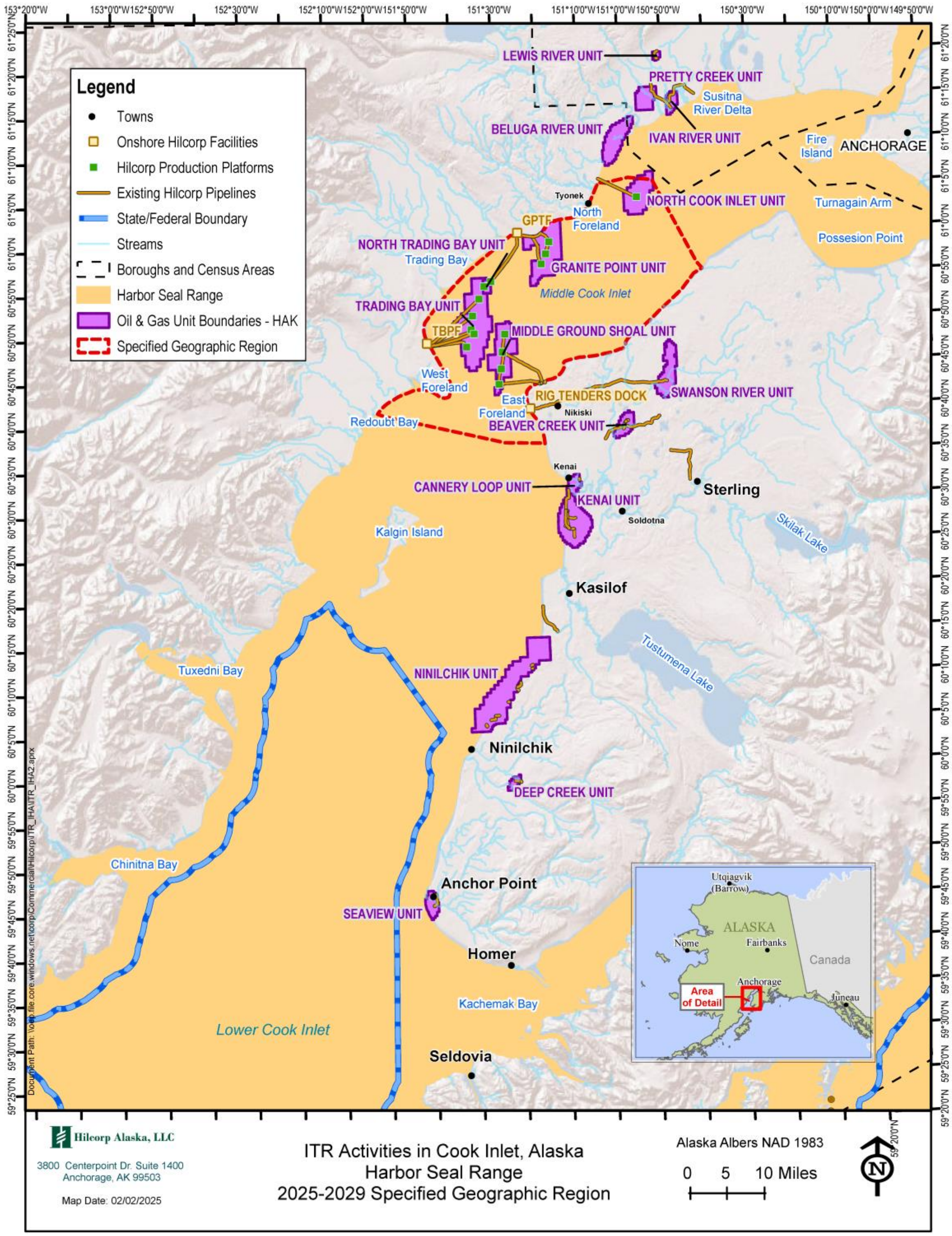
### 4.10.5 Acoustics

NMFS categorizes harbor seals in the phocid pinnipeds in water (PW) functional hearing group, with an generalized hearing frequency range between 40 Hz to 90 kHz in water, and an in-air hearing range from 42 Hz to 52 kHz (NMFS 2024). Phocids have large middle-ear ossicles, and underwater hearing is shifted towards higher frequencies (Hemilä et al. 2006). Although morphological adaptations have expanded phocids frequency range by at least six octaves, they have not lost their aerial hearing capabilities. Thus, harbor seals can hear out of water as well as many terrestrial carnivores (Reichmuth et al. 2013).

### 4.10.6 Critical Habitat

No critical habitat has been designated for harbor seals.

# Figure 13. Harbor Seal Range within Cook Inlet



## 4.11 STELLER SEA LION

### 4.11.1 Distribution

Steller sea lions inhabit temperate to subarctic waters in the North Pacific Ocean, ranging from western Alaska's Cape Suckling through the Gulf of Alaska, the Aleutian Islands, and the Bering Sea to Asia (NOAA 2023g). NMFS has identified two DPSs of Steller sea lions under the ESA based on differences in demographics and genetics including the endangered western DPS and the previously listed but now delisted Eastern DPS (62 FR 24345). Steller sea lions from the endangered Western DPS are found in lower Cook Inlet (Young et al. 2023). The endangered Western DPS has experienced significant declines, leading to smaller rookeries in the western range (NMFS 2008c). Their habitat encompasses terrestrial sites for breeding and pupping (rookeries), haulouts for resting, and marine foraging areas. More than 100 haulout and rookery sites exist, primarily in the Gulf of Alaska and the Aleutian Islands (Muto et al. 2018).

During the non-breeding season (late May to early July), many individuals disperse widely, with adults typically returning to rookeries for breeding. Haulout sites are utilized year-round, serving as both non-breeding season rookeries and resting sites. Suitability of these sites depends on factors such as substrate type, exposure to wind and waves, human activity levels, and proximity to prey resources. While Steller sea lions do not undertake annual migrations, they exhibit seasonal dispersal, with increased use of haulouts in fall and winter (Jemison et al. 2013; Allen and Angliss 2014). In winter, many sea lions utilize terrestrial haulouts and sea ice in the Bering Sea. (NMFS 2008c). There are no known haulout locations within the specific geographic region discussed here.

#### 4.11.1.1 Distribution in Cook Inlet

Steller sea lions inhabit lower Cook Inlet, especially near Shaw Island and Elizabeth Island (Nagahut Rocks) and haul out at sites south of Anchor Point around the offshore islands and along the western coast of upper Cook Inlet in the bays (Chinitna Bay, Iniskin Bay, etc.) (Rugh et al. 2005) (Figure 14). They are rarely seen in upper Cook Inlet (Nemeth et al. 2007). During NMFS CIBW aerial surveys from 1993 to 2022, 64 sightings of 1,111 individual Steller sea lions were recorded; most were observed in lower Cook Inlet (Shelden et al. 2017; Shelden et al. 2022). ~3,600 Steller sea lions utilize terrestrial sites in lower Cook Inlet (Sweeney et al. 2017), however, the nearest major rookery or haulout site is over 175 km from the closest activity (Figure 15). Sightings of large congregations of Steller sea lions during NMFS aerial surveys occurred outside the specific geographic region, on land in the mouth of Cook Inlet (e.g., Elizabeth and Shaw Islands).

During Apache's 3D Seismic surveys in 2012, three sightings of four individuals in upper Cook Inlet were recorded (Lomac-MacNair et al. 2013). PSOs associated with Buccaneer's drilling project off Cape Starichkof observed seven Steller sea lions in summer 2013 (Owl Ridge 2014), and another four Steller sea lions were observed in 2015 in Cook Inlet during SAE's 3D Seismic Program. Of the three 2015 sightings, one sighting occurred between the West and East Forelands, one occurred near Nikiski, and one occurred northeast of the North Foreland in the center of Cook Inlet (Kendall and Cornick 2015). One sighting of two individuals occurred during the CIPL Extension Project in 2018 in middle Cook Inlet (Sitkiewicz et al. 2018). Additionally, During the seismic survey conducted in lower Cook Inlet situated over 120 km (75 mi) south of the action area, PSOs on project vessels spotted five Steller sea lions, while aerial monitoring detected seven individuals. These observations all involved solitary animals, including one subadult female (Fairweather Science 2020).

During 2020 through 2022, 61 North Environmental conducted monitoring efforts in upper Cook Inlet for the POA Modernization Project. Six Steller sea lions were observed in 2020; nine in 2021; and three in 2022 (61 North Environmental 2021, 2022a, 2022b). At the end of July 2022, while conducting a waterfowl survey an estimated 25 Steller sea lions were observed hauled-out at low tide in the Lewis River, on the west side of middle Cook Inlet. (K. Lindberg, Pers. Comm., October 3, 2023). In 2023, one Steller sea lion was observed off Anchor Point in October during Hilcorp's marine vibroseis pilot project (Hanks et al. 2024).

### 4.11.2 Abundance and Trends

NMFS listed the Steller sea lion as a threatened species under the ESA in 1990 following declines of 63% in certain rookeries since 1985 and declines of 82% since 1960. In 2002, the non-pup and pup counts were the lowest recorded for the Western DPS (Sweeney et al. 2022). While the western population has been increasing slowly overall since about 2003, it continues to decline rapidly in large areas of its range (central and western Aleutian Islands regions). The Western DPS declined in abundance by about 70% between the late 1970s and 1990, with evidence that the decline had begun even earlier. Factors potentially contributing to this decline include 1) incidental take in fisheries, 2) legal and illegal shooting, 3) predation, 4) contaminants, 5) disease, and 6) climate change (NMFS 2008c). Although Steller sea lion abundance continues to decline in the western Aleutians, numbers are thought to be increasing in the eastern part of the Western DPS range (DeMaster 2011).

Counts of Steller sea lions within the range of the Western DPS increased between 2006 and 2021 (Sweeney et al. 2022), although the rate of increase was slow. The populations continue to decline west of Samala Pass (Sweeney et al. 2018). Recent changes in the counts of other areas that have been showing signs of recovery (eastern and central Gulf of Alaska regions) are of high concern, and evidence indicates that there are multiple remaining threats to their existence (NOAA 2023f). The best estimate of the total count of Western Steller sea lions in Alaska is 49,837 based on the agTrend model that uses a sum of non-pup and pup modeled counts (Young et al. 2023)

While the Western DPS has been increasing slowly since 2003, strong regional differences exist across the range in Alaska, and the population continues declining in the central and western Aleutian Islands. The North Pacific Ocean marine heatwave of 2014 to 2016 was associated with a decline in pup productivity between 2015 and 2017 in the eastern and central Gulf of Alaska; a decline in adult female survival in the eastern Aleutian Islands, Gulf of Alaska, and Southeast Alaska; and a subsequent decline in non-pup abundance throughout the Gulf of Alaska in 2019. This contrasted with a previously increasing trend until 2017 (NOAA 2023f).

### 4.11.3 Status

The Steller sea lion was listed as a threatened species under the ESA on November 26, 1990 (55 FR 49204). In 1997, NMFS reclassified Steller sea lions into two DPSs based on genetic studies and other information (62 FR 24345). On November 4, 2013, the Eastern DPS was removed from the endangered species list (78 FR 66139); the Western DPS remains listed as endangered and is designated as depleted and classified as a strategic stock under the MMPA (NOAA 2023f).

### 4.11.4 Prey and Foraging

Essential features for Steller sea lion aquatic habitat primarily revolve around feeding. Their diet varies geographically, seasonally, and over years in response to the availability and abundance of food resources. The foraging strategy of Steller sea lions is strongly influenced by seasonality of sea lion reproductive activities on rookeries and the ephemeral nature of many prey species. Steller sea lions are opportunistic predators that eat a variety of fish and cephalopods, and occasionally other marine mammals and birds (NMFS 2008c). Steller sea lions can travel long distances within a season and forage in both nearshore and pelagic waters. Their diet may vary seasonally, depending on the abundance and distribution of prey.

Steller sea lions feed largely on walleye pollock (Theragra chalcogramma), salmon (Onchorhyncus spp.), arrowtooth flounder (Atheresthes stomias) during summer, and walleye pollock and Pacific cod (Gadus macrocephalus) during winter (Sinclair and Zeppelin 2002). Incidentally, none of the forgoing species, except for salmon, are found in abundance in upper Cook Inlet (Nemeth et al. 2007).

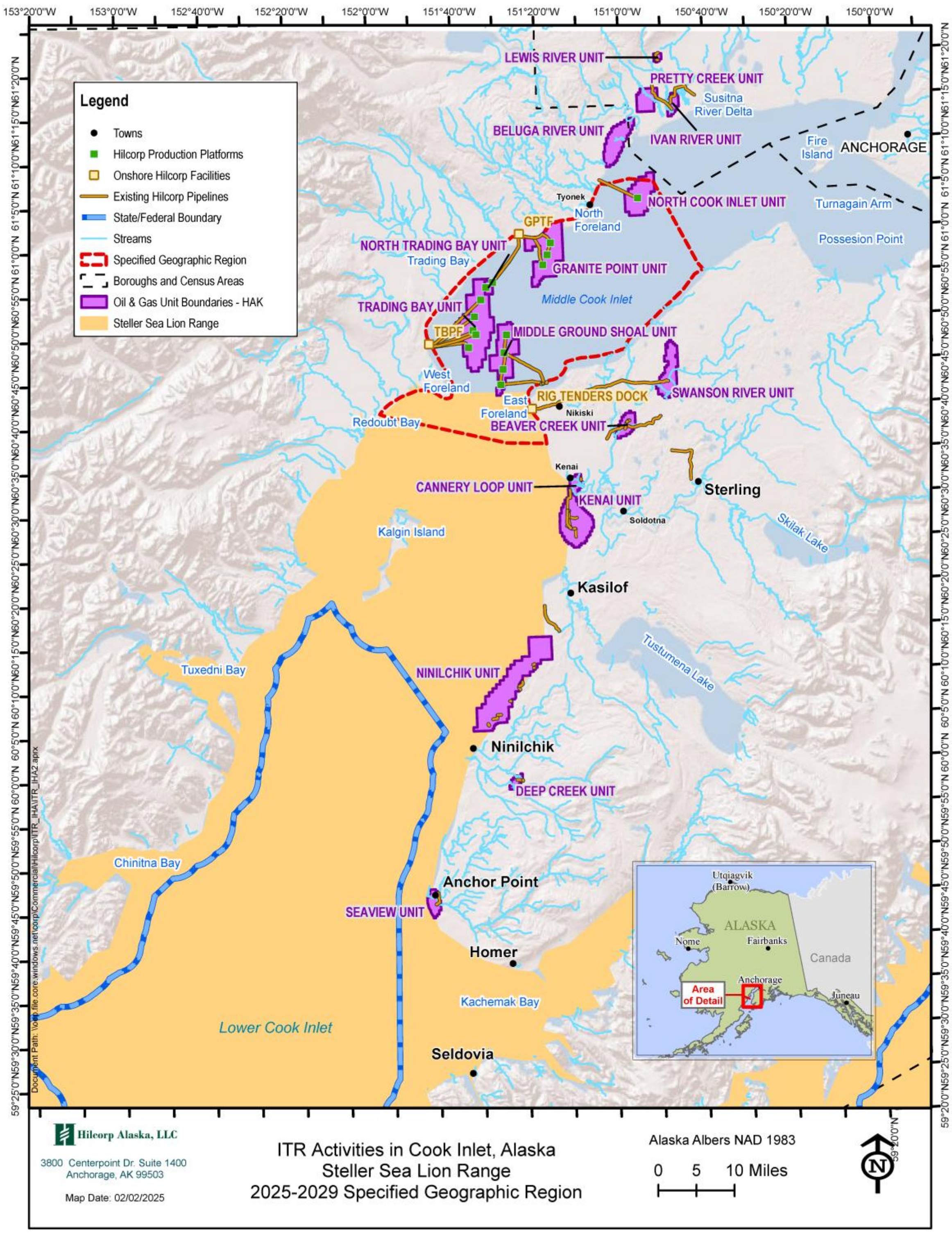
The foraging strategies and ranges of Steller sea lions change seasonally and in step with the age and reproductive status of the individual. Tagging studies indicate that the waters near rookeries and haulout sites are critical foraging habitats. The aquatic areas surrounding rookeries are essential to postpartum females and young animals, while the waters around haulout sites provide foraging and refuge habitat for both non-breeding animals year-round and reproductively mature animals during the non-breeding season (58 FR 45269).

During summer, Steller sea lions feed mostly over the continental shelf and shelf edge. Females attending pups forage within 37 km (20 nm) of breeding rookeries (Merrick and Loughlin 1997), which is the basis for designated critical habitat around rookeries and major haulout sites.

### 4.11.5 Acoustics

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 pinnipeds in water (OW) functional hearing group, with generalized underwater hearing range between 60 Hz and 68 kHz and an in-air hearing range from 90 Hz to 40 kHz (NMFS 2024). Their underwater audiogram shows the typical mammalian U-shape, and their best hearing is believed to range from 1 to 16 kHz (Kastelein et al. 2005).

## Figure 14. Steller Sea Lion Range within Cook Inlet



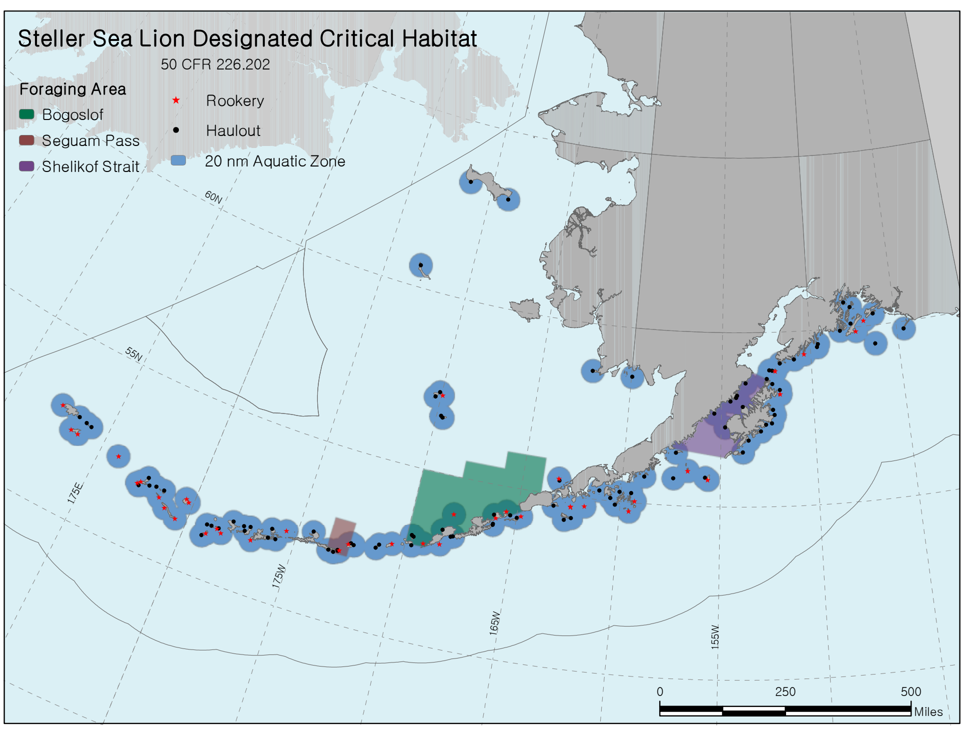
### 4.11.6 Critical Habitat

Critical habitat is not mapped within Cook Inlet. The Steller sea lion critical habitat was designated by NMFS on August 27, 1993, and amended June 15, 1994 (50 CFR 226.202). The NMFS-designated critical habitat for the Steller sea lion (58 FR 45269) is based on elements of the sea lions' habitat that are essential for the conservation of the species and includes the following:

- All Steller sea lion rookeries and major haulouts (supporting > 200 Steller sea lions) located within state- and federally managed waters off Alaska.
- A terrestrial zone that extends 914 m (3,000 ft) landward from the baseline or base point of each major rookery and major haulout in Alaska.
- An air zone that extends 914 m (3,000 ft) above the terrestrial zone of each major rookery and major haulout in Alaska, measured vertically from sea level.
- An aquatic zone that extends 914 m (3,000 ft) seaward in state- and federally managed waters from the baseline or basepoint of each major rookery and major haulout in Alaska east of 144° W.
- An aquatic zone that extends 37 km (20 nm) seaward in state- and federally managed waters from the baseline or basepoint of each major rookery and major haulout in Alaska that is west of 144° W; and
- Three special aquatic foraging areas in Alaska, including the Shelikof Strait area, the Bogoslof area, and the Seguam Pass area.

No major rookeries or haulouts exist near the planned project area or within the specific geographic region. Figure 15 displays critical habitat for Steller sea lions; no critical habitat for Steller sea lions occurs within the specific geographic region of this Petition or within Cook Inlet.

**Figure 15. Steller Sea Lion Critical Habitat**



## 4.12 CALIFORNIA SEA LION

### 4.12.1 Distribution

California sea lions live along the Pacific coastline spanning an area from central Mexico to Southeast Alaska and typically breed on islands in southern California, western Baja California, and the Gulf of California (Carretta et al. 2020) (Figure 16). Five genetically distinct geographic populations exist: Pacific Temperate, Pacific Subtropical, Southern Gulf of California, Central Gulf of California, and Northern Gulf of California (Schramm et al. 2009).

There have been few reported observations of California sea lions in Alaska. Most observations are of solitary individuals, typically males, which are known to migrate long distances. California sea lions can occasionally be found in small groups of two or more and are usually associated with Steller sea lions at their haulouts and rookeries (Maniscalco et al. 2004).

#### 4.12.1.1 Distribution in Cook Inlet

California sea lions are not typically observed north of Southeast Alaska, and sightings are rare in Cook Inlet. No California sea lions have been observed during the annual NMFS aerial surveys in Cook Inlet. Two California sea lions were documented during the Apache 2012 seismic survey (Lomac-MacNair et al. 2013). NMFS's anecdotal sighting database includes four sightings in Seward and Kachemak Bay. Though no sightings of California sea lions occurred during the 2019 Hilcorp lower Cook Inlet seismic survey (Fairweather Science 2020) or the CIPL Extension Project in 2018 (Sitkiewicz et al. 2018).

### 4.12.2 Abundance and Trends

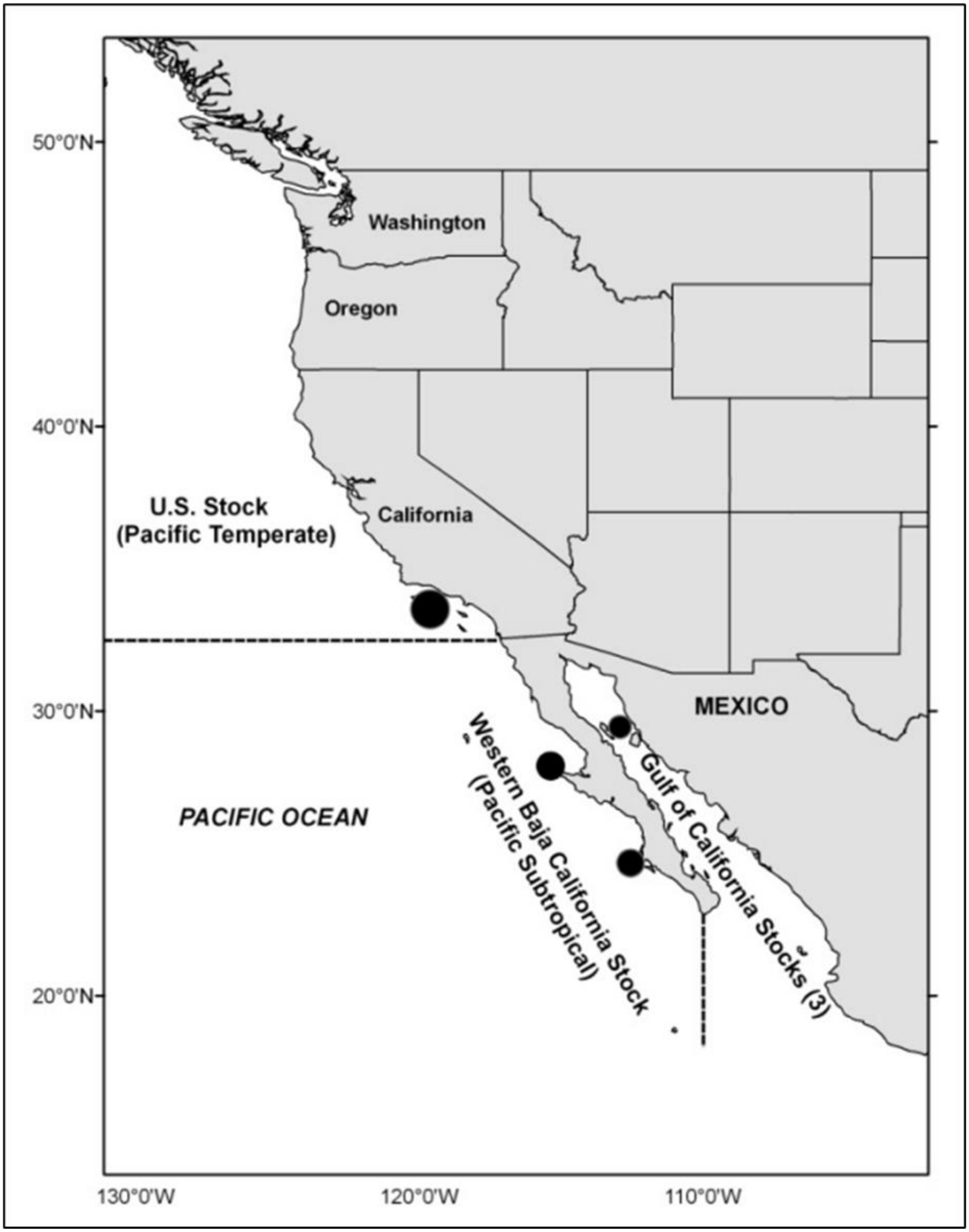
California sea lion population size was estimated from a time series (1975 to 2014) of pup counts (Lowry et al. 2017), combined with mark-recapture estimates of survival rates (DeLong et al. 2017; Laake et al. 2018). Population size in 2014 was estimated at 257,606 animals, which corresponded with a pup count of 47,691 animals along the U.S. West Coast (Lowry et al. 2017; Laake et al. 2018). Laake et al. (2018) estimated a net productivity rate of 7% per year. Populations vary widely in association with El Niño events. From 2013 to 2017, NOAA declared a UME for California sea lions due to a decline in the availability of prey species caused by warm water in the California current that affected multiple species (Cavole et al. 2016).

Threats to sea lions include entanglements in fishing gear and hook and line fishing. Between 2012 and 2016, 146 California sea lion mortalities and/or serious injuries were attributed to hook and line fisheries (an average of 29 animals per year) (Carretta et al. 2020). Other threats include power plant entrainment, marine debris entanglement, oil exposure, vessel strikes, and dog attacks (Carretta et al. 2020). Between 2012 and 2016, 485 mortalities and/or serious injuries were documented from these sources (an average of 97 sea lions per year) (Carretta et al. 2020).

### 4.12.3 Status

California sea lions in the U.S. are not listed as endangered or threatened under the ESA or as depleted under the MMPA. The growth rate of the species is ~7% annually, and the population estimate is 257,606 (Carretta et al. 2020). The total human-caused mortality of this stock is considered to be insignificant. California sea lions are not considered strategic under the MMPA, and no critical habitat has been designated or proposed for California sea lions.

**Figure 16. Geographic Range of California Sea Lions Showing Stock Boundaries and Locations of Major Rookeries**



### 4.12.4 Prey and Foraging

California sea lions feed mainly offshore in coastal areas. As opportunistic eaters, they eat a variety of prey, such as squid, anchovies, mackerel, rockfish, octopus, and sardines, many of which can be found in upwelling areas. They may also take fish from commercial fishing gear, sport fishing lines, and fish passage facilities at dams and rivers. California sea lions are preyed upon by killer whales and white sharks. They also face a variety of other threats, including entanglement in fishing gear, ocean trash, and illegal shootings by anglers.

### 4.12.5 Acoustics

California sea lions are in the OW hearing group categorized by NMFS and have a generalized underwater hearing range of 60 Hz to 68 kHz and in-air ranges from 90 Hz to 40 kHz (NMFS 2024). In terrestrial environments, sea lions' detection of sound at most frequencies is limited by ambient conditions rather than their inherent auditory capabilities (Reichmuth et al. 2017). Acute underwater hearing for the California sea lion has been measured between ~0.1 and 50 kHz (Schusterman et al. 1972; Mulsow et al. 2012; Reichmuth and Southall 2012; Reichmuth et al. 2013).

Kastak et al. (2005) elicited an ~6-dB temporary threshold shift (TTS) in sea lions exposed to sound, centered at 2.5 kHz (defined by Southall et al. [2019]). In a 2021 study by Kastelein et al. the pattern of hearing recovery for all hearing frequencies and all sounds resulted in recovery times from initial TTSs of 0 to 5 dB within 10 min, TTSs of 5 to 10 dB within 60 min, TTSs of 10 to 15 dB within 120 min, and TTSs of 15 to 25 dB within 240 min.

### 4.12.6 Critical Habitat

No critical habitat has been designated for the California sea lion.

# 5. REQUESTED TYPE OF INCIDENTAL TAKING AUTHORIZATION

*The type of incidental taking authorization that is being requested and the method of incidental taking.*

Hilcorp requests regulation pursuant to Section 101(a)(5)(A) of the MMPA for the non-lethal unintentional taking of small numbers of marine mammals incidental to oil and gas exploration, development, production, and decommissioning activities in Cook Inlet, AK, for a five-year period beginning August 15, 2025, and extending through December 31, 2029. Hilcorp requests authorization for taking by harassment only. The class of activities in this Petition are described in Section 1 and encompass all Hilcorp's currently reasonably foreseeable oil and gas exploration, development, production and decommissioning activities in Cook Inlet, AK including:

- Tugs towing, holding, or positioning a jack-up rig in support of production drilling at existing platforms in middle Cook Inlet and Trading Bay;
- Pile driving in support of production well development at the Tyonek platform;
- Tugs towing, holding, or positioning a jack-up rig and pile driving in support of exploration drilling; one location between the Anna and Bruce platforms on the northern border of Trading Bay and at two locations in the MGS Unit in middle Cook Inlet; and
- Pipeline replacement/installation involving either pipe pulling or anchor handling or a combination of both, at up to two locations in middle Cook Inlet and/or Trading Bay.

Hilcorp requests authorization of a small number of Level A takes for humpback, minke, gray, fin, and killer whales; Dall's and harbor porpoises; harbor seals; and Steller sea lions during pile driving activities in support of well development at Tyonek platform. For pipeline installation/replacement activities using lay barge methods, Level A take authorization is requested for a small number of humpback, fin, and killer whales; Dall's and harbor porpoises; harbor seals and Steller sea lions. Additionally, Level A take authorization is requested for a small number of humpback, minke, gray, and fin whales; Dall's and harbor porpoises; harbor seals and Steller sea lions during pile driving activities in support of exploratory drilling. No Level A takes are requested for tugs towing, holding or positioning a jack-up rig or pipe pulling activities. Hilcorp does not anticipate any of the activities will result in mortality or serious injury to marine mammals; however, these species may be exposed to Level A sound exposure levels (SELs).

Hilcorp requests Level B take authorization for a limited number of humpback, minke, gray, fin, killer, and beluga whales; Dall's and harbor porpoises; Pacific white-sided dolphins; harbor seals; and Steller and California sea lions. The main source of potential takes is anticipated to be Level B harassment, primarily caused by sound produced by the aforementioned sound-producing activities (i.e., tugs under load with a jack-up rig, pile driving, anchor handling, and pipe pulling). The acoustic criteria of these activities are discussed in greater detail in Section 6.2).

# 6. ESTIMATED NUMBER OF INCIDENTAL TAKES BY ACTIVITIES

*By age, sex, and reproductive condition, the number of marine mammals [by species] that may be taken by each type of taking, and the number of times such takings by each type of taking are likely to occur.*

This section presents the estimates for harassment incidental to the class of activities (as described in Section 1 and summarized in Table 1). It includes information on sound criteria, sound sources, and methods to estimate potential encounters with marine mammals during the activities described in this Petition. Potential effects of these encounters are summarized in Section 7.

To assess potential harassment during in-water activities, several factors are considered, including marine mammal densities in the specific geographic region, past monitoring data from Cook Inlet, and biological factors like propensity to travel in groups.

The following sections describe methodology used to determine the Level A and Level B areas of ensonification and estimate potential exposures of mammals from Hilcorp's projected 2025 through 2029 activities in Cook Inlet.

## 6.1 APPLICABLE NOISE CRITERIA

Under the MMPA, Level A harassment is defined as "…any act of pursuit, torment, or annoyance which has the potential to injure a marine mammal or marine mammal stock in the wild." Level B harassment is defined as "…any act of pursuit, torment, or annoyance which 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."[4]

The effects of underwater sound on marine mammals are dependent on the ability of each individual to perceive or hear the sounds. The frequency of the sound greatly influences whether marine mammals can hear them. Hildebrand (2009) broadly characterizes frequency bands (expressed in Hz or kHz) into three categories:

1. Low: 10 to 500 Hz dominated by anthropogenic sources such as seismic exploration.
2. Mid: 500 Hz to 25 kHz comprised of natural and anthropogenic sound sources (sonar, small vessels) that do not propagate over long ranges.
3. High: > 25 kHz dominated by thermal sound, with some anthropogenic sound sources such as shallow water echo sounding. Acoustic attenuation for HF sound sources is so extreme that sound sources are confined to an area within a few km of the source.

In October 2024, NMFS published the NOAA Technical Memorandum NMFS-Office of Protected Resources (OPR)-71 as updated guidance to the 2016 and 2018 documents for assessing the impact of anthropogenic sound on marine mammal hearing, specifically acute cumulative incidental exposures. Key differences include revised acoustic thresholds and updated auditory weighting functions. It specifies the sound levels and criteria at which marine mammals are predicted to experience TTS (Level B harassment)

[4] Laws & Policies: Marine Mammal Protection Act | NOAA Fisheries

and auditory injury (AUD INJ) (Level A harassment) from acute exposure to underwater and in-air sounds. TTS is defined as a temporary, reversible increase in hearing threshold, while AUD INJ includes damage to the inner ear that may or may not result in a PTS. The analyses presented in this Petition adhere to the updated guidance.

Table 8 provides a summary of the updated acoustic thresholds for marine mammals. For the purpose of this section, all underwater sound pressure levels (SPLs) are reported as dB re 1 µPa unless otherwise stated.

### Table 8. Summary of NMFS Acoustic Thresholds

| Marine Mammal Hearing Groups | Hearing Range | Auditory Injury Onset (Level A) Threshold | | Disturbance (Level B) Threshold | |
|---|---|---|---|---|---|
| | | Impulsive | Non-Impulsive | Impulsive | Non-Impulsive |
| LF Cetaceans | 7 Hz to 36 kHz | 222 dB $L_{pk}$<br>183 dB $SEL_{24h}$ | 197 dB $SEL_{24h}$ | 160 dB rms | 120 dB rms |
| HF Cetaceans | 150 Hz to 160 kHz | 230 dB $L_{pk}$<br>193 dB $SEL_{24h}$ | 201 dB $SEL_{24h}$ | 160 dB rms | 120 dB rms |
| VHF Cetaceans | 200 Hz to 165 kHz | 202 dB $L_{pk}$<br>159 dB $SEL_{24h}$ | 181 dB $SEL_{24h}$ | 160 dB rms | 120 dB rms |
| PW | 40 Hz to 90 kHz | 223 dB $L_{pk}$<br>183 dB $SEL_{24h}$ | 195 dB $SEL_{24h}$ | 160 dB rms | 120 dB rms |
| OW | 60 Hz to 68 kHz | 230 dB $L_{pk}$<br>185 dB $SEL_{24h}$ | 199 dB $SEL_{24h}$ | 160 dB rms | 120 dB rms |

**Notes:** Source: NMFS 2024; Hz – hertz; kHz – kilohertz; dB – decibels; $L_{pk}$ – peak received sound pressure level; $SEL_{24h}$ – weighted cumulative sound exposure level at the recommended 24-hour accumulation period with a reference value of 1 micropascal squared second (re 1 $\mu Pa^2$ s); rms- root mean square; LF – low-frequency; HF – high-frequency; VHF – very high-frequency; PW – phocid pinnipeds in water; OW – otariid pinnipeds in water

## 6.1.1 Threshold Criteria for Level A Harassment

NMFS provides guidelines that establish criteria for the onset of AUD INJ from both impulsive (e.g., pile driving) and non-impulsive (e.g., tugs towing a jack-up rig, pipe pulling, anchor handling) sound sources (NMFS 2024). The criteria use dual metrics that consider weighted cumulative sound exposure level ($SEL_{24h}$) and peak sound pressure level ($L_{PK}$) for impulsive sounds, and weighted $SEL_{24h}$ for non-impulsive sounds. Level A acoustic harassment (AUD INJ) is defined using these metrics, applying both $SEL_{24h}$ and $L_{PK}$ for impulsive sounds, and only $SEL_{24h}$ for non-impulsive sounds unless the impulsive peak level threshold is exceeded.

## 6.1.2 Threshold Criteria for Level B Harassment

Marine mammals may experience behavioral disturbance (Level B) when exposed to underwater sounds of 120 dB rms or greater from non-impulsive sources like tugs anchor handling or towing a jack-up rig. For impulsive underwater sounds (e.g., pile driving) exceedance of 160 dB rms or greater may cause marine mammals to experience Level B harassment (NMFS 2018, 2024).

## 6.2 DESCRIPTION OF SOUND SOURCES

The description of the class of activities is found in Section 1 of this Petition. The following sections present the sounds associated with the class of activities, the sound source verifications (SSVs), and the acoustic modeling used in threshold distances, ensonification areas, duration, and distance in the overall take analysis and exposure estimates.

### 6.2.1 Tugs under Load with a Jack-Up Rig in Support of Production and Exploratory Drilling

#### 6.2.1.1 Estimating Tug Source Levels

A literature review was undertaken of underwater sound emissions of tugs under various loading efforts. Table 9 shows data for tugs under load with a jack-up rig where the vessel length and hp are known from the primary reference. Table 10 shows data for tugs under load with a jack-up rig with more limited specification information, where the primary reference was not accessible, but results are reported in other papers.

Table 9 provides measured sound source levels of the tugs of various hp (2,000 to 8,200 hp) under loading conditions. The sound source levels for tugs under load with a jack-up rig can range from ~164 dB SPL re 1 µPa at 1 m to 202 dB SPL re 1 µPa at 1 m. This range of underwater sound source levels largely relates to the level of operational effort, e.g., with full power output and higher speeds generating more propeller cavitation and hence greater sound source levels than lower power output and lower speeds.

**Table 9. Primary Sources of Measured Tug Sound Source Levels**

| Tugboat | Length Overall (m) | Speed (kt) or Loading Effort | Source Level at 1 m (dB re 1 µPa)[1] | hp | References |
|---|---|---|---|---|---|
| *Eagle* | 32 | 9.6/towing barge | 173 | 6,770 | Bassett et al. 2012 |
| *Valor* | 30 | 8.4/towing barge | 168 | 2,400 | |
| *Lela Joy* | 24 | 4.9/towing barge | 172 | 2,000 | |
| *Pacific Eagle* | 28 | 8.2/towing barge | 165 | 2,000 | |
| *Shannon* | 30 | 9.3/towing barge | 171 | 2,000 | |
| *James T Quigg* | 30 | 7.9/towing barge | 167 | 2,000 | |
| *Island Scout* | 30 | 5.8/towing barge | 174 | 4,800 | |
| *Chief* | 34 | 11.4/towing barge | 174 | 8,200 | |
| *Lauren Foss* | 45 | Berthing a barge | 167 | 8,200 | Austin and Warner 2013 |
| *Seaspan Resolution* | 30 | Berthing half power | 180 | 6,000 | Roberts Bank Terminal 2 Technical Report 2014 |
| *Seaspan Resolution* | 30 | Berthing full power | 200 | 6,000 | |

**Notes:**
[1] Source level values rounded to the nearest whole number.
m – meters
dB re 1 µPa – decibels referenced to 1 microPascal
hp – horsepower

### Table 10. Secondary Sources of Measured Tug Sound Source Levels

| Tugboat | Source Level at 1 m (dB re 1 µPa)[1] | Description | References |
|---|---|---|---|
| Britoil | 193 | Anchor handling | Hannay et al. 2004 |
| Maersk Rover | 179 | Holding Position | Austin et al. 2005 |
| Tug 1 | 200 | Anchor pulling, Strait of Juan de Fuca, ~100-m depth | Laurinolli et al. 2005 |
| Tug 2 | 182 | | |
| Tug 3 | 202 | Anchor pulling, Cook Inlet Alaska, ~60-m depth | Austin and Warner 2013 |
| Tug and Barge | 164 | Transiting, Anchorage Harbor, Alaska, ~40-m depth | Blackwell and Greene 2003 |
| Tug and Barge | 179 | Docking, Anchorage Harbor, Alaska, ~40-m depth | |
| Tug and Barge | 182 | Transiting, Beaufort Sea | Zykov and Hannay 2006 |

**Notes:** [1] Source level values rounded to the nearest whole number; dB re 1 µPa – pressure of 1 microPascal; m – meter

Tugs under tow produce higher SPLs than a tug transiting with no load because of the higher power output necessary to pull the load. Tugs are equipped with high hp power plants to:

1. Set a large vessel in motion or bring it to a stop (berthing);
2. Tow a vessel while in motion; and
3. Divert/ steer a vessel in motion.

Berthing activities can include both pushing or towing a load. The literature review identified no existing data on sound source levels of tugs towing jack-up rigs. Accordingly, for this analysis, data was used from tug-under-load activities including berthing and towing activities. Austin and Warner (2013) measured a source level of 167 dB re 1 µPa at 1 m for tug-towing-barge activity in Cook Inlet; Blackwell and Greene (2003) reported berthing activities in the Port of Alaska (formerly Port of Anchorage) with a source level of 179 dB re 1 µPa at 1 m; Laurinolli et al. (2005) measured a source level of 200 dB re 1 µPa at 1 m for anchor towing activities by a tugboat in the Strait of Juan de Fuca, Washington.

The *Seaspan Resolution* tug from the Roberts Bank Terminal 2 Study (2014) (Table 9) is a highly informative reference for source level due to repeated measurements of the same tug operating under different speeds and loading conditions. As shown in Table 10, broadband measurements ranged from ~164 dB re 1 µPa at 1 m up to ~200 dB re 1 µPa at 1 m – the associated power output is displayed when it was described (e.g., half power to full power output for the *Seaspan Resolution*).

The literature review and the source levels identified in Table 9 demonstrate there is little evidence of different sound levels between individual tugs based purely on engine hp ratings. Source sound emissions largely relate to operational effort, with full power operations including higher transiting speeds generating more propeller cavitation and hence more sound than low power or low-load activities. The amount of power the tugs expend while operating is the best predictor of relative sound source level.

Hilcorp’s rig manager, who is experienced with towing jack-up rigs in Cook Inlet, described operational conditions wherein the tugs generally operate at half power or less for the majority of the time they are under load (Section 1) (Durham, Pers. Comm., 2021). Transit 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).

*Seaspan Resolution*'s half-power berthing scenario has a sound source level of 180 dB SPL re 1 µPa at 1 m. In addition, the Roberts Bank Terminal 2 Study (2014) analyzed 650 tug transits under varying load and speed conditions. The 2014 Roberts Bank Terminal 2 sound analysis reported mean tug source levels of 179.3 dB SPL re 1 µPa at 1 m, a 25$^{th}$ percentile of 179.0 dB SPL re 1 µPa at 1 m, and a 5$^{th}$ percentile of 184.9 dB SPL re 1 µPa at 1 m.

A half-power source level for sound transmission loss (TL) modeling of 180 dB SPL re 1 µPa at 1 m is a conservative sound source value to use for tugs pulling the jack-up rig based on the rig manager's experience towing jack-up rigs in Cook Inlet (Durham, Pers. Comm., 2021), the *Seaspan Resolution*'s sound source level at half power during berthing activities, and the mean and upper quartile tug source level measurements from the 650 tugs transits in the Roberts Bank Terminal Study (2014).

The examples of sound source levels for tug activities in the Roberts Bank Terminal and Cook Inlet are relevant to the tugs towing a jack-up rig in Cook Inlet because the average depth (~50 m [~164 ft]) of activity locations in Cook Inlet are similar to depths measured in many of the above-referenced studies. Specifically, the depth reported for the Roberts Bank Terminal 2 was 50 m (164 ft) (Roberts Bank Terminal 2 Technical Report 2014), 60 m (197 ft) for Cook Inlet (Austin and Warner 2013), and for the Port of Alaska was reported as 40 m (131 ft) (Blackwell and Greene 2002).

While traveling with the jack-up rig, the most common configuration is two tugs positioned side by side (~30 to 60 m [~98 to 197 ft]), pulling from the front of the jack-up rig, and one tug ~200 m (~656 ft) behind the front tugs positioned behind the jack-up rig, applying tension on the line as needed for steering and straightening. While positioning the jack-up rig on a platform, up to four tugs may be fanned out around the jack-up rig to provide finer control over movement necessary to safely position the jack-up rig on the platform.

If three tugs were operating simultaneously at 180 dB SPL re 1 µPa, the overall source emission levels would be expected to increase by ~5 dB when logarithmically adding the sources. In practice, the load condition of the three tugs is unlikely to be identical at all times, so sound emissions would be dominated by the single tug in the group that is working hardest at any point in time. A fourth tug may be used for positioning the jack-up rig, but its use would likely not exceed 1 hr.

From the SSV measurements performed by JASCO Applied Sciences (JASCO) during a Hilcorp jack-up rig transport with three ocean-going tugs in middle Cook Inlet, a source level of 167.3 dB $SEL_{1s}$ re 1 µPa was measured for the 20%-power scenario and a source level of 205.9 dB $SEL_{1s}$ re 1 µPa for the 85%-power scenario. Assuming a linear scaling of tug power, a source level of 185 dB SPL re 1 µPa was then calculated as a single point source level for three tugs operating at 50% power output.

In sum, based on the literature review detailed above, the tug source spectra was taken from the Roberts Bank Terminal 2 Technical Report (2014) because of its similarity to the scenario in Cook Inlet in terms of power, i.e., a 30-m (98.4-ft) tugboat, with 6,000 hp, and operating at a depth of 52 m (170.6 ft) whereas berthing a cargo vessel at half power with a source level of 180 dB SPL re 1 µPa at 1 m reasonably reflects a mean tug source sound level scenario. However, because the 2021 Cook Inlet SSV measurements by JASCO represent the most recent best available data, and because multiple tugs may be operating simultaneously, the analyses presented below use a mean tug sound source level scenario of 185 dB SPL re 1 µPa at 1 m to calculate the harassment estimates for three mobile tugs operating at 50% power output.

##### *6.2.1.1.1 Modeling Methodology of Tugs under Load with a Jack-Up Rig*

This section describes the methodology used to assess tugs towing, holding, or positioning a jack-up rig as a sound source in middle Cook Inlet and Trading Bay.

To generate the distances in m to Level A and Level B thresholds for use in take exposure calculations, a literature review was undertaken of the available data to estimate a mean source level of the tugs under load with a jack-up rig at 50% power output. The 50% (or less) power output scenario occurs during the vast majority of tug towing jack-up rig activity, as described in Section 1. Additionally, an SSV performed by JASCO in October 2021 (Lawrence et al. 2022) measured the sound source level from the tugs pulling a jack-up rig in Cook Inlet at various power outputs. The SSV returned a source level of 185 dB SPL at 50% power output, which confirmed an acoustic model developed for Hilcorp's specific geographic region for the specified activity within Cook Inlet to predict the underwater sound propagation from the tugs in various locations and seasons of expected activity.

Further modeling was done to account for one additional tug working for 1 hr at 50% power during jack-up rig positioning. This is equivalent in terms of acoustic energy to three tugs operating at 180.0 dB (each of them) for 4 hr, joined by a fourth tug for 1 hr, increasing the source level to 186.0 dB re 1 µPa only during the 1-hr period for Level B impacts (the logarithmic sum of four tugs working together at 180.0 re 1 µPa). An SEL of 185.1 decibels referenced to 1 microPascal squared second (dB re 1 $\mu Pa^2 s$) was used to account for cumulative sound exposure for Level A impacts by adding a fourth tug operating at 50% power for 20% of the 5-hr period. This is equivalent in terms of acoustic energy to three tugs operating at 185.0 dB SPL for 4 hr, joined by a fourth tug for 1 hr, increasing the source level to 186.0 dB SPL only during the 1-hr period. The use of the 20% 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.

The mathematical equations used to determine the SPL and SEL are as follows:

$$\text{SPL} = 10 * \log\left(10^{\frac{180}{10}} + 10^{\frac{180}{10}} + 10^{\frac{180}{10}} + 10^{\frac{180}{10}}\right) = 186.0\ dB\ re\ 1\mu Pa$$

$$\text{SEL} = 10 * \log\left(10^{\frac{180}{10}} + 10^{\frac{180}{10}} + 10^{\frac{180}{10}} + 10^{\frac{173*}{10}}\right) = 185.1\ dB\ re\ 1\mu Pa^2 \cdot \text{s}$$

$$* \, Duty\ Cycle\ Calculation: 180\ dB - 10 * \log(duty\ cycle\ ratio) = 180\ dB - 7\ dB = 173\ dB$$

In summary, the 185.0 dB SPL for 50% power output is used to calculate both Level B thresholds for three mobile tugs as well as for three stationary tugs under load with a jack-up rig for 4 hr. The 186.0 dB SPL source level is used for four tugs under load with a jack-up rig for 1 hr. Lastly, the 185.1 dB SEL source level for a 50% power output is used to calculate the stationary Level A threshold where three tugs are under load for 4 hr and one tug joins for 1 additional hr.

##### *6.2.1.1.2 Underwater Sound Propagation Modeling*

Acoustic modeling was undertaken by SLR Consulting (Canada) (SLR) to understand the underwater sound extents to the 120 dB rms SPL Level B threshold as well as the predicted zones of sound exposure above the Level A thresholds using NMFS 2018 guidelines. SLR modeling has since been updated to meet the new guidelines updated by NMFS in 2024. Additionally, SLR updated their own modeling criteria after the initial modeling was completed; consequently, these updates are incorporated into the tug analysis for this Petition.

Several methods can be used to predict underwater sound propagation, with varying levels of detail and complexity. The simplest models assume that TL between two points at distances D1 and D2 from the source may be described by a logarithmic relationship with attenuation factor F:

$$TL = F * log(D1/D2)$$

If all losses due to factors other than geometric spreading are neglected, then the TL would be wholly due to spherical spreading (in deep water) or cylindrical spreading (in shallow water, bounded above and below). Spherical spreading means underwater sound would attenuate by 6 dB with each doubling of distance, or F = 20. Cylindrical spreading means an attenuation of 3 dB with each doubling of distance, or F = 10. A “practical spreading loss model” based on an attenuation factor of 15 for sound transmission is commonly assumed for simple logarithmic propagation estimates.

Cook Inlet is a particularly complex acoustic environment with strong currents, large tides, variable sea floor and generally changing conditions. Accordingly, this assessment applies a more detailed propagation model than the “practical spreading loss” approach with a factor of 15. The objective of a more detailed propagation is to improve the representation of the influence of some environmental variables, in particular, by accounting for bathymetry and specific sound source locations and frequency-dependent propagation effects.

Modeling for this assessment has been undertaken using the dBSea software package. The fluid parabolic equation modeling algorithm has been used with five Padé terms to calculate the TL between the source and the receiver at low frequencies (one-third-octave bands, 31.5 Hz to up to 1 kHz). For higher frequencies (1 kHz to up to 20 kHz) the ray tracing model has been used with 1,000 reflections for each ray.

Sound sources were assumed to be omnidirectional and modeled as points.

The received sound levels throughout the project have been 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. TL 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 modelling path was obtained via interpolation of the bathymetry dataset which has 83 m (272 ft) grid resolution;

4. The one-third-octave source levels and TL 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 (3.3 ft) depth resolution along each propagation path by summing all frequency band spectral levels.

#### *6.2.1.1.3 Model Input Parameters*

Bathymetry — Bathymetry data for the specific geographic region was obtained from AFSC (2019).

Sound Speed Profiles — Based on temperature and salinity data from NOAA, sound speed profiles for May, July, and October for depths from 0 to 100 m (0 to 328 ft) were computed by using the Mackenzie equation (Mackenzie 1981). A list of these values is shown in Table 11.

## Table 11. Sound Speed Profiles in Cook Inlet

| Sound Speed Profiles (m/s) | | | |
|---|---|---|---|
| **Depth (m)** | **May** | **July** | **October** |
| 0 | 1466 | 1479 | 1480 |
| 5 | 1469 | 1479 | 1477 |
| 10 | 1470 | 1479 | 1478 |
| 15 | 1467 | 1479 | 1480 |
| 20 | 1460 | 1479 | 1482 |
| 25 | 1461 | 1479 | 1483 |
| 100 | 1469 | 1476 | 1482 |

**Notes:** m – meters; m/s – meters(s) per second

Seabed geoacoustic representation: Geoacoustic parameters were based on a mixture of sands, silts and clays transitioning to glacial-fluvial sands, gravels, and glacial till with depth as shown in Table 12 (Warner et al. 2011).

## Table 12. Geoacoustic Parameters

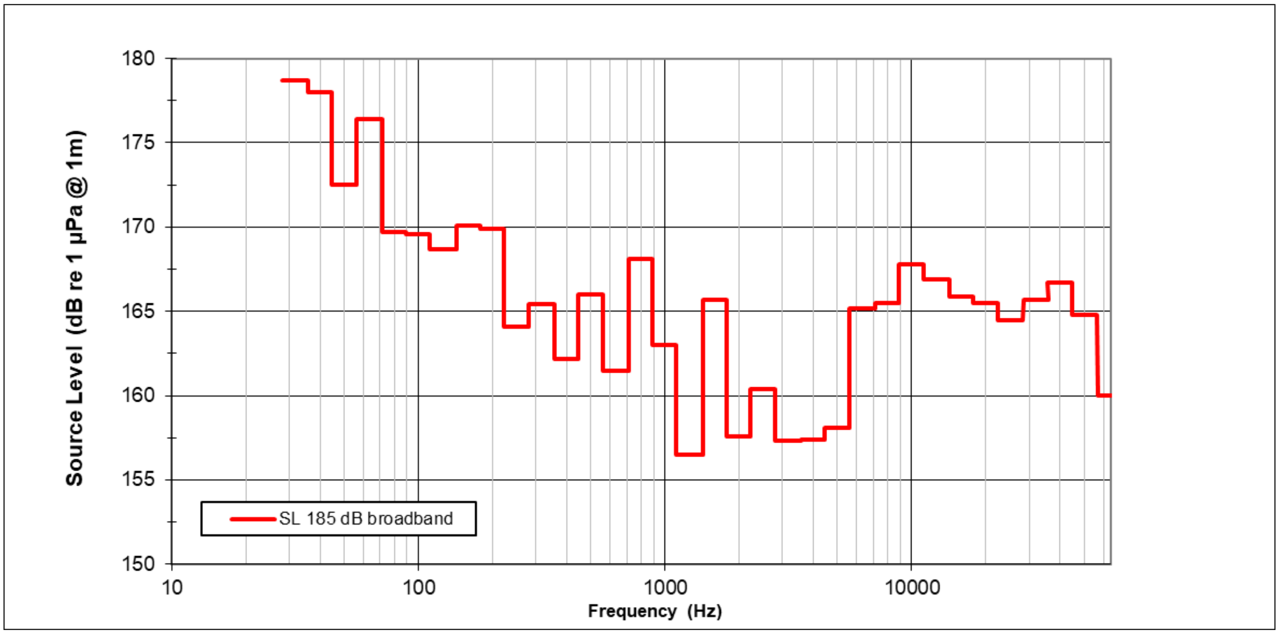
| Depth (mbsf) | Density ($g/cm^3$) | Compressional Sound Speed (m/s) | Compressional Attenuation (dB/λ) | Shear Sound Speed (m/s) | Shear Attenuation (dB/λ) |
|---|---|---|---|---|---|
| 0 | 1.58 | 1480 | 0.17 | 110 | 2.0 |
| 108 | 2.18 | 1844 | 0.5 | - | - |

**Notes:** dB/λ – decibel(s) per wavelength; $g/cm^3$ – gram(s) per cubic centimeters; m/s – meter(s) per second; mbsf – meter(s) below seafloor

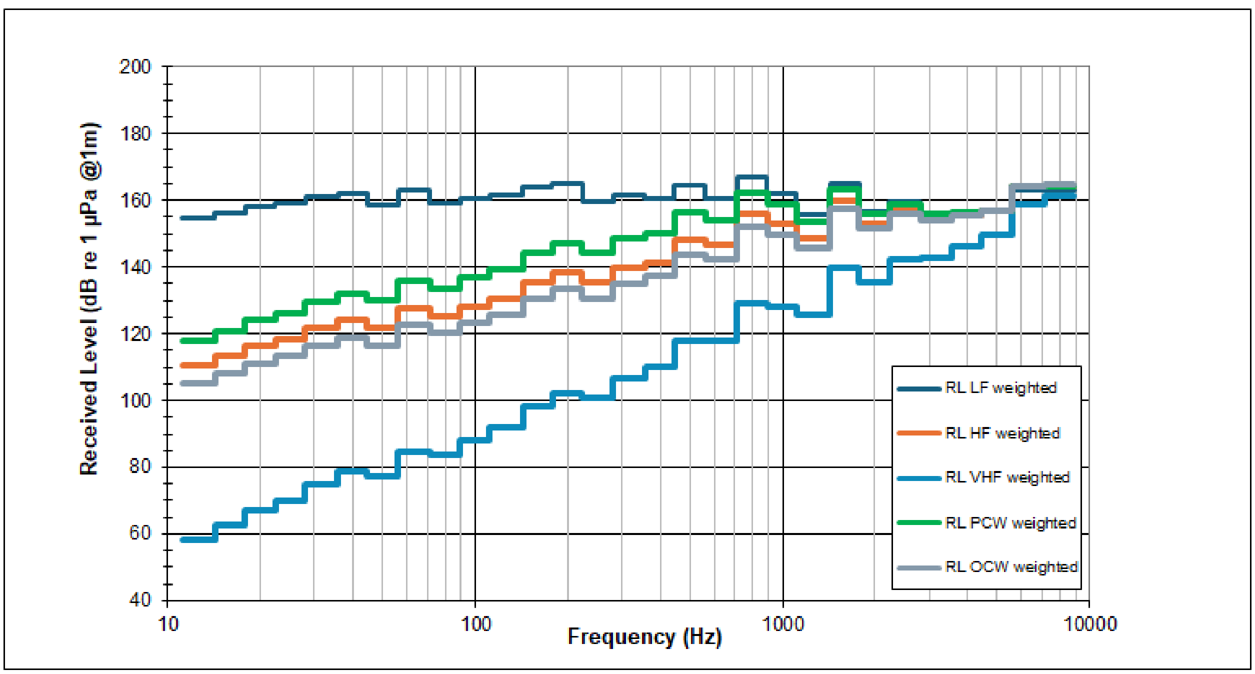
#### *6.2.1.1.4 Frequency*

Detailed broadband sound TL modeling in dBSea used the source level of 185 dB SPL re 1 µPa at 1 m calculated in one-third-octave band levels (31.5 Hz to 64,000.0 Hz) for frequency-dependent solutions (Figure 17). 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 (Figure 18).

## Figure 17. Tugboat Broadband Spectrum (One-Third-Octave Band) of Tugboat Scenarios Modeled




## Figure 18. Received Levels (One-third-Octave Band) for Each Functional Marine Mammal Hearing Group Using a Tugboat Broadband Spectrum of 185 dB SPL re 1 Pa at 1 m



#### *6.2.1.1.5 Acoustic Modeling of Tug Scenarios*

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. Consequently, sound TL modeling was undertaken for stationary and mobile scenarios to generate Level A and Level B harassment threshold extents.

For acoustic modeling purposes of the stationary Level A thresholds, two locations representative of where tugs will be stationary while they position the jack-up rig were selected in middle Cook Inlet near the Tyonek platform and in lower Trading Bay where the production platforms are located. To account for the mobile scenarios, the acoustic model generated Level A and Level B extents along a representative route from the Rig Tenders dock in Nikiski to the Tyonek platform, the northernmost platform in Cook Inlet (representing middle Cook Inlet), as well as from the Tyonek platform to the Dolly Varden (DV) platform in lower Trading Bay, then from the DV platform back to the Rig Tenders Dock in Nikiski. Note that this route is representative of a typical route the tugs may take; 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. These results were used to calculate Level A and Level B exposure estimates from three mobile tugs towing a jack-up rig. The Level B results were also used to calculate Level B exposure estimates from stationary tugs holding or positioning a jack-up rig, as the mobile route encompassed the stationary modeling points.

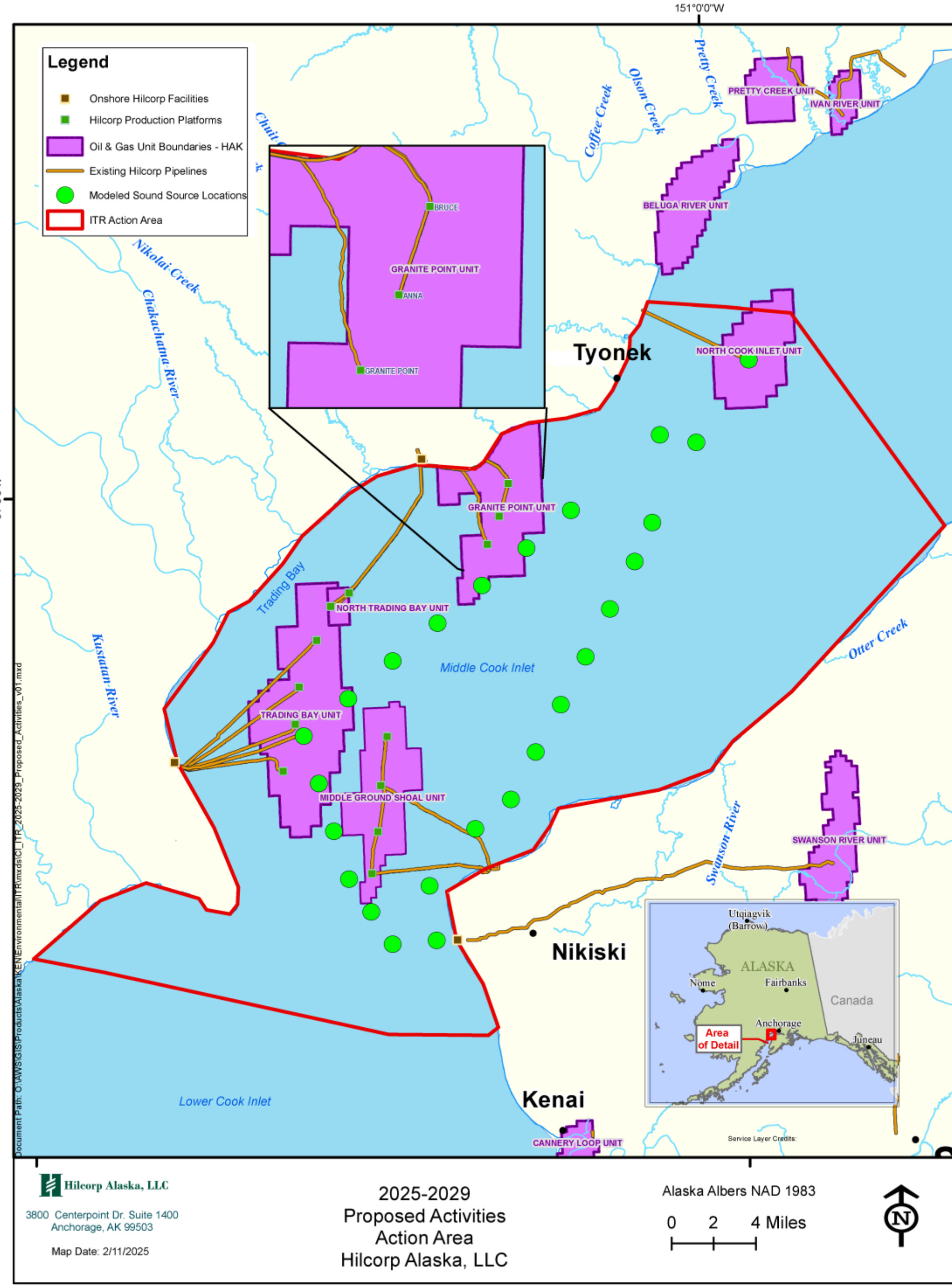
#### *6.2.1.1.6 Modeling Results Used in the Take Analysis*

For Level A and B exposure estimates, the average distance to the appropriate threshold based on the modeling results was used. When the model was run, results were calculated along 100 evenly spaced radials extending outward from the source location. See Figure 19 for modeled source locations in middle Cook Inlet.

For Level B, the average distance to the 120 dB rms threshold was based on the assessment of 100 radials at 25 locations across seasons (May, July, and October) and represents the average Level B harassment zone for each season and location. The overall average Level B harassment zone (final row in Table 13) was used to calculate exposure estimates for three mobile and stationary tugs operating for 4 hours (185 dB re 1 µPa at 1 m [SPL]).

Results of modeled underwater sound propagation to the Level B criteria of 120 dB rms for a series of scenarios representing three tugs working in middle Cook Inlet, Trading Bay, and lower Cook Inlet at different times of year (May, July, and October) are shown in Table 13. In middle Cook Inlet, the modeled locations (Figure 19) are sourced from an area extending from Rig Tenders Dock in Nikiski to the Tyonek platform, then to the Dolly Varden platform in Trading Bay and back across middle Cook Inlet to the Rig Tenders Dock, encompassing a representative route the jack-up rig may be transported along in middle Cook Inlet and Trading Bay; the locations represent a range of water depths from 18 to 77 m (59 to 253 ft) found throughout these areas.

## Figure 19. Modeled Mobile and Stationary Sound Source Locations in Middle Cook Inlet



## Table 13. Modeled Results Using 185 dB SPL re 1 μPa at 1 m for Level B Average Exposure Distances for Stationary and Mobile Locations in Middle Cook Inlet and Trading Bay during Different Seasons

| Location | Exposure Distance (m) | | | Depth (m) | Average Distance (m) to 120 dB |
|---|---|---|---|---|---|
| | May | July | October | | |
| M1 | 4215 | 3911 | 4352 | 56 | 4159 |
| M2 | 3946 | 3841 | 4350 | 77 | 4046 |
| M3 | 4156 | 3971 | 4458 | 51 | 4195 |
| M4 | 4040 | 3844 | 4364 | 31 | 4083 |
| M5 | 4053 | 3676 | 4304 | 18 | 4011 |
| M6 | 3716 | 3445 | 3554 | 21 | 3572 |
| M7 | 2947 | 2753 | 2898 | 36 | 2866 |
| M8 | 3270 | 3008 | 3247 | 44 | 3175 |
| M9 | 3567 | 3359 | 3727 | 24 | 3551 |
| M10 | 3600 | 3487 | 3691 | 21 | 3593 |
| M11 | 3746 | 3579 | 4214 | 24 | 3846 |
| M12 | 3815 | 3600 | 3995 | 25 | 3803 |
| M13 | 4010 | 3831 | 4338 | 26 | 4060 |
| M14 | 3837 | 3647 | 4217 | 37 | 3900 |
| M15 | 3966 | 3798 | 4455 | 21 | 4073 |
| M16 | 3873 | 3676 | 4504 | 24 | 4018 |
| M18 | 5562 | 3893 | 4626 | 27 | 4694 |
| M20 | 5044 | 3692 | 4320 | 30 | 4352 |
| M22 | 4717 | 3553 | 4067 | 40 | 4112 |
| M24 | 4456 | 3384 | 4182 | 46 | 4007 |
| M25 | 3842 | 3686 | 4218 | 30 | 3915 |
| M26 | 3690 | 3400 | 3801 | 39 | 3630 |
| M27 | 3707 | 3497 | 3711 | 39 | 3638 |
| M28 | 3546 | 3271 | 3480 | 41 | 3432 |
| M29 | 3618 | 3279 | 3646 | 68 | 3514 |
| **Middle Cook Inlet Overall Average** | **3958** | **3563** | **4029** | **36** | **3850** |

**Notes:** This table includes data for three tugs only.
m – meters
dB – decibels

Table 14 specifies modeled Level A thresholds for underwater sound propagation from up to four stationary tugs holding or positioning a jack-up rig in middle Cook Inlet and Trading Bay during May, July, and October. These thresholds are based on a source level of 185.1 dB SEL re 1 μPa at 1 m for a 5-hr exposure, assuming an animal remains within the specified distance for 5 consecutive hours. VHF cetaceans (e.g., porpoises) are at the greatest risk of cumulative sound above the Level A threshold, although, it is improbable that a VHF cetacean would remain within the identified zone for 5 continuous hours. The overall average Level A harassment zones (last row in Table 14) were used to calculate exposure estimates.

Table 14 also represents the modeling results for three mobile tugs towing a jack-up rig, which is considered a mobile acoustic source with a source level of 185 dB SPL and an 18-second exposure duration and shows that the Level A harassment thresholds are < 10 m (433 ft) for all marine mammal hearing groups. It is important to note that the 10-m distance is the minimum resolution limit of the modeling software. Therefore, the Level A thresholds are considered to be within the footprint of the tugs and are negligible. For calculations of ensonified areas, the number zero is used.

The 18-second exposure built into the Level A threshold model 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 dB – 15Log10(R) = 173 dB SPL. Solving for threshold distance (R) yields a distance of ~6 m (20 ft), 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 meters per second (m/s; 4 kt) 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 6 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 (6 seconds + 6 seconds + 6 seconds = 18 seconds).

### Table 14. Average Level A Acoustic Threshold Distances with a 5-hr and 18-sec Exposure for Stationary and Mobile Tugs under Load with a Jack-Up Rig

| Location | Month | Average Distance (m) to Level A Thresholds for Each Hearing Group | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | LF Cetaceans | | HF Cetaceans | | VHF Cetaceans | | PW | | OW | |
| | | 5-hr[1] | 18-sec[2] | 5-hr[1] | 18-sec[2] | 5-hr[1] | 18-sec[2] | 5-hr[1] | 18-sec[2] | 5-hr[1] | 18-sec[2] |
| Trading Bay | May | 181 | - | 6 | - | 380 | - | 84 | - | 30 | - |
| Trading Bay | July | 193 | - | 12 | - | 367 | - | 84 | - | 36 | - |
| Trading Bay | October | 153 | - | 20 | - | 399 | - | 78 | - | 35 | - |
| Middle Cook Inlet | May | 110 | - | 7 | - | 331 | - | 52 | - | 20 | - |
| Middle Cook Inlet | July | 121 | - | 9 | - | 337 | - | 58 | - | 20 | - |
| Middle Cook Inlet | October | 117 | - | 13 | - | 344 | - | 65 | - | 26 | - |
| | **Average** | **146** | **-** | **11** | **-** | **360** | **-** | **70** | **-** | **28** | **-** |

**Notes**: Thresholds in this table are for tugs under load with a jack-up rig in support of production and exploratory drilling; [1] 5-hr thresholds represent 3 stationary tugs operating for 4 hr and an additional tug added for one additional hour for a total of 4 tugs working over 5 hr. Level A distances do not materially change when adding a fourth tug for one of the five hours; [2] 18-sec thresholds represent 3 tugs operating under load consecutively. m – meter(s); LF – low-frequency; HF – high-frequency; VHF – very high-frequency; PW – phocid pinnipeds in water; OW – otariid pinnipeds in water; hr – hour(s); sec – second(s); - (dash) – indicates less than or equal to 10 m and the equivalent of the resolution of the modeling software.

### 6.2.1.2 Tugs under Load with a Jack-Up Rig Acoustic Thresholds and Ensonified Areas

Both production and exploratory drilling operations utilize the *Spartan 151* jack-up rig. Consequently, tugs involved in towing, holding, or positioning the jack-up rig are assessed for both activities. However, while they use the same parameters (further discussed below), the exposure estimate analyses for each activity is conducted separately. Three tugs are anticipated to be towing the jack-up rig from Rig Tenders Dock (mobilization), between platforms (location-to-location transfers), and back to Rig Tenders Dock (demobilization). While under tow, they are considered a mobile sound source for 6 hr in a single day per jack-up rig move between locations and for 9 hr in a single day during mobilization and demobilization.

Up to four tugs are anticipated to be holding or positioning the jack-up rig at the platforms or the Rig Tenders Dock during each move (mobilization, demobilization, and location-to-location transfers) and are considered a stationary sound source for 5 hr[5] in the first day and 5 hr in the second day if a second attempt to pin the jack-up rig is required. A second attempt was built into the exposure estimate for each pinning event.

The number of annual pinning events in support of production and exploratory drilling varies by activity and may occur in different years. For analysis purposes, the following jack-up rig transport and pin events are analyzed to occur in the following years:

- Production Drilling: Years 1, 3, and 5
    - 1-mobilization, up to 4 location-to-location moves, and 1-demobilization
    - Up to 12 total pinning events
- Production Drilling: Year 2
    - 1- mobilization, up to 3 location-to-location moves, and 1-demobilization
    - Up to 10 total pinning events
- Production Drilling: Year 4
    - 1- mobilization, up to 2 location-to-location moves, and 1-demobilization
    - Up to 8 total pinning events
- Exploratory Drilling: Year 2
    - 1-location-to-location move
    - Up to 2 total pinning events
- Exploratory Drilling: Year 4
    - 2-location-to-location moves
    - Up to 4 total pinning events

Mobilization and demobilization of the jack-up rig are incorporated into the production drilling exposure estimates. Location-to-location moves are calculated using the average distance between platforms (16.77 km [10.42 mi]).

The Level A and Level B threshold distances for stationary (holding, positioning) and mobile (towing) tugs under load with a jack-up rig and resulting areas of ensonification for Year 1 through 5 are presented in Tables 15 and 16. The Level B harassment threshold for tugs towing (mobile source) and holding and

[5] Please note, stationary 5 hr includes 3 tugs under load with a jack-up rig for 4 hours and 4 tugs under load with a jack-up rig for up to 1 hour and is the same on the second day.

positioning (i.e., three stationary tugs working concurrently for 4 hr) a jack-up rig is 3,850 m (12,631 ft). When a fourth tug is added for 1 hr, the Level B threshold increases to 4,453 m (14,610 ft).

The ensonified area for tug mobilization and demobilization in Year 1 through Year 5 in support of production drilling represents a rig move to/from Rig Tenders Dock in Nikiski to/from a production platform in middle Cook Inlet and includes 9 mobile hr over a distance of up to 64.34 km (40 mi) in a single day and 5 stationary hr on the first day and 5 stationary hr on a second day. The Level B ensonified area during mobilization/demobilization between Rig Tenders Dock and the Tyonek platform for mobile tugs is 542 $km^2$ (209.3 $mi^2$). The Level B ensonified area for stationary tugs is the same as above.

The ensonified area for a location-to-location transport during both production and exploratory drilling in Year 1 through Year 5 represents a rig move between two platforms in middle Cook Inlet and/or Trading Bay and includes 6 mobile hr over an average distance of 16.77 km (10.42 mi) in a single day and 5 stationary hr on the first day and 5 stationary hr on a second day. The Level B ensonified area for mobile tugs transiting between locations is 175.67 $km^2$ (67.8 $mi^2$). During holding or positioning with 3 tugs for 4 hr, the Level B ensonified area is 46.56 $km^2$ (17.98 $mi^2$) increasing to 62.30 $km^2$ (24.05 $mi^2$) with 4 tugs for one hr (Table 16).

Exposure to Level A harassment by a marine mammal is not likely to occur while tugs are holding and/or positioning a jack-up rig (stationary source), as the marine mammal would need to remain within the Level A isopleths (Table 14) of stationary tugs for a continuous period of 5 hr. This is improbable given the mobile nature of marine mammals; therefore, no Level A takes are requested for this activity. Additionally, when tugs are towing a jack-up rig (mobile source), potential for marine mammal exposure to Level A harassment is negligible as all exposure thresholds are confined within the immediate acoustic footprint of the tug. Consequently, no Level A takes are projected or requested for this activity.

Level B acoustic harassment associated with tugs towing, holding or positioning a jack-up rig may occur. As a result, incidental take authorization is requested at numbers described in Section 6.4. Interactions with gear or equipment, vessel strikes, or other encounters are not anticipated to occur as a consequence of tugs under load with a jack-up rig activity. No other interactions are anticipated.

The exposure analysis Excel workbook submitted in tandem with this Petition also contains a detailed description, by activity, of each input used to calculate exposures from tugs under load with a jack-up rig.

## Table 15. Average Calculated Distances to NMFS Thresholds for Stationary and Mobile Tugs under Load with a Jack-Up Rig

<table>
<tr><th rowspan="3">Activity</th><th colspan="5">Level A</th><th>Level B</th></tr>
<tr><th>LF Cetaceans<br>(humpback, fin, minke, and gray whales)</th><th>HF Cetaceans<br>(beluga and killer whales and Pacific white-sided dolphins)</th><th>VHF Cetaceans<br>(Dall's and harbor porpoises)</th><th>PW<br>(harbor seals)</th><th>OW<br>(Steller and California sea lions)</th><th>All Marine Mammals</th></tr>
<tr><th>197 dB SEL</th><th>201 dB SEL</th><th>181 dB SEL</th><th>195 dB SEL</th><th>199 dB SEL</th><th>120 dB rms</th></tr>
<tr><td>Tugs Holding or Positioning a Jack-Up Rig - Stationary (3 tugs operating for 4 hours)</td><td rowspan="2">146</td><td rowspan="2">11</td><td rowspan="2">360</td><td rowspan="2">70</td><td rowspan="2">28</td><td>3,850</td></tr>
<tr><td>Tugs Holding or Positioning Rig - Stationary (4 tugs operating for 1 hour)</td><td>4,453</td></tr>
<tr><td>Tugs Towing a Jack-Up Rig – Mobile (3 tugs)</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>3,850</td></tr>
</table>

**Notes:**
The species listed are those from each group which may occur in the project area.
All threshold distances are meters.
The fourth tug added for one of the 5 hours is built into the average Level A threshold.
LF – low-frequency
HF – high-frequency
VHF – very high-frequency
PW – phocid pinnipeds in water
OW – otariid pinnipeds in water
dB – decibel(s)
SEL – sound exposure level
rms – root mean square

## Table 16. Areas of Ensonification ($km^2$) for Stationary and Mobile Tugs under Load with a Jack-Up Rig

| Activity | Level A | | | | | Level B |
|---|---|---|---|---|---|---|
| | LF Cetaceans | HF Cetaceans | VHF Cetaceans | PW | OW | All Marine Mammals |
| **Location-to-Location** | | | | | | |
| Tugs Holding or Positioning a Jack-Up Rig - Stationary (3 tugs operating for 4 hours) | 0.07 | 0.00 | 0.41 | 0.02 | 0.00 | 46.56 |
| Tugs Holding or Positioning a Jack-Up Rig -Stationary (4 tugs operating for 1 hour) | 0.07 | 0.00 | 0.41 | 0.02 | 0.00 | 62.30 |
| Tugs Towing a Jack-Up Rig - Mobile | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 175.67 |
| **Demobilization and Mobilization** | | | | | | |
| Tugs Holding or Positioning a Jack-Up Rig - Stationary (3 tugs operating for 4 hours) | 0.07 | 0.00 | 0.41 | 0.02 | 0.00 | 46.56 |
| Tugs Holding or Positioning a Jack-Up Rig -Stationary (4 tugs operating for 1 hour) | 0.07 | 0.00 | 0.41 | 0.02 | 0.00 | 62.30 |
| Tugs Towing a Jack-Up Rig - Mobile | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 541.96 |

**Notes:**
The mobile ensonified area is calculated with the following equation *Ensonification area = Distance*(2*Threshold Value/1000) +* $\pi$**Threshold*$^2$*;* however, only $\pi$*Threshold$^2$ will be ensonified at any given point in time. The stationary ensonified area is calculated with the following equation *Ensonification area = Pi*(Threshold Value/1000)^2*
$km^2$ – square kilometers
LF – low-frequency
HF – high-frequency
VHF – very high-frequency
PW – phocid pinnipeds in water
OW – otariid pinnipeds in water
dB – decibels
SEL – sound exposure level
rms – root mean square

### 6.2.2 Winter Season Pile Driving at the Tyonek Platform in Support of Production Well Development

Pile driving in support of Tyonek well development will occur intermittently over several weeks, with sound-producing activity lasting up to 7 days per pile. Hilcorp analyzed this activity to occur Year 1 through Year 5 (2025-2029) in middle Cook Inlet at the Tyonek platform during the winter season. This section describes the methodology used to assess pile driving at the Tyonek platform as a sound source in middle Cook Inlet during the winter season.

#### 6.2.2.1 Estimating Winter Season Pile Driving Source Levels

Pile driving sound source values for use in exposure estimate calculations are extracted from the 'Impact Proxy Sound Source' tab in the NMFS Multi-Species Pile Driving Calculator (2022).[6] Row 40 specifies the criteria required for this activity and provides sound source levels 10 m from the pile in water depths of 10 m, assuming a TL of 15 log units for a 76.2-cm (30-in) diameter steel pile. The associated sound source levels are: 177 dB single strike SEL ($SEL_{ss}$), 210 dB $L_{pk}$, and 190 dB rms. These levels are then entered into the E.1 tab on the NMFS Acoustic Guidance 2024 Draft user spreadsheet[7] to determine AUD INJ (Level A) isopleths. Level B behavioral disturbance isopleths are calculated using the same sound source levels entered into the NMFS 2022 Multi-Species Pile Driving Calculator (Impact Calculator tab) as the 2024 NMFS Acoustic Guidance does not include Level B calculation options.

The following calculation assumptions were also entered into the Impact Calculator and consider the most significant combinations and the most probable scenario that Hilcorp will implement for Tyonek well development: strike rate of 50 blows per min; 8 hr of pile driving per day; and an installation rate of one pile every seven days.

#### 6.2.2.2 Winter Season Pile Driving Acoustic Thresholds and Ensonified Areas

Level A and B acoustic thresholds and ensonified areas for winter season pile driving at the Tyonek platform are presented in Table 17.

Level A thresholds are 3,296 m (10,814ft) for LF cetaceans; 421 m (1,381 ft) for HF cetaceans; 5,100 m (16,732 ft) for VHF cetaceans; 2,928 m (9,606 ft) for PW; and 1,091 m (3,579 ft) for OW. Level B threshold distance radii are 1,000 m (3,281 ft) for all marine mammal hearing groups.

For ensonified area calculations, an average of eight hours is used to represent the time required to drive each pile per day. The Level A ensonified areas are 34.13 $km^2$ (13.18 $mi^2$) for LF cetaceans; 0.56 $km^2$ (0.22 $mi^2$) for HF cetaceans; 81.72 $km^2$ (31.55 $mi^2$) for VHF cetaceans; 26.93 $km^2$ (10.4 $mi^2$) for PW; and 3.74 $km^2$ (1.44 $mi^2$) for OW. The Level B ensonified area for all marine mammal hearing groups is 3.14 $km^2$ (1.21 $mi^2$).

[6] https://www.fisheries.noaa.gov/s3/2023-10/Acousticwebpage-multispeciescalculator-MarineMammals-OPR1.xlsx

[7] https://www.fisheries.noaa.gov/s3/2024-05/NMFSAcousticGuidance-024DRAFTBLANKUSERSPREADSHEET-OPR1.xlsx

### Table 17. Level A and Level B Acoustic Thresholds for Winter Season Pile Driving at the Tyonek Platform

| Hearing Group | Level A Threshold Distance Radii (m)[1] | | Level B Threshold Distance Radii (m) (160 dB) | Level A Ensonified Area ($km^2$) | Level A Ensonified Area ($km^2$) | Level B Ensonified Area ($km^2$) |
|---|---|---|---|---|---|---|
| | pk | SEL | rms | pk | SEL | rms |
| LF Cetaceans | 1.58 | 3,295.83 | 1,000 | 0.00 | 34.13 | 3.14 |
| HF Cetaceans | 0.00 | 420.51 | | 0.00 | 0.56 | |
| VHF Cetaceans | 34.15 | 5,100 | | 0.00 | 81.72 | |
| PW | 0.00 | 2,927.89 | | 0.00 | 26.93 | |
| OW | 0.00 | 1,091.39 | | 0.00 | 3.74 | |

**Notes:** [1] Rounded to the nearest whole number; LF – low-frequency; HF – high-frequency; VHF – very high-frequency; PW – phocid pinnipeds in water; OW – otariid pinnipeds in water; dB – decibels; pk – zero to peak sound pressure level; SEL – sound exposure level, rms – root mean square; m – meters; $km^2$ – square kilometers

Level A and B acoustic harassment associated with sound produced during winter season pile driving may occur. As a result, incidental take authorization is requested at numbers described in Section 6.4. Interactions with gear or equipment, vessel strikes, or other encounters are not anticipated to occur as a result of winter season pile driving activities. No other interactions are anticipated.

The exposure analysis Excel workbook submitted in tandem with this Petition also contains a detailed description, by activity, of each input used to calculate exposures from production well development winter season pile driving at the Tyonek platform.

## 6.2.3 Pile Driving in Support of Exploratory Drilling

Pile driving is anticipated to occur for up to 6 days at each well site location. To determine the maximum annual take authorization requests, Hilcorp analyzed exploratory drilling to occur in Year 2 (2026) in Trading Bay (one well site between the Anna and Bruce platforms) and in Year 4 (2028) in middle Cook Inlet (two well sites within the MGS Unit). However, only 50% of each day is dedicated to active pile driving, which will occur intermittently over multiple days.

### 6.2.3.1 Estimating Exploratory Drilling Pile Driving Source Levels

Pile driving sound source values for use in exposure estimate calculations were extracted from the ‘Impact Proxy Sound Source’ tab in the NMFS Multi-Species Pile Driving Calculator[8] (2022). Row 40 describes the criteria necessary to pile drive a 30-inch steel pile and provides sound source levels 10 m from the pile assuming a TL of 15 log units. The associated source levels are: 177 dB $SEL_{ss}$, 210 dB $L_{pk}$, and 190 dB rms. These levels are then entered into the E.1 tab on the NMFS Acoustic Guidance 2024 Draft user spreadsheet[9] using a strike rate of 65 strikes per ft over 12 hr per day to determine AUD INJ (Level A) isopleths. Level B behavioral disturbance isopleths are calculated using the NMFS 2022 Multi-Species Pile Driving Calculator (Impact Calculator tab) as the 2024 draft does not include Level B calculation options.

[8] https://www.fisheries.noaa.gov/s3/2023-10/Acousticwebpage-multispeciescalculator-MarineMammals-OPR1.xlsx

[9] https://www.fisheries.noaa.gov/s3/2024-05/NMFSAcousticGuidance-024DRAFTBLANKUSERSPREADSHEET-OPR1.xlsx

#### 6.2.3.2 Exploratory Drilling Pile Driving Acoustic Thresholds and Ensonified Areas

Level A and B acoustic thresholds and ensonified areas for exploratory drilling pile driving at the MGS Unit and between Anna and Bruce platforms are presented in Table 18.

Resulting Level A thresholds are 1,042 m (3,419 ft) for LF cetaceans; 133 m (436 ft) for HF cetaceans; 1,613 m (5,292 ft) for VHF cetaceans; 926 m (3,038 ft) for PW; and 345 m (1,132 ft) for OW. Level B threshold distance radii is 1,000 m (3,280 ft) for all marine mammal hearing groups.

For ensonified area calculations, 12 hours is used to represent the time required to drive each pile per day. The Level A ensonified areas are 3.41 km$^2$ (1.32 mi$^2$) for LF cetaceans; 0.06 km$^2$ (0.02 mi$^2$) for HF cetaceans; 8.17 km$^2$ (3.15 mi$^2$) for VHF cetaceans; 2.69 km$^2$ (1.04 mi$^2$) for PW; and 0.37 km$^2$ (0.14 mi$^2$) for OW. The Level B ensonified area for all marine mammal hearing groups is 3.14 km$^2$ (1.21 mi$^2$).

**Table 18. Level A and Level B Acoustic Thresholds for Exploratory Well Pile Driving**

| Hearing Group | Level A Threshold Distance Radii (m)[1] | | Level B Threshold Distance Radii (m) (160 dB) | Level A Ensonified Area (km$^2$) | Level A Ensonified Area (km$^2$) | Level B Ensonified Area (km$^2$) |
|---|---|---|---|---|---|---|
| | pk | SEL | rms | pk | SEL | rms |
| LF Cetaceans | 1.58 | 1,041.78 | 1,000 | 0.00 | 3.41 | 3.14 |
| HF Cetaceans | 0.00 | 132.92 | | 0.00 | 0.06 | |
| VHF Cetaceans | 34.15 | 1,612.16 | | 0.00 | 8.17 | |
| PW | 1.36 | 925.48 | | 0.00 | 2.69 | |
| OW | 0.00 | 344.98 | | 0.00 | 0.37 | |

**Notes:**[1]Rounded to the nearest whole number; LF – low-frequency; HF – high-frequency; VHF – very high-frequency; PW – phocid pinnipeds in water; OW – otariid pinnipeds in water; dB – decibels; pk – zero to peak sound pressure level; SEL – sound exposure level, rms – root mean square; m – meters; km$^2$ – square kilometers

Level A and Level B acoustic harassment associated with sound produced by pile driving activities during exploratory drilling may occur and incidental take authorization is requested at numbers described in Section 6.4. Interactions with gear or equipment, vessel strikes, or other encounters are not anticipated as a result of exploratory drilling activities. No other interactions are anticipated.

The exposure analysis Excel workbook submitted in tandem with this Petition also contains a detailed description, by activity, of each input used to calculate exposures from pile driving in support of exploratory drilling.

### 6.2.4 Pipeline Replacement/Installation Using Lay Barge Methodology

The subsequent sections outline the methodology employed to assess sound sources associated with pipeline replacement/installation using lay barge methods, which entails anchor handling, setting, and retrieving, as well as holding the barge against the current between tides. Both pipeline replacement/installation scenarios utilize lay barge methods; *Scenario 1* comprises one project using lay barge methods in Year 2 and one pipe pull project in Year 4. *Scenario 2* comprises two projects using lay barge methods in Year 2 (see Section 1.2.3).

### 6.2.4.1 Estimating Anchor Handling Source Levels

When determining the source levels for anchor handling, the tug operators, considered subject experts, were first consulted to determine power usage for one tug anchor handling and for two tugs anchor handling or holding against the tides. They reported that both tugs would operate at 50% power output. Because the power output was consistent and these values matched our modeling and SSV data for tugs in Cook Inlet, the same modeling methodology was used for tugs towing a jack-up rig (Section 6.2.1.1.1). Based on the tug operator's description of 50% power output while anchor handling, as well as the situation wherein two tugs are working together holding a barge in place between slack tides, a conservative source level of 180 dB for a single tug and 183 dB for two tugs are used to estimate the distance ensonified for anchor handling and barge holding, respectively, during the pipeline replacement activities.

#### *6.2.4.1.1 Acoustic Modeling of Anchor Handling Tug Scenarios*

Based on the acoustic model developed for Hilcorp's specific geographic region in middle Cook Inlet, the estimated average maximum distance to the 120 dB rms Level B threshold in middle Cook Inlet is 2,890 m (9,482 ft) for a single tug with a source level of 180 dB SPL and 3,740 m (12,270 ft) for two tugs with a combined source level of 183 dB SPL.

The modeled scenarios include anchor setting, anchor retrieval, and pipeline replacement for Level A; and a single tug anchor handling and two tugs working together to hold the pipelay barge (50% power) for Level B. The selected sites and locations are shown in Table 19 with an additional deep-water site (Site 3 at 153 m [502 ft] depth) to enhance assessment for anchor-setting operations.

**Table 19. Modeled Locations for Anchor Handling Operations**

| Site | Location | Latitude | Longitude | Easting | Northing | Depth (m) | UTM Zone |
|---|---|---|---|---|---|---|---|
| 1 | Middle Cook Inlet | 60.9689 | -151.3243 | 590713 | 6760483 | 21 | 5V |
| 2 | Trading Bay | 60.807 | -151.6352 | 574260 | 6742062 | 36 | 5V |
| 3 | Trading Bay | 60.7661 | -151.6077 | 575850 | 6737546 | 153 | 5V |

**Notes:** UTM – Universal Transverse Mercator; m – meters

##### 6.2.4.1.1.1 Anchor Setting

Setting anchors will occur from a fixed, stationary position. Eight anchors will be used. Setting an anchor will require one AHT, operating at an average of 50% power for 1 hr to set one anchor during slack tide. Four slack tides occur daily with ~4.5 hr of incoming or outgoing tide between them. Four anchors will be set during the four slack tides in 1 day using AHT-1. Between anchor settings, AHT-2 (plus an assist tug [i.e., two tugs]) will average 50% power to hold the barge in place against the current for ~4.5 hr. During this time, AHT-1 will be idle while AHT-2 and the assist tug hold the barge against the tide. During a 24-hr period of setting four anchors, AHT-1 would operate at an average of 50% power for 4 hr (during each slack tide), followed by AHT-2 and an assist tug working at an average of 50% power during each incoming or outgoing tide for ~4.5 hr between each slack tide. This pattern will continue until all eight anchors are set over 2 days.

On Day 1, AHT-1 will be used for a total of 4 hr to set four anchors, and AHT-2 (plus an assist tug) will be used for 18 hr in a 24-hr period (to hold the barge during tidal cycles) until all four anchors are set. On Day 2, AHT-1 will be used for 4 hr, but AHT-2 and the assist tug will be used for only 13.5 hr total because, after the third tidal cycle, all eight anchors will be set.

Tables 20 and 21 show the results for average distances to Level A thresholds for Day 1 and Day 2. Extents are greatest at Site 2 (36 m [118 ft]), with Level A impacting VHF cetaceans extending to 1,399 m (4,590 ft) on Day 1 but reducing to 1,232 m (4,142 ft) on Day 2. All other hearing groups differ between days by 36 m (118 ft) or less.

Re-evaluation of anchor-setting activities at a third (deeper) site shows significantly reduced Level A thresholds for all hearing groups (as low as 37 m [121 ft] for anchor setting on Day 1 in Table 20 and 31 m [102 ft] on Day 2 in Table 21). This reduction is primarily due to increased propagation loss at the deeper location and fewer bottom/surface reflections.

### Table 20. Level A (24-Hr Cumulative Exposure) for Anchor Setting on Day 1

| Scenario | Location | Season | Source Level(s) (dB re 1 µPa) | Average Distance (m) to Level A Thresholds | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | LF Cetaceans | HF Cetaceans | VHF Cetaceans | PW | OW |
| 1 | Middle Cook Inlet (21 m) | July | AHT-1: 180 dB (4 hr);<br>AHT-2 and Assist: 183 dB (18 hr) | 294 | 208 | 1,392 | 337 | 251 |
| 2 | Trading Bay (36 m) | July | AHT-1: 180 dB (4 hr);<br>AHT-2 and Assist: 183 dB (18 hr) | 303 | 225 | 1,399 | 360 | 266 |
| 3 | Trading Bay (153 m) | July | AHT-1: 180 dB (4 hr);<br>AHT-2 and Assist: 183 dB (18 hr) | 68 | 37 | 637 | 94 | 52 |
| | | | **Average** | **222** | **157** | **1,143** | **264** | **190** |

**Notes:** LF- low-frequency; HF – high-frequency; VHF – very high-frequency; PW – phocid pinnipeds in water; OW – otariid pinnipeds in water; m – meters; dB – decibels; dB re 1 µPa – referenced to 1 micropascal

### Table 21. Level A (24-Hr Cumulative Exposure) for Anchor Setting on Day 2

| Scenario | Location | Season | Source Level(s) (dB re 1 µPa) | Average Distance (m) to Level A Thresholds | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | LF Cetaceans | HF Cetaceans | VHF Cetaceans | PW | OW |
| 1 | Middle Cook Inlet (21 m) | July | AHT-1: 180 dB (4 hr);<br>AHT-2 and Assist: 183 dB (13.5 hr) | 268 | 182 | 1,262 | 311 | 225 |
| 2 | Trading Bay (36 m) | July | AHT-1: 180 dB (4 hr);<br>AHT-2 and Assist: 183 dB (13.5 hr) | 277 | 204 | 1,232 | 324 | 240 |
| 3 | Trading Bay (153 m) | July | AHT-1: 180 dB (4 hr);<br>AHT-2 and Assist: 183 dB (13.5 hr) | 63 | 31 | 522 | 84 | 42 |
| | | | **Average** | **203** | **139** | **1,005** | **240** | **169** |

**Notes:** LF- low-frequency; HF – high-frequency; VHF – very high-frequency; PW – phocid pinnipeds in water; OW – otariid pinnipeds in water; m – meters; dB – decibels; dB re 1 µPa – referenced to 1 micropascal

It should be noted that the location and underwater acoustic characteristics of Site 3 and the surrounding bathymetry (the deepest point proximate to Trading Bay) are unique. The depth range covered by Sites 1 and 2 (21 m [69 ft] and 36 m [118 ft], respectively) better represents the water depth in which tugs will engage in their primary anchor setting operations. Correspondingly, only Sites 1 and Site 2 have been evaluated in the following sections.

Tables 22 and 23 display average distances to the Level B thresholds when a single tug is engaged in load bearing activities and when two tugs are engaged simultaneously, respectively. In calculating exposure estimates, the largest average threshold distance is utilized to account for the limited sample size, as the modeling locations were fewer compared to those used for other activities.

## Table 22. Level B Threshold for Single Tug Operations

| Scenario | Location | Season | Source Level(s) (dB re 1 µPa) | Average Distance (m) to Level B 120 dB Threshold |
|---|---|---|---|---|
| 1 | Middle Cook Inlet (21 m) | July | AHT-1: 180 dB | **2,890** |
| 2 | Trading Bay (36 m) | July | AHT-1: 180 dB | 2,615 |

**Notes:** Bold numbers are used to inform exposure estimates; m – meters; dB – decibels; dB re 1 µPa – referenced to 1 micropascal

## Table 23. Level B Threshold for Two Tug Operations

| Scenario | Location | Season | Source Level(s) (dB re 1 µPa) | Average Distance (m) to Level B 120 dB Threshold |
|---|---|---|---|---|
| 1 | Middle Cook Inlet (21 m) | July | AHT-2 and Assist: 183 dB; AHT-2 and AHT-1: 183 dB | **3,740** |
| 2 | Trading Bay (36 m) | July | AHT-2 and Assist: 183 dB; AHT-2 and AHT-1: 183 dB | 3,325 |

**Notes:** Bold numbers are used to inform exposure estimates; m – meters; dB – decibels; dB re 1 µPa – referenced to 1 micropascal

### 6.2.4.1.1.2 Pipelay

Once all eight anchors are set, the barge will be moved every 305 m (1,000 ft) along the pipeline route. Each time the barge needs to be repositioned, AHT-1 will be used at half power (50%) for anchor handling. During the pipelay, each anchor move takes ~15 min however, each anchor is moved individually resulting in an intermittent process. Table 24 shows results for average distances to Level A thresholds while pipelaying during pipeline replacement and/or installation. In calculating exposure estimates, the largest average threshold distance is utilized to account for the limited sample size, as the modeling locations were fewer compared to those used for other activities.

## Table 24. Level A (24-Hr Cumulative Exposure) for Pipe Lay Operations

| Scenario | Location | Season | Source Level(s) (dB re 1 µPa) | Average Distance (m) to Level A Thresholds | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | LF Cetaceans | HF Cetaceans | VHF Cetaceans | PW | OW |
| 1 | Middle Cook Inlet (21 m) | July | AHT-1: 180 dB (2 hr) | 9 | 0 | 294 | 26 | 9 |
| 2 | Trading Bay (36 m) | July | AHT-1: 180 dB (2 hr) | **84** | **37** | **496** | **120** | **57** |

**Notes:** Bold numbers are used to inform exposure estimates; LF – low-frequency; HF – high-frequency; VHF – very high-frequency; PW – phocid pinnipeds in water; OW – otariid pinnipeds in water; m – meters; dB – decibels; dB re 1 µPa – referenced to 1 micropascal

### 6.2.4.1.1.3 Anchor Retrieval

Anchor retrieval will occur from a fixed, stationary position. There will be eight anchors, and recovery will occur during each of the four slack tides in 1 day. Retrieving anchors is faster than anchor setting because it is easier for the tug crew to capture the anchor from its fixed position on the seafloor to initially set the anchors (refer to the previous section). Two anchors can be retrieved during 1 hr at slack tide; therefore, all eight anchors can be retrieved within 24 hr.

AHT-1 will retrieve anchors during slack tide (slack tides are ~1 hr). While AHT-1 is retrieving anchors, AHT-2 will be idle. Then, when the tide is coming in or going out, AHT-1 and AHT-2 will hold the barge against the tide for ~4.5 hr using an average of 50% power between slack tides. All eight anchors will be retrieved during four slack tides within 1 day. The exposure estimate assumes AHT-1 will retrieve two anchors during slack tides (i.e., a total of 4 hr). AHT-1 and AHT-2 will be used for a total of 13.5 hr when they are holding the barge against the incoming or outgoing tide.

Table 25 shows the results for average distances to Level A thresholds for anchor retrieval at Sites 1 and 2. The source levels and modelling inputs (exposure time) for anchor retrieval are identical to those modelled for Day 2 of anchor setting (4 hr with one tug and 13.5 hr with two tugs). In calculating exposure estimates, the largest average threshold distance is utilized to account for the limited sample size, as the modeling locations were fewer compared to those used for other activities.

## Table 25. Level A (24-hr Cumulative Exposure) for Anchor Retrieval Operations

| Scenario | Location | Season | Source Level(s) (dB re 1 µPa) | Average Distance (m) to Level A Thresholds | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | LF Cetaceans | HF Cetaceans | VHF Cetaceans | PW | OW |
| 1 | Middle Cook Inlet (21 m) | July | AHT-1: 180 dB (4 hr); AHT-2 and Assist: 183 dB (13.5 hr) | 268 | 182 | **1,262** | 311 | 225 |
| 2 | Trading Bay (36 m) | July | AHT-1: 180 dB (4 hr); AHT-2 and Assist: 183 dB (13.5 hr) | **277** | **204** | 1,232 | **324** | **240** |

**Notes:** Bold numbers are used to inform exposure estimates; LF- low-frequency; HF – high-frequency; VHF – very high-frequency; PW – phocid pinnipeds in water; OW – otariid pinnipeds in water; m – meters; dB – decibels; dB re 1 µPa – referenced to 1 micropascal

#### 6.2.4.2 Modeling Results Used in the Take Analysis

The following tables present modeled results for anchor handling associated with pipeline replacement and installation in middle Cook Inlet and Trading Bay.

##### *6.2.4.2.1 Anchor Handling Acoustic Thresholds and Ensonified Areas*

The number of estimated exposures during anchor handling is determined by using the estimated distance to the 120-dB rms threshold assuming a source level of 180 dB SPL re 1 μPa when a single tug is in use and 183 dB SPL re 1 μPa when two tugs are in use. Areas of ensonification represent durations included in the following statements.

Anchor handling and tugs holding the barge will occur for an average of 22 hr on the first day and 17.5 hr on the second day. A single tug will be in use for 4 hr each day; two tugs will be working simultaneously for 18 and 13.5 hr, respectively, on Day 1 and Day 2. During anchor retrieval, anchor handling will occur for an average of 17.5 hr on a single day, 4 hr of which will involve a single tug and 13.5 hr of which two tugs will be operating. Anchor handling during setting and retrieval is considered a stationary, non-impulsive source. Level A acoustic thresholds and ensonified areas for these activities can be found in Tables 26, 27, and 28.

**Table 26. Level A Acoustic Thresholds and Ensonified Areas for Anchor Setting (Stationary Source Using Lay Barge Methodology)**

| Hearing Group | Level A | | | |
|---|---|---|---|---|
| | Day 1 Threshold Distance Radii (m) | Day 2 Threshold Distance Radii (m) | Day 1 Ensonified Area ($km^2$) | Day 2 Ensonified Area ($km^2$) |
| | SEL | SEL | SEL | SEL |
| LF Cetaceans | 222 | 203 | 0.15 | 0.13 |
| HF Cetaceans | 157 | 139 | 0.08 | 0.06 |
| VHF Cetaceans | 1,143 | 1,005 | 4.10 | 3.18 |
| PW | 264 | 240 | 0.22 | 0.18 |
| OW | 190 | 169 | 0.11 | 0.09 |

**Notes:** LF – low-frequency; HF – high-frequency; VHF – very high-frequency; PW – phocid pinnipeds in water; OW – otariid pinnipeds in water; m – meters; $km^2$ – square kilometers; SEL– sound exposure level

## Table 27. Level A Acoustic Thresholds and Ensonified Areas for Anchor Retrieval (Stationary Source Using Lay Barge Methodology)

| Hearing Group | Level A | |
|---|---|---|
| | Threshold Distance Radii (m) | Ensonified Area ($km^2$) |
| | SEL | SEL |
| LF Cetaceans | 277 | 0.24 |
| HF Cetaceans | 204 | 0.13 |
| VHF Cetaceans | 1,262 | 5.00 |
| PW | 324 | 0.33 |
| OW | 240 | 0.18 |

**Notes:** LF – low-frequency; HF – high-frequency; VHF – very high-frequency; PW – phocid pinnipeds in water; OW – otariid pinnipeds in water; m – meters; $km^2$ – square kilometers; SEL– sound exposure level

## Table 28. Level A Acoustic Thresholds and Ensonified Areas for Pipelay (Mobile Source Using Lay Barge Methodology)

| Hearing Group | Level A | |
|---|---|---|
| | Threshold Distance Radii (m) | Ensonified Area ($km^2$) |
| | SEL | SEL |
| LF Cetaceans | 84 | 0.07 |
| HF Cetaceans | 37 | 0.03 |
| VHF Cetaceans | 496 | 1.06 |
| PW | 120 | 0.11 |
| OW | 57 | 0.04 |

**Notes:** LF – low-frequency; HF – high-frequency; VHF – very high-frequency; PW – phocid pinnipeds in water; OW – otariid pinnipeds in water; m – meters; $km^2$ – square kilometers; SEL– sound exposure level

During pipelay activities, a single tug will be anchor handling for an average of 2 hr per day over an average distance of ~0.29 km (951 ft) resulting in a Level B ensonified area of 27.89 $km^2$ (10.77 $mi^2$). Pipe laying will occur over 8 days. Anchor handling during pipelay is considered a mobile source and the associated Level B acoustic thresholds and ensonified areas are detailed in Table 29 and 30.

## Table 29. Level B Acoustic Threshold and Ensonified Area for Anchor Setting and Retrieving (Stationary Source Using Lay Barge Methodology)

| Hearing Group | Level B | | | |
|---|---|---|---|---|
| | Single Tug Anchor Handling Threshold Distance Radii (m) | Two Tug Threshold Distance Radii (m) | Single Tug Anchor Handling Ensonified Area (km$^2$) | Two Tug Ensonified Area (km$^2$) |
| | rms | rms | rms | rms |
| All Marine Mammals | 2,890 | 3,740 | 26.24 | 43.94 |

**Note:** m – meters; km$^2$ – square kilometers; rms – root mean square

## Table 30. Level B Acoustic Threshold and Ensonified Area for Pipelay Operations

| Hearing Group | Level B | |
|---|---|---|
| | Single Tug Anchor Handling Threshold Distance Radii (m) | Single Tug Anchor Handling Ensonified Area (km$^2$) |
| | rms | rms |
| All Marine Mammals | 2,890 | 27.89 |

**Note:** m – meters; km$^2$ – square kilometers; rms – root mean square

Level A and Level B acoustic harassment associated with sound produced by anchor handling activities (i.e., lay barge method) during pipeline replacement/installation may occur and incidental take authorization is requested at numbers described in Section 6.4. The risk of interaction or entanglement with gear or equipment is minimal due to the small area occupied by the cables relative to the marine mammals' habitat in Cook Inlet. Additionally, the lines are kept taut in the water, eliminating the risk of entanglement that loose lines pose to marine mammals. Vessel strikes or other encounters are not anticipated as a result of anchor handling activities. No other interactions are anticipated.

The exposure analysis Excel workbook submitted in tandem with this Petition also contains a detailed description, by activity, of each input used to calculate exposures from anchor handling activities during pipeline replacement/installation.

## 6.2.5 Pipeline Replacement/Installation using Pipe Pull Methodology

This section outlines the methodology employed to assess sound sources associated with pipeline replacement/installation using pipe pulling methods in middle Cook Inlet and Trading Bay, which involve two tugs engaged in pipe pulling operations combined with the bottom impact sounds generated from the pipe interacting with the seafloor during the pipe pulling. As stated in Section 1.2.3, pipeline replacement/installation using pipe pulling methodology may be utilized in Year 4 for one pipeline replacement/installation project (*Scenario 1*).

### 6.2.5.1 Estimating Pipe Pull Source Levels

In lieu of information more specific to the area and activity, which is currently unavailable, the modeling undertaken for tugs towing a jack-up rig has been used as a proxy based on discussions with pipe-pulling tug operators and the anticipated tug energy output. The sound source and methods levels for tugs engaged in pipe pulling, along with the resultant bottom impact sounds are derived from the same review and SSV data detailed in Section 6.2.1. However, the subsequent discussions pertain specifically to the SSV analysis wherein tug output is consistently sustained at 85% power in conjunction with an additional tug working at 50% as well as bottom impact sounds of the pipe connecting with the seafloor. Consequently, the take estimates also assume 85% power output for tugs. Pipe pulling is considered a mobile, continuous sound source and will occur for an average of 3 hr per day for a total of 24 hr over 8 days to complete the 2,286 m (7,500 ft) pipelay. Day 2 the total pipe pulling distance will decrease by 305 m (1,000 ft) as a result of the previous day's pull, as will each additional day.

In the JASCO SSV study, sound sources were estimated for three tugs towing a jack-up rig (Lawrence et al. 2024). The analysis of sound level attenuation as a function of distance from the loudest tug in front, while still accounting for the combined sound and spatial distribution of all three, resulted in the entire tug convoy acting as a single point sound source. The spatial arrangement of the three tugs during the towing of the jack-up rig (two tugs in front and one in the rear) aligns with the configuration used for pipe pulling operations with two tugs at the front, emitting sound, while the interaction of the pipeline with the seafloor creates bottom impact sounds at the rear. The sound source levels considered for the single point source during pipe pulling operations are based on the following sources:

1. Primary Tug: One tug operating at a maximum power output of 85% while actively engaged in the process of pipe pulling.

2. Assist Tug: An assisting tug operating at an average power output of 50% to provide navigation support during pipe pulling activity.

3. Bottom Impact Sounds: The production of sounds resulting from the interaction between the pipeline and the seafloor as the pulling process takes place.

The maximum power output of the primary tug is 85% and will be sustained for the duration of the pull. During navigational assistance, the second tug will vary in power output but will not exceed 85% and are expected to average 50%. Considering the sound levels produced by the primary tug up front either match or surpass those of the assisting tug or the bottom impact sounds at the rear, the dominant sound source emanates from the primary tug under the highest load, functioning at an 85% power output. Although these individual sources are discussed separately above, they occur concurrently. In the context of this analysis, they will collectively be treated as a single sound source, represented by the primary tug's source level, which will be utilized to establish distances to acoustic thresholds to generate potential take estimates.

Table 31 shows sound source levels for all three sources. Tug source level estimates originate from the JASCO SSV study and reflect tugs' operations at 85% and 50% power outputs (Lawrence et al. 2024). Bottom impact source levels, as analyzed in Harvest Alaska's CIPL Extension Project and characterized by Castellote (2019), were subsequently integrated into this analysis.

## Table 31. Sound Source Level Considerations for Pipe Pulling

| Activity | Sound Level (dB rms re 1 µPa) | Resource |
|---|---|---|
| Tug operating at 85% power output (maximum) | 205.9 | Lawrence et al. 2022* |
| Tug operating at 50% power output (average) | 180 | Lawrence et al. 2022* |
| Bottom Impact Sounds | 132.7 | Castellote 2019 |

**Notes: *** Lawrence et al. 2022 was updated in August of 2024 to meet the 2024 NMFS Technical Guidance updates; rms- root-mean-square; dB re 1 µPa- decibels referenced to 1 microPascal

The NMFS User Spreadsheet (Version 3.1: 2024)[10] is used to calculate MMPA Level A acoustic harassment thresholds and uses a 20log(10) propagation loss factor; therefore, to better fit the spreadsheet an adjusted sound source level of 193.29 dB $SEL_{1s}$ for one tug operating at 85% power output was employed. This level is derived from the LF cetaceans' source level of 173.2 dB $SEL_{1s}$ at 10 m, as indicated in Table 32 and measured by JASCO (2022, 2024) during the original Sound Source Verification (SSV). The LF cetaceans source level was used because the weighting function graph, as recommended by NMFS (2024), is mostly flat over the important frequencies where vessel sound occurs and has the smallest calculation difference (JASCO 2024). See Figure 20. By applying the inverse square law for sound propagation, this measurement is converted to 1 m by adding 20 times the logarithm (base 10) of the distance ratio (from 10 m to 1 m), which is 20log(10). Additionally, an adjustment of 0.09 dB is included to approximate the unweighted source level. Therefore, to arrive at the final sound source level, the calculation is:

1) $173.2 + 20\log(10) + 0.09 = 193.29 \text{ dB } SEL_{1s} \text{ at } 1 \text{ m}$

To determine Level A NMFS isopleths, the source level 193.29 dB $SEL_{1s}$ and the source velocity of 0.358 m/s (1 kn) is entered into the User Spreadsheet. Notably, the User Spreadsheet requests an $L_{rms}$ source level; however, the $SEL_{1s}$ is applied as the two source levels are equivalent at 1 m.

To determine Level B isopleths, the original SSV source level for tugs towing a jack-up rig at 85% power output is utilized. The 3-tug proxy is employed as it represents the closest actual measurement available and, based on the SSV and previous modeling, is more accurate than the traditional Level B calculation. This calculation employs an unweighted sound source level of 205.9 dB, using a 23.1Log(R) transmission loss model (JASCO 2022, 2024). The threshold distance has been recently updated to comply with the 2024 NMFS Acoustic Technical Guidance (NMFS 2024).

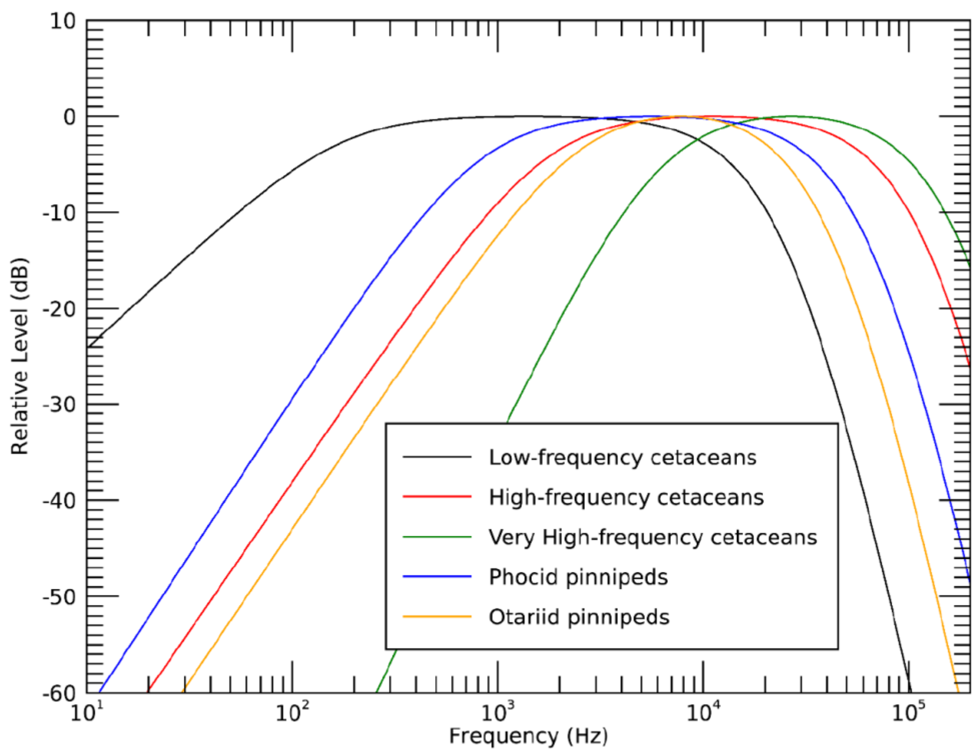
[10] Tab C: Mobile Source: Non-Impulsive, Continuous (“Safe Distance” Methodology)

## Table 32. Measured SEL1s at CPA and Estimated SEL1s at 10m for Tugs Operating at 85% Power

| Hearing Group | Measured $SEL_{1s}$ at CPA [a] (dB re 1 µ$Pa^2$s) | Estimated $SEL_{1s}$ at 10 m [b] (dB re 1 µ$Pa^2$s) |
|---|---|---|
| LF Cetaceans | 129 | 173.2 |
| HF Cetaceans | 115.9 | 160.1 |
| VHF Cetaceans | 105.2 | 149.4 |
| PW | 122.6 | 166.8 |
| OW | 116.9 | 161.1 |

**Notes:** Source: Lawrence et al. 2022, 2024; SEL- sound exposure level; dB re 1 µ$Pa^2$s – decibels referenced to 1 micropascal squared second; [a] Frequency-weighted SEL recorded during the 1-second window when front tugs were at closest point of approach (CPA); [b] Estimated SEL at 1 second; LF – low frequency; HF - high frequency; VHF – very high frequency; PW – phocid pinnipeds in water; OW – otariid pinnipeds in water

## Figure 20. NMFS Auditory Weighting Functions for Functional Marine Mammal Hearing Groups




**Source:** Lawrence et al. 2024; NMFS 2024 Technical Acoustic Guidelines

### 6.2.5.2 Pipe Pull Acoustic Thresholds and Ensonified Areas

The Level A and Level B acoustic harassment thresholds and ensonified areas for tugs operating at 85% power during pipe pull activities are shown in Table 33.

Level A threshold distance calculations result in the following distances: 3.39 m (11 ft) for LF cetaceans; 0.81 m (2.66 ft) for HF cetaceans; 2.51 m (8.23 ft) for VHF cetaceans; 4.96 m (16.27 ft) for PW; and 0.97 m (3.18 ft) for OW. MMPA Level B acoustic harassment thresholds extend to 5,150 m (16,896 ft).

The ensonified area represents two tugs engaged in pipe pulling for a total of three hr in a 24-hr period. The Level A ensonified areas are negligible across hearing groups and range between 0.0 $km^2$ (0.0 $mi^2$) and 0.01 $km^2$ (0.004 $mi^2$). The Level B ensonified area over the duration of pipe pulling per day is 95.87 $km^2$ (37.02 $mi^2$).).

**Table 33. Level A and Level B Acoustic Thresholds for Tugs Operating at 85% Power during Pipe Pull Operations**

| Hearing Group | Level A Threshold Distance Radii (m) | Level B Threshold Distance Radii[1] (m) | Level A Ensonified Area ($km^2$) | Level B Ensonified Area ($km^2$) |
|---|---|---|---|---|
| | SEL | rms | SEL | rms |
| LF Cetaceans | 3.39 | 5,150 | 0.01 | 95.87 |
| HF Cetaceans | 0.81 | | 0.00 | |
| VHF Cetaceans | 2.51 | | 0.01 | |
| PW | 4.96 | | 0.01 | |
| OW | 0.97 | | 0.00 | |

**Notes:** Source: Lawrence et al. 2022, 2024 (revised to include NMFS 2024 acoustic guidelines; LF- low-frequency; HF – high-frequency; VHF – very high-frequency; PW – phocid pinnipeds in water; OW – otariid pinnipeds in water; m – meter(s); $km^2$ – kilometer(s) squared; pk – zero to peak sound pressure level; SEL – sound exposure level; rms – root mean square

No Level A takes are requested for pipe pulling during pipeline replacement/installation activities as all distances fall within the footprint of the tug. Level B acoustic harassment associated with sound produced by pipe pulling and the resulting request for incidental take authorization is discussed in Section 6.4. Interactions with gear or equipment, vessel strikes, or other encounters are not anticipated as a result of pipeline replacement/installation activities. No other interactions are anticipated. The exposure analysis Excel workbook submitted in tandem with this Petition also contains a detailed description of each input used to calculate exposures from pipe pull activities during pipeline replacement/installation.

## 6.3 ESTIMATES OF MARINE MAMMAL DENSITY

As detailed below, Hilcorp combined the most recently published data from the Marine Mammal Laboratory (MML) aerial survey results (Goetz et al. 2023 and Shelden et al. 2022) with the MML data from 2000 through 2022 and Goetz et al. (2012a) data for Cook Inlet belugas for the exposure analysis.

### 6.3.1 Goetz Beluga Whale Habitat-Based Model

As part of Apache's second Incidental Harassment Authorization in early 2013, Goetz et al. (2012a) developed a habitat-based model to estimate Cook Inlet beluga density. The model was based on sightings, depth soundings, coastal substrate type, environmental sensitivity index, anthropogenic disturbance, and anadromous fish streams to predict densities throughout Cook Inlet. The result of this work is a beluga density map of Cook Inlet, which predicts spatially explicit density estimates for Cook Inlet belugas. Using data from the Geographic Information System files provided by NMFS and the different project locations, the resulting estimated density is shown in Table 34. The density applicable to the area of activity (i.e., the North Cook Inlet Unit density for middle Cook Inlet activities and the Trading Bay density for activities in Trading Bay) are used to calculate exposure estimates. Likewise, when a range is given, the higher end of the range is used to calculate exposure estimates (i.e., Trading Bay in the Goetz model has a range of 0.004453 to 0.015053; the upper limit [0.015053] was used for the exposure estimates). The upper end of the density range is used to ensure that whale densities are not underestimated; exposure estimates based upon those densities therefore represent maximum potential impacts resulting from sound exposure.

### Table 34. Cook Inlet Beluga Whale Density Based on Goetz Habitat Model

| Project Location | Beluga Whale Density (individuals per $km^2$) |
|---|---|
| North Cook Inlet Unit (Middle Cook Inlet) | 0.001664 |
| Trading Bay | 0.004453–0.015053 |
| Lower Cook Inlet | 0.000000 |

**Notes:** $km^2$- square kilometer

## 6.3.2 MML Beluga Whale Aerial Survey Data

The density was also estimated using the sighting information from the annual MML aerial surveys for beluga whales between 2000 and 2022 (Rugh et al. 2005; Shelden et al. 2008, 2009, 2010, 2013, 2015, 2017, 2019, and 2022; Goetz et al. 2023). Although these surveys are only flown for a few days in summer, they represent the best available long-term dataset for beluga whales in Cook Inlet. Table 35 summarizes the total beluga whales observed for each year for the survey, the area covered, the correction factor for missed beluga whales, and the resulting calculated density.

To estimate density, the maximum number of beluga whales was multiplied by the correction factor and divided by the area covered. Because of the low sighting numbers, densities were calculated for the entire Cook Inlet survey area and for the middle and lower Cook Inlet (NMFS Zones 1 and 2 from the annual survey reports) south of Point Possession and Trading Bay (Table 35). The estimates for these three different regions are fairly low, as the general trend of beluga sightings are in upper Cook Inlet (Rugh et al. 2005; Shelden et al. 2013, 2015, 2017, and 2019).

Generally, the density of marine mammals in middle Cook Inlet during spring through fall correlates with the presence or absence of anadromous fish species during spawning activities. While a temporal overlap exists between activities in the specific geographic region and the occurrence of several species of marine mammals in middle and lower Cook Inlet (primarily beluga whales, harbor seals, and harbor porpoise), the spatial overlap is considerably smaller. The distance between the class of activities in the specific geographic region most closely centered in Trading Bay and eastern middle Cook Inlet and dense concentrations of foraging marine mammals at the mouths of major spawning rivers in upper Cook Inlet (namely the Beluga River and Susitna River) exceeds 40 to 50 km (25 to 31 mi).

Based on additional sighting data from 90-day marine mammal monitoring reports, including Lomac-McNair et al. (2014) and Sitkiewicz et al. (2018), most marine mammals (in particular beluga whales) sighted during aerial-, land-, and vessel-based monitoring were noted as “traveling” through middle Cook Inlet and are included in the area identified in this application as the specific geographic region. This correlates with the assumption that CIBWs occur in higher densities near foraging areas, including the Susitna Delta, ~27 km (~17 mi) from the Tyonek platform, where the nearest activities would occur.

### 6.3.3 Other Marine Mammals

MML surveys also observed and counted marine mammal species other than belugas. Density estimates of these species were estimated from the MML June aerial surveys conducted between 2000 and 2022 (Rugh et al. 2005; Shelden et al. 2008, 2009, 2010, 2013, 2015, 2017, 2019, and 2022; Goetz et al. 2023). Although these surveys are only flown for a few days per month, they represent the best available long-term dataset for marine mammal sightings in Cook Inlet. Table 36 summarizes the maximum marine mammals observed each year of the survey and respective areas covered. To estimate density, the total number of individuals per species was divided by the area covered. The total number of animals observed accounts for both lower and upper Cook Inlet. No density estimates are available for California sea lions in Cook Inlet (83 FR 19224).

### Table 35. Beluga Whale Sightings and Calculated Densities from MML Annual Surveys 2000–2022

| Location | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2014 | 2016 | 2018 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Beluga Whales (highest daily count)** | | | | | | | | | | | | | | | | | | |
| Turnagain Arm (North and East of Chickaloon Bay) | 0 | 10 | 0 | 25 | 50 | 21 | 0 | 76 | 0 | 0 | 4 | 0 | 2 | 0 | 5 | 1 | 9 | 3 |
| Chickaloon Bay to Point Possession | 28 | 34 | 11 | 64 | 176 | 66 | 60 | 50 | 33 | 40 | 131 | 72 | 30 | 51 | 72 | 56 | 61 | 55 |
| Point Possession to East Foreland[1,2] | 0 | 0 | 0 | 0 | 0 | 0 | 15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 5 | 0 |
| Middle Cook Inlet, East of Trading Bay[1,2] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 0 | 7 | 0 | 2 | 0 | 0 | 21 |
| East Foreland to Homer[1] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Kachemak Bay[1] | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Western Side of Lower Cook Inlet[1] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Redoubt Bay[1] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Trading Bay[1,2] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 21 | 0 | 0 | 52 | 142 | 116 |
| Susitna Delta (North Foreland to Port Mackenzie) | 114 | 114 | 93 | 41 | 99 | 155 | 126 | 152 | 103 | 290 | 160 | 187 | 286 | 333 | 191 | 152 | 501 | 833 |
| Knik Arm | 42 | 60 | 88 | 94 | 0 | 43 | 9 | 23 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0 |
| Fire Island | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 2 | 0 | 0 | 9 | 2 | 0 | 0 | 0 | 0 | 0 | 4 |
| Correction Factor | 1.021 | 1.021 | 1.021 | 1.021 | 1.021 | 1.021 | 1.021 | 1.021 | 1.021 | 1.021 | 1.031 | 1.031 | 1.001 | 1.036 | 1.022 | 1.64 | 3.930 | 1.940 |
| Area Surveyed ($km^2$) | 6,911.20 | 5,445.20 | 5,445.20 | 5,235.80 | 6,492.30 | 5,445.20 | 6,701.80 | 5,235.80 | 7,120.60 | 5,864.00 | 6,073.50 | 6,701.80 | 6,282.90 | 6,701.80 | 8,377.20 | 10,471.50 | 8,377.20 | 8,377.20 |
| **Density Estimates (individuals per $km^2$)** | | | | | | | | | | | | | | | | | | |
| Entire Cook Inlet | 0.02718 | 0.04125 | 0.03600 | 0.04368 | 0.05111 | 0.05644 | 0.03199 | 0.05909 | 0.01950 | 0.05746 | 0.05313 | 0.04015 | 0.05513 | 0.05936 | 0.03294 | 0.04197 | 0.34434 | 0.23922 |
| Lower Cook Inlet | 0 | 0.00038 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00000 | 0.00023 |
| Middle Cook Inlet | 0 | 0 | 0 | 0 | 0 | 0 | 0.00229 | 0 | 0 | 0 | 0.00153 | 0 | 0.00446 | 0 | 0.00024 | 0.00924 | 0.06896 | 0.03173 |

**Notes:**
[1] Lower Cook Inlet Area (MML Zone 1)
[2] Middle and lower Cook Inlet (MML Zones 1 and 2)
[3] Total coverage of Cook Inlet surface area was not reported by Shelden et al. 2022 or Goetz et al. 2023 and is estimated based on discussion within each document relative to previous reports.
$km^2$- square kilometer

### Table 36. Non-Beluga Marine Mammal Sightings and Calculated Densities from NMFS Annual Surveys 2000- 2022

| Marine Mammal | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2014 | 2016 | 2018 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Marine Mammal Sightings (highest observed for survey)** | | | | | | | | | | | | | | | | | | |
| Humpback whales (total observed) | 11 | 47 | 20 | 22 | 15 | 18 | 14 | 3 | 7 | 5 | 2 | 9 | 1 | 11 | 6 | 0 | 0 | 7 |
| Minke whales (total observed) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 |
| Gray whales (total observed) | 2 | 2 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Fin whales (total observed) | 0 | 2 | 0 | 16 | 3 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 1 | 0 | 0 | 0 |
| Killer whales (total observed) | 0 | 15 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 33 | 0 | 9 | 0 | 0 | 0 | 0 | 4 |
| Dall’s porpoises (total observed) | 17 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Harbor porpoises (total observed) | 29 | 25 | 0 | 0 | 101 | 2 | 0 | 4 | 6 | 42 | 10 | 30 | 11 | 129 | 17 | 0 | 41 | 7 |
| Harbor seals (total observed) | 2,023 | 1,853 | 1,608 | 1,165 | 1,886 | 1,364 | 1,799 | 1,474 | 2,037 | 1,415 | 1,156 | 2,318 | 1,812 | 2,115 | 1,910 | 1,380 | 2,557 | 2,120 |
| Steller sea lions (total observed) | 10 | 26 | 56 | 77 | 1 | 104 | 84 | 0 | 75 | 39 | 0 | 100 | 65 | 43 | 71 | 1 | 0 | 0 |
| Area surveyed ($km^2$) | 6,911.2 | 5,445.2 | 5,445.2 | 5,235.8 | 6,492.3 | 5,445.2 | 6,701.8 | 5,235.8 | 7,120.6 | 5,864.0 | 6,073.5 | 6,701.8 | 6,282.9 | 6,701.8 | 8,377.2 | 10,471.5 | 8,377.2[1] | 8,377.2[1] |
| **Density Estimates (individuals per $km^2$) (calculated by dividing area surveyed by total observed in each year)** | | | | | | | | | | | | | | | | | | |
| Humpback whales | 0.002 | 0.009 | 0.004 | 0.004 | 0.002 | 0.003 | 0.002 | 0.001 | 0.001 | 0.001 | 0.000 | 0.001 | 0.000 | 0.002 | 0.001 | 0.000 | 0.000 | 0.001 |
| Minke Whales | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Gray Whales | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Fin Whales | 0.000 | 0.000 | 0.000 | 0.003 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 |
| Killer whales | 0.000 | 0.003 | 0.000 | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.005 | 0.000 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Dall’s porpoises | 0.002 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Harbor porpoises | 0.004 | 0.005 | 0.000 | 0.000 | 0.016 | 0.000 | 0.000 | 0.001 | 0.001 | 0.007 | 0.002 | 0.004 | 0.002 | 0.019 | 0.002 | 0.000 | 0.005 | 0.001 |
| Harbor seals | 0.293 | 0.340 | 0.295 | 0.223 | 0.291 | 0.251 | 0.268 | 0.282 | 0.286 | 0.241 | 0.190 | 0.346 | 0.288 | 0.316 | 0.228 | 0.132 | 0.305 | 0.253 |
| Steller sea lions[2] | 0.001 | 0.005 | 0.010 | 0.015 | 0.000 | 0.019 | 0.013 | 0.000 | 0.011 | 0.007 | 0.000 | 0.015 | 0.010 | 0.006 | 0.008 | 0.000 | 0.000 | 0.000 |

**Notes:**
[1] Total coverage of Cook Inlet surface area was not reported by Shelden et al. 2022 or Goetz et al. 2023 and is estimated based on discussion within each document relative to previous reports.
[2] No density estimates are available for Pacific white-sided dolphins or California sea lions in Cook Inlet.
$km^2$- square kilometer

### 6.3.4 Average Densities

The density information described in the previous table is used to calculate average densities per species; Table 37 shows the average densities for each marine mammal species in Cook Inlet. These densities are used in the exposures estimates. For beluga whales, the density appropriate for each region is used to calculate exposure estimates, from the MML and Goetz model. The exposure estimate calculated using the higher density between MML and the Goetz model are used to inform take authorization requests.

**Table 37. Average Densities of Marine Mammal Species in Cook Inlet**

| Species | Density (individuals per km$^2$) |
|---|---|
| Humpback whale | 0.00185 |
| Minke whale | 0.00003 |
| Gray whale | 0.00007 |
| Fin whale | 0.00028 |
| Killer whale | 0.00061 |
| Beluga whale (MML Middle Cook Inlet) | 0.00658 |
| Beluga whale (MML Lower Cook Inlet) | 0.00003 |
| Goetz beluga (North Cook Inlet) | 0.00166 |
| Goetz beluga (Lower Cook Inlet) | 0.00000 |
| Goetz beluga (Trading Bay) | 0.01505 |
| Dall’s porpoise | 0.00014 |
| Harbor porpoise | 0.00380 |
| Pacific white-sided dolphin | 0.00000 |
| Harbor seal | 0.26819 |
| Steller sea lion | 0.00669 |
| California sea lion | 0.00000 |

**Notes:** km$^2$- square kilometer

## 6.4 EXPOSURE ESTIMATE INPUTS FOR 2025- 2029 ACTIVITIES

The number of each marine mammal species that could potentially be exposed to sound expected to exceed NMFS (2024) acoustic harassment criteria are estimated using the methods described in the following sections. The area of ensonification (km$^2$), duration of activity, and density of marine mammals (number of marine mammals per km$^2$) were multiplied, as appropriate.

The acoustic characteristics of sound sources for each activity are described in Section 6.2 and were used to evaluate potential for Level A and Level B harassment.

### 6.4.1 Exposure Estimates

Project timing and location information as described in Sections 1 and 2 have been used to calculate Level A and Level B exposure estimates of marine mammals as a result of Hilcorp's projected 2025-2029 activities.

As delineated in Sections 1, 2, and 6, and summarized below, pipeline replacement/installation presents multiple execution methodologies. This multi-optional approach is proposed to give Hilcorp the flexibility to utilize the appropriate procedure for the project. For each method, a comprehensive analysis of all potential options was conducted. The resultant annual exposure estimates are compared against alternative scenarios and the combinations resulting in the highest potential estimated exposures to marine mammals are subsequently integrated into the take calculations.

Although the annual schedule of Hilcorp activities has not yet been finalized, to determine the maximum annual exposure estimates the following activities are analyzed to occur:

- Year 1 – Year 5: Tugs towing, holding, or positioning a jack-up rig in support of production drilling
- Year 1 – Year 5: Pile driving in support of production well development at the Tyonek platform
- Year 2 and Year 4: Tugs towing, holding, or positioning a jack-up rig and pile driving in support of exploratory drilling
- Year 2 or Year 2 and Year 4: Pipe pulling and/or anchor handling in support of pipeline replacement/installation

The greatest potential estimated exposure scenario to beluga whales results from the following activities in Year 2: two lay barge projects *(Scenario 2)*, winter pile driving at the Tyonek, tugs under load with a jack-up rig, and exploratory drilling (one well) between the Anna & Bruce platforms.

The greatest potential estimated exposure scenario to all other marine mammals (i.e.,fin, gray, humpback, and killer whales, Dall's and harbor porpoises, Pacific white-sided dolphins, harbor seals, and Steller and California sea lions) results from the following activities in Year 4: exploratory drilling (two wells) in the MGS Unit, tugs under load with a jack-up rig, winter pile driving at Tyonek, and pipe pulling *(Scenario 1)*.

These two combinations of activities are used to calculate the maximum annual take authorization requests for each species. Hilcorp will be requesting up to the annual maximum amount of take per year depending upon the activities planned. The exposure estimates analyses, comparison tables, and take calculations for all activities and both *Scenarios* can be found in the Excel workbook submitted in tandem with this Petition. It should be noted that the specific years that activities are analyzed to occur may or may not coincide with the actual year of execution; however, there will only be two pipeline replacements or installations over the 5-year ITR Petition period and only lay barge methodology can be utilized in the same year (i.e., *Scenario 2*). Additionally, exploratory drilling within the MGS Unit and between the Anna and Bruce platforms may happen in any two separate years during the Petition period.

Tables 38 through 42 present Level A and Level B exposure estimates used for take analyses by activity for Year 1 through Year 5, respectively. Please note, as there are no density estimates for Pacific white-sided dolphins or California sea lions, all exposure estimates for these species are reported as zero.

## Table 38. Year 1 Exposure Estimates by Activity

| Species | Production Drilling + Well Development | | Pipeline Replacement or Installation | Exploratory Drilling | Total |
|---|---|---|---|---|---|
| | Tugs under Load with a Jack-up Rig | Winter Season Pile Driving at Tyonek | | Tugs under Load with a Jack-up Rig + Pile Driving | |
| **Level A** | | | | | |
| Humpback whale | 0.000 | 0.294 | | | **0.294** |
| Minke whale | 0.000 | 0.004 | | | **0.004** |
| Gray whale | 0.000 | 0.0011 | | | **0.011** |
| Fin whale | 0.000 | 0.044 | | | **0.044** |
| Killer whale | 0.000 | 0.002 | | | **0.002** |
| Beluga whale | 0.000 | 0.017 | | | **0.017** |
| Dall’s porpoise | 0.000 | 0.052 | | | **0.052** |
| Harbor porpoise | 0.000 | 1.448 | | | **1.448** |
| Pacific white-sided dolphin | 0.000 | 0.000 | | | **0.000** |
| Harbor seal | 0.000 | 33.706 | | | **33.706** |
| Steller sea lion | 0.000 | 0.117 | | | **0.117** |
| California sea lion | 0.000 | 0.000 | | | **0.000** |
| **Level B** | | | | | |
| Humpback whale | 3.528 | 0.027 | | | **3.555** |
| Minke whale | 0.054 | 0.000 | | | **0.054** |
| Gray whale | 0.127 | 0.001 | | | **0.128** |
| Fin whale | 0.527 | 0.004 | | | **0.532** |
| Killer whale | 1.169 | 0.009 | | | **1.178** |
| Beluga whale | 15.902 | 0.096 | | | **15.998** |
| Dall’s porpoise | 0.261 | 0.002 | | | **0.263** |
| Harbor porpoise | 7.257 | 0.056 | | | **7.313** |
| Pacific white-sided dolphin | 0.000 | 0.000 | | | **0.000** |
| Harbor seal | 512.479 | 3.932 | | | **516.411** |
| Steller sea lion | 12.786 | 0.098 | | | **12.884** |
| California sea lion | 0.000 | 0.000 | | | **0.000** |

**Notes:** The specific years activities are analyzed to occur may or may not coincide with the actual year of execution, therefore, Hilcorp will be requesting up to the annual maximum number of takes per year depending upon the activities planned. For further details, these potential combinations of activities across the five-year action period are analyzed in the *Scenario 1* and *Scenario 2* tab in the Excel workbook submitted in tandem with this ITR.

## Table 39. Year 2 Exposure Estimates by Activity

| Species | Production Drilling + Well Development | | 1-Pipeline Project using Lay Barge Methods[1] | 2-Pipeline Projects using Lay Barge Methods[1,2] | Exploratory Drilling[3] | Total |
|---|---|---|---|---|---|---|
| | Tugs under Load with a Jack-up Rig | Winter Season Pile Driving at Tyonek | | | Tugs under Load with a Jack-up Rig + Pile Driving | |
| **Level A** | | | | | | |
| Humpback whale | 0.000 | 0.294 | 0.002 | | 0.038 | **0.344** |
| Minke whale | 0.000 | 0.004 | 0.000 | | 0.001 | **0.005** |
| Gray whale | 0.000 | 0.0011 | 0.000 | | 0.001 | **0.012** |
| Fin whale | 0.000 | 0.044 | 0.000 | | 0.006 | **0.050** |
| Killer whale | 0.000 | 0.002 | 0.000 | | 0.000 | **0.002** |
| Beluga whale[2] | 0.000 | 0.017 | | 0.012 | 0.003 | **0.032** |
| Dall's porpoise | 0.000 | 0.052 | 0.002 | | 0.007 | **0.061** |
| Harbor porpoise | 0.000 | 1.448 | 0.069 | | 0.186 | **1.703** |
| Pacific white-sided dolphin | 0.000 | 0.000 | 0.000 | | 0.000 | **0.000** |
| Harbor seal | 0.000 | 33.706 | 0.398 | | 4.330 | **38.434** |
| Steller sea lion | 0.000 | 0.117 | 0.004 | | 0.015 | **0.136** |
| California sea lion | 0.000 | 0.000 | 0.000 | | 0.000 | **0.000** |
| **Level B** | | | | | | |
| Humpback whale | 3.166 | 0.027 | 0.588 | | 0.380 | **4.161** |
| Minke whale | 0.048 | 0.000 | 0.009 | | 0.006 | **0.064** |
| Gray whale | 0.114 | 0.001 | 0.021 | | 0.014 | **0.150** |
| Fin whale | 0.473 | 0.004 | 0.088 | | 0.057 | **0.622** |
| Killer whale | 1.049 | 0.009 | 0.195 | | 0.126 | **1.379** |
| Beluga whale[2] | 13.778 | 0.096 | | 9.593 | 3.098 | **26.565** |
| Dall's porpoise | 0.234 | 0.002 | 0.044 | | 0.028 | **0.308** |
| Harbor porpoise | 6.511 | 0.056 | 1.210 | | 0.782 | **8.559** |
| Pacific white-sided dolphin | 0.000 | 0.000 | 0.000 | | 0.000 | **0.000** |
| Harbor seal | 459.812 | 3.932 | 85.456 | | 55.195 | **604.395** |
| Steller sea lion | 11.472 | 0.098 | 2.132 | | 1.377 | **15.079** |
| California sea lion | 0.000 | 0.000 | 0.000 | | 0.000 | **0.000** |

**Notes:** The specific years activities are analyzed to occur may or may not coincide with the actual year of execution, therefore, Hilcorp will be requesting up to the annual maximum number of takes per year depending upon the activities planned. For further details, these potential combinations of activities across the five-year action period are analyzed in the *Scenario 1* and *Scenario 2* tab in the Excel Exposure Estimate workbook submitted in tandem with this ITR.

[1] To determine maximum annual exposure estimates, two pipeline scenarios are analyzed to occur: *Scenario 1* comprises one project using lay barge methods in Year 2 and one project using pipe pull methods in Year 4; *Scenario 2* comprises two projects using lay barge methods in Year 2 and no additional projects thereafter. A maximum of two pipeline projects will occur during the Petition period. Pipeline projects may occur simultaneously in any one year or in separate years year during the Petition period however, only lay barge methodology can be utilized in the same year (i.e., *Scenario 2*).

[2] The greatest potential estimated exposure to beluga whales results from the following activities in Year 2: two lay barge projects *(Scenario 2)*, winter pile driving at the Tyonek, tugs under load with a jack-up rig, and exploratory drilling (one well) between the Anna & Bruce platforms. The greatest potential estimated exposure to all other marine mammals results from the following activities in Year 4: exploratory drilling (two wells) in the MGS Unit, tugs under load with a jack-up rig, winter pile driving at Tyonek, and pipe pulling *(Scenario 1)*. These two combinations of activities are used to calculate the maximum annual take authorization requests for each species. Alternative combinations of activities result in fewer estimated exposures, thereby supporting the use of these combinations.

[3] To determine maximum annual exposure estimates, one exploratory well between Anna and Bruce is analyzed to occur in Year 2 and two exploratory wells in the MGS Unit are analyzed to occur in Year 4; however, the exploratory wells may be developed in any separate years during the Petition period.

## Table 40. Year 3 Exposure Estimates by Activity

| Species | Production Drilling + Well Development | | Pipeline Installation or Replacement | Exploratory Drilling | Total |
|---|---|---|---|---|---|
| | Tugs under Load with a Jack-up Rig | Winter Season Pile Driving at Tyonek | | Tugs under Load with a Jack-up Rig + Pile Driving | |
| **Level A** | | | | | |
| Humpback whale | 0.000 | 0.294 | | | **0.294** |
| Minke whale | 0.000 | 0.004 | | | **0.004** |
| Gray whale | 0.000 | 0.0011 | | | **0.011** |
| Fin whale | 0.000 | 0.044 | | | **0.044** |
| Killer whale | 0.000 | 0.002 | | | **0.002** |
| Beluga whale | 0.000 | 0.017 | | | **0.017** |
| Dall’s porpoise | 0.000 | 0.052 | | | **0.052** |
| Harbor porpoise | 0.000 | 1.448 | | | **1.448** |
| Pacific white-sided dolphin | 0.000 | 0.000 | | | **0.000** |
| Harbor seal | 0.000 | 33.706 | | | **33.706** |
| Steller sea lion | 0.000 | 0.117 | | | **0.117** |
| California sea lion | 0.000 | 0.000 | | | **0.000** |
| **Level B** | | | | | |
| Humpback whale | 3.528 | 0.027 | | | **3.555** |
| Minke whale | 0.054 | 0.000 | | | **0.054** |
| Gray whale | 0.127 | 0.001 | | | **0.128** |
| Fin whale | 0.527 | 0.004 | | | **0.532** |
| Killer whale | 1.169 | 0.009 | | | **1.178** |
| Beluga whale | 15.902 | 0.096 | | | **15.998** |
| Dall’s porpoise | 0.261 | 0.002 | | | **0.263** |
| Harbor porpoise | 7.257 | 0.056 | | | **7.313** |
| Pacific white-sided dolphin | 0.000 | 0.000 | | | **0.000** |
| Harbor seal | 512.479 | 3.932 | | | **516.411** |
| Steller sea lion | 12.786 | 0.098 | | | **12.884** |
| California sea lion | 0.000 | 0.000 | | | **0.000** |

**Notes:** The specific years activities are analyzed to occur may or may not coincide with the actual year of execution, therefore, Hilcorp will be requesting up to the annual maximum number of takes per year depending upon the activities planned. For further details, these potential combinations of activities across the five-year action period are analyzed in the *Scenario 1* and *Scenario 2* tab in the Excel workbook submitted in tandem with this ITR.

## Table 41. Year 4 Exposure Estimates by Activity

| Species | Production Drilling + Well Development | | 1-Pipeline Replacement or Installation using Pipe Pull Methods[1] | Exploratory Drilling[2] | Total |
|---|---|---|---|---|---|
| | Tugs under Load with a Jack-up Rig | Winter Season Pile Driving at Tyonek | | Tugs under Load with a Jack-up Rig + Pile Driving | |
| **Level A** | | | | | |
| Humpback whale | 0.000 | 0.294 | 0.000 | 0.076 | **0.370** |
| Minke whale | 0.000 | 0.004 | 0.000 | 0.001 | **0.006** |
| Gray whale | 0.000 | 0.0011 | 0.000 | 0.003 | **0.013** |
| Fin whale | 0.000 | 0.044 | 0.000 | 0.011 | **0.055** |
| Killer whale | 0.000 | 0.002 | 0.000 | 0.000 | **0.002** |
| Beluga whale | 0.000 | 0.017 | 0.000 | 0.004 | **0.021** |
| Dall’s porpoise | 0.000 | 0.052 | 0.000 | 0.013 | **0.066** |
| Harbor porpoise | 0.000 | 1.448 | 0.000 | 0.372 | **1.821** |
| Pacific white-sided dolphin | 0.000 | 0.000 | 0.000 | 0.000 | **0.000** |
| Harbor seal | 0.000 | 33.706 | 0.000 | 8.660 | **42.366** |
| Steller sea lion | 0.000 | 0.117 | 0.000 | 0.030 | **0.147** |
| California sea lion | 0.000 | 0.000 | 0.000 | 0.000 | **0.000** |
| **Level B** | | | | | |
| Humpback whale | 3.166 | 0.027 | 1.416 | 0.760 | **5.006** |
| Minke whale | 0.048 | 0.000 | 0.022 | 0.012 | **0.076** |
| Gray whale | 0.114 | 0.001 | 0.051 | 0.027 | **0.180** |
| Fin whale | 0.473 | 0.004 | 0.212 | 0.114 | **0.748** |
| Killer whale | 1.049 | 0.009 | 0.469 | 0.252 | **1.659** |
| Beluga whale | 13.788 | 0.096 | 11.545 | 2.709 | **23.296** |
| Dall’s porpoise | 0.234 | 0.002 | 0.105 | 0.056 | **0.371** |
| Harbor porpoise | 6.511 | 0.056 | 2.913 | 1.563 | **10.297** |
| Pacific white-sided dolphin | 0.000 | 0.000 | 0.000 | 0.000 | **0.000** |
| Harbor seal | 459.812 | 3.932 | 205.700 | 110.390 | **727.166** |
| Steller sea lion | 11.472 | 0.098 | 5.132 | 2.754 | **18.142** |
| California sea lion | 0.000 | 0.000 | 0.000 | 0.000 | **0.000** |

**Notes:** The specific years activities are analyzed to occur may or may not coincide with the actual year of execution, therefore, Hilcorp will be requesting up to the annual maximum number of takes per year depending upon the activities planned. For further details, these potential combinations of activities across the five-year action period are analyzed in the *Scenario 1* and *Scenario 2* tab in the Excel Exposure Estimate workbook submitted in tandem with this ITR.

[1] To determine maximum annual exposure estimates, two pipeline scenarios are analyzed to occur: *Scenario 1* comprises one project using lay barge methods in Year 2 and one project using pipe pull methods in Year 4; *Scenario 2* comprises two projects using lay barge methods in Year 2 and no additional projects thereafter. A maximum of two pipeline projects will occur during the Petition period. Pipeline projects may occur simultaneously in any one year or in separate years year during the Petition period however, only lay barge methodology can be utilized in the same year (i.e., *Scenario 2*). The greatest potential estimated exposure to beluga whales results from the following activities in Year 2: two lay barge projects *(Scenario 2)*, winter pile driving at the Tyonek, tugs under load with a jack-up rig, and exploratory drilling (one well) between the Anna & Bruce platforms. The greatest potential estimated exposure to all other marine mammals results from the following activities in Year 4: exploratory drilling (two wells) in the MGS Unit, tugs under load with a jack-up rig, winter pile driving at Tyonek, and pipe pulling *(Scenario 1)*. These two combinations of activities are used to calculate the maximum annual take authorization requests for each species. Alternative combinations of activities result in fewer estimated exposures, thereby supporting the use of these combinations.

[2] To determine maximum annual exposure estimates, one exploratory well between Anna and Bruce is analyzed to occur in Year 2 and two exploratory wells in the MGS Unit are analyzed to occur in Year 4; however, the exploratory wells may be developed in any separate years during the Petition period.

## Table 42. Year 5 Exposure Estimates by Activity

| Species | Production Drilling + Well Development | | Pipeline Replacement or Installation | Exploratory Drilling | Total |
|---|---|---|---|---|---|
| | Tugs under Load with a Jack-up Rig | Winter Season Pile Driving at Tyonek | | Tugs under Load with a Jack-up Rig + Pile Driving | |
| **Level A** | | | | | |
| Humpback whale | 0.000 | 0.294 | | | **0.294** |
| Minke whale | 0.000 | 0.004 | | | **0.004** |
| Gray whale | 0.000 | 0.0011 | | | **0.011** |
| Fin whale | 0.000 | 0.044 | | | **0.044** |
| Killer whale | 0.000 | 0.002 | | | **0.002** |
| Beluga whale | 0.000 | 0.017 | | | **0.017** |
| Dall's porpoise | 0.000 | 0.052 | | | **0.052** |
| Harbor porpoise | 0.000 | 1.448 | | | **1.448** |
| Pacific white-sided dolphin | 0.000 | 0.000 | | | **0.000** |
| Harbor seal | 0.000 | 33.706 | | | **33.706** |
| Steller sea lion | 0.000 | 0.117 | | | **0.117** |
| California sea lion | 0.000 | 0.000 | | | **0.000** |
| **Level B** | | | | | |
| Humpback whale | 3.528 | 0.027 | | | **3.555** |
| Minke whale | 0.054 | 0.000 | | | **0.054** |
| Gray whale | 0.127 | 0.001 | | | **0.128** |
| Fin whale | 0.527 | 0.004 | | | **0.532** |
| Killer whale | 1.169 | 0.009 | | | **1.178** |
| Beluga whale | 15.902 | 0.096 | | | **15.998** |
| Dall's porpoise | 0.261 | 0.002 | | | **0.263** |
| Harbor porpoise | 7.257 | 0.056 | | | **7.313** |
| Pacific white-sided dolphin | 0.000 | 0.000 | | | **0.000** |
| Harbor seal | 512.479 | 3.932 | | | **516.411** |
| Steller sea lion | 12.786 | 0.098 | | | **12.884** |
| California sea lion | 0.000 | 0.000 | | | **0.000** |

**Notes:** The specific years activities are analyzed to occur may or may not coincide with the actual year of execution, therefore, Hilcorp will be requesting up to the annual maximum number of takes per year depending upon the activities planned. For further details, these potential combinations of activities across the five-year action period are analyzed in the *Scenario 1* and *Scenario 2* tab in the Excel workbook submitted in tandem with this ITR.

#### 6.4.1.1 Tugs under Load with a Jack-Up Rig in Support of Production Drilling

Tugs under load with a jack-up rig in support of production drilling is analyzed to occur each year in the Petition period (Year 1 through Year 5). Tables 38 through 42 detail exposure estimates associated with this activity.

The following reports the individual exposure estimates for tugs under load with a jack-up rig in support of production drilling based on the analyzed year of execution.

**Years 1 through 5 – Tugs under Load with a Jack-up Rig – Level A:** Acoustic harassment resulting in AUD INJ from tugs towing, holding, or positioning a jack-up rig is not anticipated for any species; therefore, no Level A takes are requested for this activity. Section 6.2.1 provides more acoustic details on tugs under load with a jack-up rig.

**Years 1, 3, & 5 – Tugs under Load with a Jack-up Rig – Level B:** Estimated exposures from tugs towing, holding, or positioning a jack-up rig in support of production drilling are zero for Pacific white-sided dolphins and California sea lions and are less than one for minke (0.054), gray (0.127), and fin (0.527) whales and Dall's porpoise (0.261). Estimated Level B exposures are greater than one for killer (1.169), humpback (3.528), and beluga (15.902) whales; harbor porpoise (7.257); harbor seals (512.479); and Steller sea lions (12.786).

**Year 2 – Tugs under Load with a Jack-up Rig – Level B:** Estimated exposures from tugs towing, holding, or positioning a jack-up rig in support of production drilling are zero for Pacific white-sided dolphins and California sea lions and are less than one for minke (0.048), gray (0.114), and fin (0.473) whales and Dall's porpoise (0.234). Estimated Level B exposures are greater than one for killer (1.049), humpback (3.166), and beluga (13.778) whales; harbor porpoise (6.511); harbor seals (459.812); and Steller sea lions (11.472).

**Year 4 – Tugs under Load with a Jack-up Rig – Level B:** Estimated exposures from tugs towing, holding, or positioning a jack-up rig in support of production drilling are zero for Pacific white-sided dolphins and California sea lions and are less than one for minke (0.043), gray (0.101), killer (0.929), and fin (0.419) whales and Dall's porpoise (0.207). Estimated Level B exposures are greater than one for humpback (2.803) and beluga (11.654) whales; harbor porpoise (5.766); harbor seals (407.144); and Steller sea lions (10.158).

#### 6.4.1.2 Winter Pile Driving in Support of Production Well Development

Winter season pile driving in support of production well development is analyzed to occur every year of the Petition (Year 1 through Year 5). Tables 38 through 42 detail exposure estimates associated with this activity.

The following reports the individual exposure estimates for winter pile driving at the Tyonek platform in support of production well development.

**Years 1 through 5 – Winter Pile Driving – Level A:** Estimated exposures from winter pile driving are zero for Pacific white-sided dolphins and California sea lions. Harbor porpoises (1.448) and harbor seals (33.706) greater than one and exposure estimates for all other marine mammals are less than one: humpback (0.294), minke (0.004), gray (0.011), fin (0.044), killer (0.002), and beluga (0.017) whales, Dall's porpoises (0.052), and Steller sea lions (0.117).

**Years 1 through 5 – Winter Pile Driving – Level B:** Estimated exposures from winter season pile driving at the Tyonek platform are zero for minke whales, Pacific white-sided dolphins and California sea lions and above zero but below one for the following species: humpback (0.027), gray (0.001), fin (0.004), killer

(0.009) and beluga (0.096) whales; Dall's (0.002) and harbor (0.056) porpoises; and Steller sea lions (0.098). Harbor seals (3.932) are the only marine mammal to have an estimated Level B exposure above one.

#### 6.4.1.3 Anchor Handling and Pipe Pulling in Support of Pipeline Replacement/ Installation

Pipeline replacement/installation is analyzed to occur in either middle Cook Inlet or Trading Bay, or a combination of both, in either Year 2 and Year 4 or Year 2 only. As previously mentioned in Section 6.2.4 and Section 6.2.5, two pipeline replacement/installation scenarios are analyzed for this Petition, consisting of one pipeline project occurring in Year 2 using lay barge methods and one project occurring in Year 4 using pipe pull methods (*Scenario 1*), or two projects occurring in Year 2 using lay barge methods and no subsequent pipeline projects thereafter (*Scenario 2*). *Scenario 2* results in the greatest potential estimated exposure to beluga whales, while *Scenario 1* results in the greatest potential estimated exposures to all other marine mammals. Both *Scenarios* are used in the final exposure estimate calculations and inform the maximum annual take authorization requests. See Section 6.2.4 and Section 6.2.5 for further details on analysis. Exposure estimates for *Scenarios 1 and 2* are available in the Excel Exposure Estimates workbook. Additionally, it is important to note that when analyzing the highest estimated exposure scenarios, the final exposure estimate is derived from the aggregate of the individual activity annual exposure estimates. In other words, *Scenario 2*, Year 2, results in the greatest exposure scenario to beluga whales when analyzed in conjunction with winter pile driving, tugs under load with a jack-up rig, and pile driving at one exploratory well site between the Anna and Bruce platforms. *Scenario 1*, Year 4, results in the greatest exposure scenario to all other marine mammals when analyzed in conjunction with winter pile driving, tugs under load with a jack-up rig, and pile driving at two exploratory well sites within the MGS Unit. Alternative combinations of activities result in fewer estimated exposures, thereby supporting the use of these combinations.

The following reports the individual exposure estimates for *Scenario 1 and Scenario 2*.

***Scenario 1* – Year 2 – Level A:** Exposure estimates from executing one pipeline project using lay barge methods (i.e., anchor handling) as listed in Table 39 are as follows: humpback whales (0.002); Dall's (0.002) and harbor (0.069) porpoises; harbor seals (0.398) and Steller sea lions (0.004). For minke, gray, fin, killer, and beluga whales, Pacific white-sided dolphins, and California sea lions exposure estimates are zero.

***Scenario 1* – Year 2 – Level B:** Exposure estimates from executing one pipeline project using lay barge methods (Table 39) are below one and above zero for the following species: humpback (0.588), minke (0.009), gray (0.021), fin (0.088), and killer (0.195) whales and Dall's porpoises (0.044). Harbor porpoises (1.210), harbor seals (85.456), and Steller sea lions (2.132) are all estimated at numbers greater than one. Exposure estimates for Pacific white-sided dolphins and California sea lions are zero.

***Scenario 1* – Year 4 – Level A:** Exposure estimates as listed in Table 41 resulting from pipeline projects using pipe pull methods are zero for all species.

***Scenario 1* – Year 4 – Level B:** Exposure estimates from pipe pull methods during pipeline installation/replacement found in Table 41 are above zero and below one for the following species: minke (0.022), gray (0.051), fin (0.212), and killer (0.469) whales, and harbor porpoises (0.105). Humpback (1.416) and beluga (11.545) whales, Dall's porpoises (2.913), harbor seals (205.700) and Steller sea lions (5.132) are all estimated at numbers greater than one. Exposure estimates for Pacific white-sided dolphins and California sea lions are zero.

***Scenario 2* – Year 2 – Level A:** Exposure estimates from executing two pipeline projects using lay barge methods are also detailed in Table 39. However, these estimates are provided exclusively for beluga whales and represent the highest potential estimated exposure scenario for beluga whales (0.012) in conjunction with the other analyzed activities specific to that year (0.032) as mentioned above.

***Scenario 2* – Year 2 – Level B:** Exposure estimates from executing two pipeline projects using lay barge methods (Table 39) are also provided. However, these estimates are exclusively for beluga whales and represent the highest potential estimated exposure scenario for this species (9.593) in conjunction with the other analyzed activities specific to that year (26.565) as mentioned above.

#### 6.4.1.4 Tugs under Load with a Jack-Up Rig and Pile Driving in support of Exploratory Drilling

Tugs under load with a jack-up rig in support of exploratory drilling and pile driving at one well site in Trading Bay, between the Anna and Bruce platforms is analyzed to occur in Year 2 and at two well sites in middle Cook Inlet within the MGS Unit in Year 4. See Section 6.2.1 and 6.2.3. Table 39 and Table 41 list exposure estimates associated with both years of activity. This timeline is used in the final exposure estimate calculations and informs the maximum annual take authorization requests. Refer to Section 6.2.3 and the Excel Exposure Estimates workbook for further details on analysis. Additionally, it is important to note that when analyzing the highest estimated exposure scenarios, the final exposure estimate is derived from the aggregate of the individual activity annual exposure estimates. In other words, *Scenario 2,* Year 2, results in the greatest exposure scenario to beluga whales when analyzed in conjunction with winter pile driving, tugs under load with a jack-up rig, and pile driving at one exploratory well site between the Anna and Bruce platforms. *Scenario 1*, Year 4, results in the greatest exposure scenario to all other marine mammals when analyzed in conjunction with winter pile driving, tugs under load with a jack-up rig, and pile driving at two exploratory well sites within the MGS Unit. Alternative combinations of activities result in fewer estimated exposures, thereby supporting the use of these combinations.

The following reports the individual exposure estimates for tugs under load with a jack-up rig and pile driving in support of exploratory drilling between the Anna and Bruce platforms and within the MGS Unit.

**Year 2 & Year 4 – Tugs under Load with a Jack-Up Rig – Level A:** Level A acoustic harassment is not anticipated for any species from tugs towing, holding or positioning a jack-up rig during exploratory drilling, as described in Section 6.2.1.

**Year 2 – Pile Driving – Level A:** Exposure estimates during pile driving at one exploratory well site between the Anna and Bruce platforms are zero for killer whales, Pacific white-sided dolphins, and California sea lions. Estimated exposures are above zero but below one for humpback (0.038), minke (0.001), gray (0.001), fin (0.006), beluga (0.003) whales; Dall's (0.007) and harbor (0.186) porpoises; and Steller sea lion (0.015). The only species with estimated exposures greater than one is harbor seals (4.330).

**Year 2 – Pile Driving – Level B:** Exposure estimates during pile driving at one exploratory well site between the Anna and Bruce platforms in Trading Bay are zero for Pacific white-sided dolphins, and California sea lions and less than one for humpback (0.380), minke (0.006), gray (0.014), fin (0.057), and killer (0.126) whales; and Dall's (0.028), and harbor (0.782) porpoises. Estimated exposures are above one for beluga whales (3.098), Steller sea lions (1.377), and harbor seals (55.195).

**Year 4 – Pile Driving – Level A:** Exposure estimates during pile driving at two exploratory well sites in the MGS Unit are zero for killer whales, Pacific white-sided dolphins, and California sea lions and are less than one for humpback (0.076), minke (0.001), gray (0.003), fin (0.011), and beluga (0.004) whales; Dall's (0.013) and harbor (0.372) porpoises; and Steller sea lions (0.030). Estimated exposures are above one for harbor seals (8.660).

**Year 4 – Pile Driving – Level B:** Exposure estimates from pile driving in the MGS Unit are zero for Pacific white-sided dolphins, and California sea lions and greater than zero but less than one for humpback (0.760), minke (0.012), gray (0.027), fin (0.114), and killer (0.252) whales, and Dall's porpoise (0.056). Estimated exposures are above one for beluga whales (2.709), harbor porpoises (1.563), Steller sea lions (2.754), and harbor seals (110.390).

### 6.4.2 Requested Harassment Take Authorizations

The maximum annual requested take authorizations for activities in this Petition as described in Section 1 that exceed NMFS acoustic harassment Level A and Level B criteria are presented in Table 43 and do not account for mitigation of any of the sound-generating activities. Take authorization requests are rounded up in circumstances where exposure estimates are less than a whole number, with the exception of beluga whales, for which the maximum annual Level A exposure estimate is 0.032 (Year 2, *Scenario 2*). However, no Level A takes are requested for beluga whales. As previously mentioned, Pacific white-sided dolphins and California sea lions don't have published density estimates for Cook Inlet therefore, take requests are based on reported single-event sighting numbers.

The maximum annual Level A take authorization requests for humpback, fin, minke, gray, and killer whales; Dall's porpoises; harbor seals and Steller sea lions are commensurate to calculated exposure estimates. The maximum annual Level A take authorization request for harbor porpoises exceeds the calculated exposure estimates to account for potential group sightings during winter pile driving and limited winter distribution data in Cook Inlet.

Level B take authorization requests generally align with exposure estimates; however, for gregarious species with low exposure estimates, additional Level B take authorizations are requested to account for potential exposures to small groups of animals that travel together.

Pile driving at the Tyonek platform is analyzed for winter (mid-November to mid-April) primarily because most species are less likely to be present in middle Cook Inlet. However, winter distribution data remain limited. Castellote et al. (2016) detected harbor porpoises near the Beluga River until mid-November but recorded no detections through late January, suggesting they may move south to avoid ice formation, which typically begins in November (Mulherin et al., 2001). Castellote et al. (2024) further support this ice displacement hypothesis, showing harbor porpoises were detected almost daily in Tuxedni Bay from September to May, except for a decrease in January. In Chinitna Bay, detections were nearly daily except for most of January, aligning with peak sea ice concentrations in the Bay (National Weather Service Alaska Sea Ice Program[11]).

Humpback whales were only detected once at the end of May in Tuxedni Bay and in Chinitna Bay, detections occurred between mid-December and mid-January and not again until late April. While this is only one area of Cook Inlet, aerial surveys in summer months indicate humpbacks are less common in middle and upper Cook Inlet (Shelden et al. 2013, 2017, 2019, 2022). Additionally, humpback whales from the Mexico-North Pacific, Western North Pacific and Hawai'i stocks are known to migrate to southern waters (Calambokidis et al. 2017; Curtis et al. 2022; Martien et al. 2021; Wade et al. 2021; Young et al. 2023) further reducing their likelihood in middle Cook Inlet in winter months.

[11] Ocean Data Explorer: Map portal

Killer whale detections occurred in December and February through May in Chinitna Bay while fewer occurrences (7 days) were recorded in Tuxedni Bay with only one during the winter months (January). However, the likelihood of killer whales in the area during winter season pile driving is still probable.

Castellote et al. (2024) show beluga whales spend a considerable amount of time outside of middle Cook Inlet – moving into lower Cook Inlet – in winter months. Over 120 acoustic detections were documented of beluga whales foraging in the Tuxedni River and Bay between September and April, underscoring the significance of this area as important winter foraging grounds. Tuxedni Bay is approximately 135 km (84 mi) from pile driving activities.

Dall's porpoises, fin whales, and Steller sea lions are uncommon in middle Cook Inlet, though winter distribution data for these species is limited. Moran et al. (2018) report seasonal shifts in Dall's porpoise distribution in Prince William Sound (PWS), with a preference for eastern PWS in winter and shallower waters in spring, likely influenced by prey availability, particularly overwintering Pacific herring. Given the presence of Pacific herring in Cook Inlet, occasional sightings remain possible. Steller sea lions primarily prey on pollock and Pacific cod in winter (Sinclair & Zeppelin 2002), species largely concentrated in lower Cook Inlet (Rumble et al. 2023).

The following paragraphs offer additional information in support of Tables 43 and 44 and further elaborate on Hilcorp's take authorization requests.

## Table 43. Maximum Annual Level A and Level B Take Authorization Requests

| Species | Stock | Level A Harassment | | Level B Harassment | | Total Annual Take Authorization Requests | |
|---|---|---|---|---|---|---|---|
| | | Maximum Annual Estimated Exposures | Maximum Take Authorization Requests | Maximum Annual Estimated Exposures | Maximum Take Authorization Requests | Level A + B Annual Take Authorization Requests | Combined Level A + B percent of Population |
| Humpback whale[1] | Mexico North Pacific | 0.0370 | 1 | 5.006 | 6 | 7 | 0.76% |
| | Western North Pacific | | | | | | 0.65% |
| | Hawai'i | | | | | | 0.06% |
| Minke whale[1] | Alaska | 0.006 | 1 | 0.076 | 3 | 4 | 0.32% |
| Gray whale[1] | Eastern Pacific | 0.013 | 1 | 0.180 | 5 | 6 | 0.04% |
| Fin whale[1] | Northeastern Pacific | 0.055 | 1 | 0.748 | 3 | 4 | 0.16% |
| Killer whale[1] | Alaska Resident | 0.002 | 1 | 1.659 | 10 | 11 | 0.57% |
| | Alaska Transient | | | | | | 1.87% |
| Beluga whale[2] | Cook Inlet | 0.032 | 0 | 26.565 | 27 | 27 | 8.16% |
| Dall's porpoise[1] | Alaska | 0.066 | 1 | 0.371 | 10 | 11 | 0.01% |
| Harbor porpoise[1] | Gulf of Alaska | 1.821 | 4 | 10.279 | 11 | 15 | 0.05% |
| Pacific white-sided dolphin | North Pacific | 0.000 | 0 | 0.000 | 3 | 3 | 0.01% |
| Harbor seal[1] | Cook Inlet/ Shelikof | 42.366 | 43 | 727.166 | 728 | 771 | 2.71% |
| Steller sea lion[1] | Western United States | 0.147 | 1 | 18.142 | 19 | 20 | 0.04% |
| California sea lion | United States | 0.000 | 0 | 0.000 | 2 | 2 | 0.00% |

**Notes:** It should be noted that the specific years that activities are analyzed to occur may or may not coincide with the actual year of execution, therefore, Hilcorp will be requesting up to the annual maximum amount of take per year depending upon the activities planned.

[1] The greatest potential estimated exposure to beluga whales results from the following activities in Year 2: two lay barge projects *(Scenario 2)*, winter pile driving at the Tyonek, tugs under load with a jack-up rig, and exploratory drilling (one well) between the Anna & Bruce platforms.

[2] The greatest potential estimated exposure to all other marine mammals (i.e., humpback, fin, gray, and killer whales, Dall's and harbor porpoises, harbor seals, and Steller sea lions) results from the following activities in Year 4: exploratory drilling (two wells) in the MGS Unit, tugs under load with a jack-up rig, winter pile driving at Tyonek, and pipe pulling *(Scenario 1)*. These two combinations of activities are used to calculate the maximum annual take authorization requests for each species. Alternative combinations of activities result in fewer estimated exposures, thereby supporting the use of these combinations.

## Table 44. Total Maximum Requested Takes Year 1 - Year 5

| Species | Maximum 5-year Level A | Maximum 5-year Level B | Combined Level A and Level B 5-year Maximum |
|---|---|---|---|
| Humpback whale - MNP<br>Humpback whale - WNP<br>Humpback whale - HS | 5 | 30 | 35 |
| Minke whale | 5 | 15 | 20 |
| Gray whale | 5 | 25 | 30 |
| Fin whale | 5 | 15 | 20 |
| Killer whale - resident<br>Killer whale - transient | 5 | 50 | 55 |
| Beluga whale | 0 | 133 | 133 |
| Dall's porpoise | 5 | 50 | 55 |
| Harbor porpoise | 20 | 55 | 75 |
| Pacific white-sided dolphin | 0 | 15 | 15 |
| Harbor seal | 215 | 3,640 | 3,855 |
| Steller sea lion | 5 | 95 | 100 |
| California sea lion | 0 | 10 | 10 |

**Notes:** The total maximum requested takes assume the maximum take authorizations are requested each year. The specific years activities are analyzed to occur may or may not coincide with the actual year of execution, therefore, Hilcorp will be requesting up to the annual maximum number of takes per year depending upon the activities planned. For further details, these potential combinations of activities across the five-year action period are analyzed in the *Scenario 1* and *Scenario 2* tab in the Excel Exposure Estimate workbook submitted in tandem with this ITR.

Table 44 lists the total take authorization requests over the Petition period. The maximum annual take authorizations that are requested should not be inferred to represent the number of takes that are needed in each of the five years of the Petition. Since the specified activities could shift to a different year, the maximum takes are used to maintain scheduling flexibility for specified activities to occur in years other than those initially estimated (e.g., Year 3 instead of Year 2). For example, the maximum number of beluga whale take authorization requests is 27. However, 27 takes are only projected to be needed, based on exposure estimates, for Year 2 if *Scenario 2* is executed. In all other years (when *Scenario 2* is executed), the requested takes for beluga whales range from 12 to 16. Contrary, when *Scenario 1* is executed, the maximum number of beluga whale take authorization requests (24) is greatest in Year 4 but still less than Year 2, *Scenario 2*.

Hilcorp will develop a request for a Letter of Authorization (LOA) with exposure estimates based on anticipated activities during the specific LOA period. Based on available resources activities may occur in any of the five years. The LOA period may range from annual to multi-year durations, such as three-year or five-year terms.

During annual aerial surveys conducted in Cook Inlet from 2000 to 2016, humpback group sizes ranged from one to 12 individuals, with most groups comprised of one to three individuals (Shelden et al. 2013). Three humpback whales were observed in Cook Inlet during SAE’s seismic study in 2015: two near the Forelands and one in Kachemak Bay (Kendall and Cornick 2015). During the 2019 Hilcorp lower Cook Inlet seismic survey in fall 14 sightings of 38 humpback whales (ranging in group size from one to 14) were documented (Fairweather Science 2020). Two sightings totaling three humpback whales were recorded near Ladd Landing north of the Forelands on the recent Harvest Alaska CIPL Extension Project (Sitkiewicz et al. 2018). Commensurate with exposure estimates, Hilcorp's maximum annual requested authorization for Level A takes for humpback whales is one. Based on recent documented observations during the CIPL survey, which occurred within the specific geographic region, Hilcorp is requesting an annual maximum of six Level B takes of humpback whales. This allows for the observation of individuals consistent with those identified in the CIPL project, as well as groups of up to three individuals, which aligns with the majority of group sizes documented during aerial surveys. Given the extended duration of activity over the CIPL timeline, it is plausible that the cumulative number of active days per year could account for sightings of up to six individuals without contradicting prior reports. The annual combined maximum humpback whale take request of seven whales represent 0.76% of the Mexico North Pacific stock, 0.06% of the Hawai'i stock, and 0.65% of the Western North Pacific stock.

Minke whales are migratory in Alaska but have been observed off Cape Starichkof and Anchor Point year-round (Muto et al. 2017). Minke whales usually travel in groups of two to three individuals (NOAA 2023e) and have been documented traveling in small groups in Cook Inlet. During Cook Inlet-wide aerial surveys conducted from 1993 to 2004, minke whales were encountered three times (1998, 1999, and 2006) each time off Anchor Point 26 km (16 mi) northwest of Homer (Shelden et al. 2013, 2015, and 2017). Several minke whales were recorded off Cape Starichkof in early summer 2013 during exploratory drilling (Owl Ridge 2014), suggesting this location is regularly used by minke whales year-round. During Apache's 2014 survey, a total of two minke whale groups (three individuals) were observed: one sighting southeast of Kalgin Island and another sighting near Homer (Lomac-MacNair et al. 2014). Minke whales were also sighted in lower Cook Inlet near Tuxedni Bay in 2015 (Kendall and Cornick 2015). During the 2019 Hilcorp lower Cook Inlet seismic survey eight minke whale sightings were reported (Fairweather Science 2020). Recent sightings of minke whales include during an aerial survey in 2021 when three whales were sighted in June near Anchor Point in lower Cook Inlet (Shelden et al. 2022), and a single sighting during Hilcorp's marine vibroseis seismic survey in 2024 near Anchor Point. The annual maximum take authorization requested for Level A exposures for minke whales is one and is commensurate with exposure estimates. Although the request for Level B take authorizations slightly exceeds the estimated exposures, the activity involving tugs under load with a jack-up rig is the southernmost in the geographic area and has the highest exposure estimate for minke whales. Considering this information, along with observed group sizes and the general location of sightings in lower Cook Inlet, Hilcorp is requesting an annual maximum of three Level B takes to account for the possibility of encountering a group of two to three individuals in a given year. The combined annual maximum take authorization requested of four minke whales represents 0.32% of the Alaska stock population

Apache conducted a seismic program along the western side of middle Cook Inlet and northern Trading Bay, included within the specific geographic area of the Petition's specified activities; monitoring efforts reported nine sightings of nine individual gray whales through June and July in 2012 (Lomac-MacNair et al. 2013) and one gray whale in 2014 (Lomac-MacNair et al. 2014). However, no gray whales were reported during SAE's seismic survey in 2015 (Kendall and Cornick 2015), the 2018 CIPL Extension Project (Sitkiewicz et al. 2018), or during the 2019 Hilcorp seismic survey in lower Cook Inlet (Fairweather Science 2020). In 2020, PSOs on the PCT Construction Project in the POA reported one gray whale, with another sighting in2021. (61 N Environmental 2021, 2022a). NMFS's 2021 POA Visual Monitoring Project also documented one gray whale in August near Point Woronzof (Easley-Appleyard and Leonard 2022). The greatest densities of gray whales occur in lower Cook Inlet from November through January and March through May corresponding to their southbound and northbound migrations, respectively (Ferguson et al. 2015). Gray whales generally travel alone or in small groups (NOAA 2024a). Commensurate to exposure estimates, Hilcorp requests one annual maximum Level A take. Based on the recent sightings in upper Cook Inlet, observations made in the specified geographic area, and known group size, five annual maximum Level B take authorizations are requested for gray whales to allow for the potential occurrence of a small group or several individual gray whales, particularly during fall and spring migration periods. The combined annual maximum take authorization requested of six gray whales represents 0.04% of the Eastern Pacific stock.

Fin whales most often travel alone, although they are sometimes seen in groups of two to seven individuals. During migration they may be in groups of 50 or up to 300 individuals (NMFS 2010). During the NMFS aerial surveys in Cook Inlet from 1993 to 2022, 10 sightings of 28 individual fin whales were recorded in lower Cook Inlet (Shelden et al. 2013, 2015, and 2016; Shelden and Wade 2019). Ferguson et al. (2015) identified areas south of the mouth of Cook Inlet as a fin whale BIA. As such, there exists potential for fin whales to venture further into Cook Inlet. During seismic surveys conducted in 2019 by Hilcorp in lower Cook Inlet, eight sightings of 23 fin whales were recorded in groups ranging in size from one to 15 individuals (Fairweather Science 2020). The higher number of sightings in a single year relative to the multi-year NMFS aerial surveys suggests fin whales may be present in greater numbers, particularly during fall. The maximum annual Level A take authorization requested for fin whales is one, commensurate with the exposure estimates. While above exposure estimates, Hilcorp is requesting three maximum annual Level B take authorizations based on the recent sighting information detailed above, to account for one small group or a few individuals over the year. The combined maximum annual take authorization request of four fin whales represents 0.16% of the Northeastern Pacific stock.

Killer whale pods typically consist of a few to 20 or more animals (NOAA 2023d). Two killer whales were sighted offshore of Point Woronzof in upper Cook Inlet in September 2021 (61 North Environmental 2022a). During seismic surveys conducted in 2019 by Hilcorp in lower Cook Inlet, 21 killer whales were observed. Although also observed as single individuals, killer whales were recorded during this survey in groups ranging in size from two to five individuals (Fairweather Science 2020). One killer whale group of two individuals was observed during the 2015 SAE seismic program near the North Foreland (Kendall and Cornick 2015). Passive acoustic monitoring efforts throughout Cook Inlet documented killer whales at the Beluga River, Kenai River, and Homer Spit. These detections were likely resident killer whales since transient killer whales tend to move quietly through waters to track marine mammal prey (Small 2010; Lammers et al. 2013). The maximum annual Level A take authorization requested for killer whales is one, commensurate to the exposure estimates. With multiple recent observations in upper Cook Inlet, Hilcorp is requesting an annual take authorization of 10 Level B takes of killer whales. The requested Level B takes are above the exposure estimate to allow for two sightings with a group size of five individuals (the upper range of documented group size in recent surveys in Cook Inlet) in a given year. The combined maximum annual killer whale take authorization request of 11 constitute 0.57% of the Alaska resident stock and 1.87% of the Alaska transient stock.

The median group size of observed beluga whales during the 2018 MML aerial survey was ~11 whales (Shelden and Wade 2019), although estimated group sizes were highly variable (ranging from 2 to 147 whales) (Boyd et al. 2019). The median group size during 2021 and 2022 MML aerial surveys was 34 and 15, respectively, with variability between 1 and 174 between the years (Goetz et al. 2023). Vessel-based surveys in 2019 found beluga whale groups in the Susitna River Delta (roughly 24 km [15 mi] north of the Tyonek platform) that ranged from 5 to 200 animals (McGuire et al. 2021). However, the very large groups seen in the Susitna River Delta are not expected near Hilcorp's activities because groups of this size have not been observed or documented outside river deltas in upper Cook Inlet. During Hilcorp's jack-up rig move in May 2024, ~25 beluga whales were sighted outside of the aerial survey area, ~20 of which were at the mouth of the Big Susitna River (Horsley and Larson 2024). One sighting of 3 beluga whales was also reported near the Tyonek platform during Hilcorp's October jack-up rig move (Horsley et al. 2024). Hilcorp is not requesting any Level A take authorizations for beluga whales. The requested maximum annual Level B take authorization is 27 whales, which is commensurate with the maximum annual exposure estimates for Year 2, *Scenario 2*. The requested take authorization allows for the possibility of one observation of the 2022 mean group size of 15 whales in Cook Inlet, plus a few smaller groups and individuals. The CIBW annual maximum take request of 27 whales represents 8.16% of the total population.

Dall's porpoises are usually found in groups averaging between 2 and 12 individuals (NOAA 2023a). The 2012 Apache survey recorded two groups of three individual Dall's porpoises (Lomac-MacNair et al. 2014). Hilcorp conducted a seismic survey in lower Cook Inlet in 2019 and 30 individual Dall's porpoise in 10 groups were sighted ranging from two to seven individuals per group (Fairweather Science 2020). During Hilcorp's 2023 jack-up rig move in June, one Dall's porpoise was sighted by a PSO in middle Cook Inlet, just offshore from Rig Tenders Dock (Horsley and Larson 2023). Hilcorp requests a maximum annual Level A take authorization of one, commensurate to exposure estimates. Because the occurrence of Dall's porpoises is anticipated to be less likely in middle Cook Inlet than lower Cook Inlet, the smaller end of documented group sizes (three) is used for calculating takes. Hilcorp requests authorization for 10 Level B takes annually for Dall's porpoises based on the observed group size and frequency of recent sightings in the reports mentioned above while recognizing those numbers exceed the exposure estimates. This request accounts for sightings of several groups or small groups as well as individuals. The combined annual maximum Dall's porpoise take request of 11 animals constitutes 0.01% of the population of the Alaska stock.

Harbor porpoises are most often seen in groups of two to three (NOAA 2023b); however, based on observations during project-based marine mammal monitoring, they occur in larger group sizes as well. Shelden et al. (2014) compiled historical sightings of harbor porpoises from lower to upper Cook Inlet that spanned from a few animals to 92 individuals. Additionally, the 2018 CIPL Extension Project that occurred in middle Cook Inlet reported 29 sightings of 44 individuals (Sitkiewicz et al. 2018). The PCT PSO program reported 15 harbor porpoise sightings of 18 individuals and 22 harbor porpoise sightings (27 individuals) in upper Cook Inlet across their 2020 and 2021 field season respectively (61 North Environmental 2021, 2022). During jack-up rig moves in 2021, a PSO observed an individual harbor porpoise in middle Cook Inlet in July and another in October (Horsley and Larson 2023). Additionally, another harbor porpoise was sighted during the June 2023 jack-up rig move in middle Cook Inlet (Horsley and Larson 2023). Hilcorp is requesting a maximum annual Level A take authorization of two harbor porpoises, and a maximum annual Level B take authorization of 11 harbor porpoises. Level A take request is higher than exposure estimates to account for the less-known winter distribution of harbor porpoises, which also may travel in groups. The Level B take authorization request allows for multiple group sightings across a season and is commensurate to exposure estimates. The combined maximum annual harbor porpoise take request of 15 animals represents 0.05% of the Gulf of Alaska stock.

Recent data specific to Pacific white-sided dolphins within Cook Inlet remains lacking. Although acoustic detections of several Pacific white-sided dolphins were recorded in 2020 near Iniskin Bay, prior to this, only one other survey in the last 20 years noted the presence of Pacific white-sided dolphin (three animals) within Cook Inlet. As a result of the dearth of current data on this species, an accurate density for pacific white-sided dolphins in the specific project region could not be generated. As a default measure, the maximum annual take of three Pacific white-sided dolphin by Level B harassment is requested in the event the maximum number of Pacific white-sided dolphins that have been recorded in the somewhat recent past are present in Cook Inlet during project activities. This is consistent with NMFS authorizations for similar activities (87 FR 62364). No Level A take authorizations are requested for Pacific white-sided dolphins. The annual maximum take authorization request of 3 individuals represents 0.001% of the North Pacific stock.

Harbor seals are often solitary in water but can haulout in groups of a few to thousands (ADF&G 2022) and are commonly observed throughout Cook Inlet. In 2018 Harvest Alaska conducted marine mammal monitoring in middle Cook Inlet within the same geographic area as this Petition and reported 313 sightings comprised of 316 harbor seal individuals (Sitkiewicz et al. 2018). During the PCT Construction Project in 2020 and 2021, 524 groups of 560 individual harbor seals were observed in upper Cook Inlet near the POA (61 N Environmental 2021, 2022a). Commensurate to the exposure estimate, a maximum annual Level A take authorization of 27 harbor seals is requested. Also, commensurate with the exposure estimate, an annual maximum take authorization request of 731 Level B takes is requested for a combined total annual maximum of 758. The combined annual maximum take authorization request constitutes 2.67% of the Cook Inlet/Shelikof Strait stock.

Steller sea lions tend to forage individually or in small groups (Fiscus and Baines 1966) but have been documented feeding in larger groups when schooling fish were present (Gende et al. 2001). Steller sea lions have been observed during marine mammal surveys conducted in Cook Inlet. During NMFS CIBW aerial surveys from 1993 to 2022, 64 sightings of 1,111 individual Steller sea lions mostly in lower Cook Inlet were reported (Shelden et al. 2017; Shelden et al. 2022). In 2012, during Apache's 3D Seismic surveys, three sightings of approximately four individuals in upper Cook Inlet were reported (Lomac-MacNair et al. 2013). SAE's 3D Seismic Program in 2015 observed four Steller sea lions: one sighting occurred between the West and East Forelands; one occurred near Nikiski; and one occurred northeast of the North Foreland in the center of Cook Inlet (Kendall and Cornick 2015). Additionally, in middle/upper Cook Inlet, Hilcorp reported one sighting of two Steller sea lions while conducting pipeline work (Sitkiewicz et al. 2018). During 2020 through 2022, 61 North Environmental conducted monitoring efforts in upper Cook Inlet for the POA Modernization Project. Six Steller sea lions were observed in 2020; nine in 2021; and three in 2022 (61 North Environmental 2021, 2022a, 2022b). At the end of July 2022, while conducting a waterfowl survey an estimated 25 Steller sea lions were observed hauled-out at low tide in the Lewis River, on the west side of middle Cook Inlet. (K. Lindberg, Pers. Comm., October 3, 2023). In 2023, one Steller sea lion was observed off Anchor Point in October during Hilcorp's marine vibroseis pilot project (Hanks et al. 2024). Based on exposure estimates and the documented occurrence of Steller sea lions throughout Cook Inlet, Hilcorp is requesting a maximum annual Level A take authorization of one Steller sea lion and a maximum annual Level B take authorization of 19 Steller sea lions. The combined maximum annual take authorization request of 20 animals represents 0.04% of the Western U.S. stock.

Although California sea lions are uncommon in the specific geographic region, two were seen during the 2012 Apache seismic survey in Cook Inlet (Lomac-MacNair et al. 2013). California sea lions in Alaska are typically alone but may be seen in small groups usually associated with Steller sea lions at their haulouts and rookeries (Maniscalco et al. 2004). No Level A takes are requested for California sea lions. Hilcorp requests an annual maximum of two-Level B take authorizations of California sea lions to account for the potential to see up to two animals over the course of a given year, equal to the number observed during the 2012 Apache seismic survey. This request represents < 0.001% of the U.S. stock.

Hilcorp's monitoring and mitigation program to minimize harassment events is outlined in Sections 11 and 13.

# 7. DESCRIPTION OF IMPACT ON MARINE MAMMALS

*The anticipated impact of the activity upon the species or stock.*

Serious injury to or mortality of marine mammals as a result of Hilcorp's proposed specified activities in Cook Inlet is not anticipated. Furthermore, due to the mobile nature of marine mammals, temporary hearing impairment or non-auditory physical effects on marine mammals are unlikely. However, low numbers of Level A take authorization are requested based on the exposure estimates. All requested Level A take authorizations fall below 0.20% of each species population or stock.

The combined requested Level A and Level B take authorization levels are 2.67% or less of each species' population or stock, except for beluga whales in which the requested take authorization represents 8.16% of the Cook Inlet population (Table 43).

## 7.1 DURATION OF ACTIVITY

Dates[12] and durations of activity are discussed in detail in Section 1 and 2 and summarized in Table 1. The class of activities include the following activities:

1. Tugs towing, holding, or positioning a jack-up rig in support of production drilling for 12 days in Year 1 (between August 15 and December 31) Year 3, and Year 5, for 10 days in Year 2, and 8 days in Year 4 between April and December;

2. Winter season pile driving in support of production well development at the Tyonek platform intermittently for 14 days over multiple weeks occurring between mid-November and mid-April in Year 1 through Year 5;

3. Tugs towing, holding, or positioning a jack-up rig in support of exploratory drilling over 2 days between April and December in Year 2 and over 4 days between April and December in Year 4;

4. Pile driving in support of exploratory drilling over 6 days between April and December in Year 2 and over 12 days between April and December in Year 4;

5. One pipeline replacement/installation using lay barge methods (anchor handling) between April and November over 11 days in Year 2 and one pipeline replacement/installation using pipe pull methods between April and November over 8 days in Year 4 (*Scenario 1*); and

6. Two pipeline replacement/installations using lay barge methods (anchor handling) between April and November over 22 days in Year 2 (*Scenario 2*).

## 7.2 POTENTIAL BEHAVIORAL EFFECTS

Marine mammals use hearing and sound transmission to perform vital life functions including interpreting their environment, communication, prey detection, and predator detection. Behavioral effects on marine mammals from underwater sounds generated by Hilcorp's proposed 2025 to 2029 activities may vary

[12] It should be noted that the year of activity is subject to change and is specified for the purposes of analysis.

depending on the marine mammal species, the age of the animal, and characteristics of the sound including the source, duration, intensity, and frequency.

The potential consequences for marine mammals from underwater sound generated by industrial activities are multifaceted. Marine mammals may exhibit adaptive responses, termed tolerance, as they acclimate to continuous acoustic stimuli. However, these emitted sounds can also disrupt the reception of natural auditory cues, leading to the masking of essential natural sounds (Richardson et al. 1995).

Exposure to industrial sound can result in behavioral disturbance, causing alterations in the typical patterns of marine mammal behavior, influencing crucial activities like feeding, mating, and migration. This disturbance may manifest in auditory consequences, ranging from TTS, indicating transient hearing impairment, to AUD INJ, signifying lasting auditory impairment or deafness (Richardson et al. 1995; Southall et al. 2007).

In addition to auditory implications, there exists the potential for non-auditory physical effects. Prolonged exposure to intense underwater sound associated with industrial activities may trigger physiological responses in marine mammals, including stress, neurological effects, bubble formation, resonance effects, and various forms of organ or tissue damage (Richardson et al. 1995).

It should be noted that high levels of background noise exist in upper and middle Cook Inlet, so much so that results from five acoustic studies in Cook Inlet published prior to 2018 led NMFS to define an exception for upper Cook Inlet for behavioral harassment (Level B take). NMFS instituted a 125 dB rms threshold instead of the standard 120 dB rms limit for this area. However, in a 2019 paper entitled “Anthropogenic Noise and the Endangered Cook Inlet Beluga Whale, *Delphinapterus leucas*: Acoustic Considerations in Management”, Castellote et al. (2019) argued that the increased harassment threshold was not justified based on their extensive data set since SPL values were below 120 dB in all locations most of the time, with the exception of locations exposed to strong current, and mean SPLs were all below 120 dB.

### 7.2.1 Potential Effects of Vessel Sound on Marine Mammals

Underwater sound generated by tugs towing, holding, and positioning a jack-up rig or engaging in pipe pulling or anchor handling may affect marine mammal behavior in the vicinity of the sound source. Marine mammal reactions to underwater sound may include approach or deflection from the sound source, low level avoidance or short-term vigilance behavior. Additionally, short-term masking of echolocation or acoustic communication may occur among individuals or within family groups. Behavioral reactions to the presence of vessels can vary depending on the type and speed of the vessel, spatial relationship between the animal and the vessel, the marine mammal species, and the behavior of the animal prior to exposure (Richardson et al. 1995).

Individuals of the same species that are exposed to the same sound can vary in response to the sound depending on age and the individual mammal’s past experiences. Slow-moving vessels may be tolerated by some whales while other individuals may deflect around vessels and continue on their migratory path. Marine mammal responses to mobile non-impulsive sound from vessel traffic are typically associated with sound that is generated by changes in the engine and propeller speed (Wartzok et al. 1989; Richardson et al. 1995). Whales have been known to tolerate slow-moving vessels within several hundred meters, especially when the vessel is not directed toward the animal and when there are no sudden changes in direction or engine speed (Wartzok et al. 1989, Richardson et al. 1995, Heide-Jørgensen et al. 2003). Additionally, visual cues may also contribute to responses from marine mammals to vessel traffic (Richardson et al. 1995). Responses to sound associated with vessels by toothed whales, baleen whales, and pinnipeds are provided in the following sections. Tugs engaged in towing, holding, and positioning a jack-up rig, anchor handling, or pipe pulling are slow-moving as compared to typical recreational and commercial vessel traffic. Assuming an animal was stationary, exposure from the moving tug configuration (which comprises most of the tug activity being considered) would be in the order of minutes in any particular location. The slow, predictable, and generally straight path of these activities are expected to further lessen the likelihood that sound exposures at the expected levels would result in the harassment of marine mammals. Also, this slow transit along a predictable path is also planned in an area of routine vessel traffic where many large vessels move in slow straight-line paths, and some individuals are expected to be habituated to these sorts of sounds. Based on these characteristics of the sound source and the other activities regularly encountered in the area, it is unlikely an animal will exhibit a disruption of behavioral patterns.

#### 7.2.1.1 Toothed Whales

Toothed whale responses to vessel activity can vary depending on species of whale, the sea conditions (ice or ice-free) and the activity of the whale (hunting, transiting, etc.). While some dolphin species and killer whales approach vessels so they can ride the bow and stern waves, other species of toothed whales such as sperm whales and river dolphins practice avoidance of motorized vessels.

Beluga whale responses to vessel sound in the past have ranged from tolerance to extreme sensitivity resulting in changes in vocalizations, behavior states, and avoidance (Richardson et al. 1995; Lesage et al. 1999). Changes in the vocal behavior of belugas was observed by Lesage et al. (1999) when the belugas were exposed to sound from both a small 7 m (23 ft) motorboat and an 80 m (260 ft) ferry boat. Responses included a progressive reduction in calling rate, brief increases in falling tonal calls and three-pulsed-tone call types, an increase in repetition of specific calls when the vessel distance was < 1 km (0.6 mi) away, and a shift in frequency bands used by the belugas. Responses occurred more frequently when the whales were exposed to the ferry than the small vessel. Krasnova et al. (2020) studied the influence of boat tourism on the behavior of Russian beluga whales in the White Sea from 1995 to 2015. They found that changes in beluga behavior were affected by both the distance between boats and whales and the type of boat activity (e.g., anchoring, drifting, or motoring), with boats following belugas causing the greatest behavioral changes in the whales. In the Churchill River estuary in Manitoba, Canada, Ausen et al. (2022) found that belugas are attracted to kayaks, avoid paddleboards, and are neutral regarding motorboats and inflatable boats, based on measured distances to the various watercraft using a time-lapse camera overlooking the estuary. Blackwell and Greene (2003) observed beluga whales swimming in close proximity to a Northern Lights freighter ship that was docked with the motors running (126 dB re 1µPa) at the Port of Alaska, indicating that sound from the ship did not significantly affect the whales, who may have become accustomed to high background sound levels in Cook Inlet.

Brewer et al. (2023) investigated masking of beluga whale calls in the 0-12 kHz range by commercial ship noise in Cook Inlet. Their study found that all seven of the most common call types in the CIBW repertoire were partially masked by distant commercial ship noise and completely masked by close commercial ship noise in the 0-12 kHz range. The average of 8-10 commercial ships per week that use the POA likely heavily impact beluga whale communication within their core habitat, which could hinder navigation, foraging, group cohesion, and predator avoidance.

For the activities detailed in this Petition, any potential impacts to toothed whales from vessel sound would be localized within the specific geographic area and would not result in significant impacts to resident stocks or populations.

#### 7.2.1.2 Baleen Whales

Masking of acoustic communication may occur for baleen whale species that vocalize in low frequencies over long distances since shipping sound often overlaps with these frequencies. Some baleen whales have adapted to increased background sounds by shifting the frequency with which they communicate, the rate at which they call and the intensity of their call to limit masking effects as best they can (McDonald et al. 1995). Blue whales in California have shifted their call frequencies downward by 31% since the 1960s to effectively communicate below the sound frequency generated by propeller cavitation from ships (McDonald et al. 1995). Right whales have been observed changing vocalizations as a result of increased shipping sounds (Parks et al. 2007), fin whales have reduced their calling rate in response to sound from boats (Watkins 1986), and humpback whale cow-calf pairs significantly reduced the amount of time spent resting and milling when vessels approached compared with undisturbed whales (Morete et al. 2007). Watkins also determined from reviewing whale observations recorded over more than a 25-year timespan that whales' responses to vessels have changed over the years. Minke whales initially expressed positive interest in ships but changed to being uninterested, whereas fin whales changed from mostly negative to uninterested and humpbacks changed from mixed responses that were often negative to mostly strongly positive responses (Watkins 1986). Gray whales wintering in San Ignacio Lagoon gradually become habituated to boats and are less likely to flee from vessels later in the season than when they first arrive at the lagoon (Jones and Swartz 1984).

For the activities detailed in this Petition, any potential impacts to baleen whales from vessel sound would be localized within the specific geographic area and would not result in significant impacts to resident stocks or populations.

#### 7.2.1.3 Pinnipeds

Both sea lions and seals tend to show tolerance and sometimes curiosity towards ships while the animals are in the water but can react negatively to ships approaching within 200 to 300 m (330 to 660 ft) when they are hauled out on land (Richardson et al. 1995). Cates and Acevedo-Gutierrez (2017) studied the tolerance to vessels by harbor seals that were hauled out at three locations in Puget Sound, WA. In the study they measured the flushing behavior (retreat into the water) of harbor seals exposed to different levels of vessel traffic and found that flushing behavior was best explained by a combination of three factors: the number of boats, the type of boat, and the distance from the boat to the haul-out site. They also determined that the percentage of harbor seals flushing was greater at sites with low vessel activity. NMFS reports in their Steller sea lion recovery plan that repeated disturbances that result in abandonment or reduced use of rookeries by nursing female Steller sea lions could negatively affect the fitness and survival of pups through interruption of normal nursing cycles (NMFS 2008b). Increased ambient noise from vessel traffic has the potential to mask communication among Steller sea lions and can impair their ability to detect predators (Weilgart 2007). Hilcorp activities within Cook Inlet will not occur within close proximity to any known haulout areas for seals or sea lions. As a result, local pinnipeds should experience only minor short-term disturbance responses to underwater sound from vessel traffic. These potential impacts would be constrained to the immediate project area and would not result in population level effects.

Any potential impacts to pinnipeds from vessel sound detailed in this Petition would be localized within the specific geographic area and would not result in significant impacts to resident stocks or populations.

### 7.2.2 Potential Effects of Pile Driving Sound on Marine Mammals

Marine mammals rely on sound for crucial activities such as locating food, navigating, communicating, and avoiding predators. However, pile driving noise can interfere with these functions, causing sound masking, behavioral changes, hearing loss, and other potential non-auditory effects, though research on the latter is still limited. Impact pile driving, which Southall et al. (2007) and Bailey et al. (2010) show, can be detected by marine mammals up to 70 km (43 mi) away. Generally, cetaceans and pinnipeds have shown behavioral responses when observed in the presence of active pile-driving. Responses include altered use of the area (i.e., faster passage through, erratic behavior within, or avoidance of the area all together), changes in vocal behavior, hunting, feeding, breeding, calving, and other social interactions. Additionally, natural sounds present in marine environments serve as cues for some marine mammals, aiding them in navigation, detecting prey, and avoiding predators. However, activities like pile driving and other construction-related sounds can mask these natural sources potentially inhibiting natural behavior and response (Hildebrand 2005). The following sections describe the potential effects pile driving may have on the different groups of marine mammals. Hilcorp will implement mitigation and monitoring measures as described in Sections 11 and 13.

#### 7.2.2.1 Toothed Whales

The sound produced during pile driving can elicit behavioral responses in odontocetes, such as changes in their vocal behavior and avoidance of the area. Würsig et al. (2000) documented a notable decline in the presence of Indo-Pacific humpback dolphins (*Sousa chinensis*) during pile driving activities, along with an observed increase in their travel speed. In respective studies using passive acoustic monitoring, multiple researchers investigated the effects of underwater pile driving sounds on harbor porpoises in areas during offshore wind turbine construction. Carstensen et al. (2006) found that harbor porpoises were less frequently detected in turbine construction areas compared to other regions. Tougaard et al. (2009) observed reduced echolocation activity occurring at distances exceeding 21 km (13 mi) resulting from a monopile installation in the North Sea. Similarly, Brandt et al. (2011) reported on the effects of offshore pile driving sounds on detected harbor porpoise acoustic signals. Reduced detection was found at distances of up to 18 km (11 mi) from the sound source. Additionally, Dähne et al. (2013) conducted visual surveys and static acoustic monitoring to investigate harbor porpoise behavior in proximity to the pile driving source and found strong avoidance within 20 km (12 mi) from the source based on visual surveys. Furthermore, static acoustic monitoring revealed reduced echolocation within distances < 11 km (7 mi), while increased detection rates were observed at distances reaching 50 km (31 mi) from the sound source, indicating avoidance behavior and potential displacement of porpoises (Kastelein et al. 2013). Graham et al. (2023) deployed hydrophone clusters within 10 km (6.2 mi) of foundation pile installations to test whether harbor porpoise move away from mitigation measures at offshore windfarm sites during active pile driving. Prior to implementation of mitigation measures, porpoise movements were evenly distributed in all directions. In contrast, porpoises showed significant directional movement away from the sound sources when acoustic deterrent devices were used, or a soft start occurred, indicating harbor porpoise respond to impact hammering sounds by swimming away from the sound source. A similar study by Rumes et al. and reported by Degraer et al. (2022), found that during and 24-hr post-pile driving detection rates within 20 km (12.4 mi) reduced and within immediate vicinity of the pile driving detection rates were lower even before pile driving began suggesting potential avoidance to other aspects of noise associated with pile driving.

During the POA Marine Terminal Redevelopment (MTR) Project, Kendall et al. (2013) conducted a passive acoustic monitoring study to assess the presence of beluga whales in the area. Echolocation clicks were frequently detected, however there were no beluga whistles or sound vocalizations recorded. When compared against active pile-driving periods, the hourly click rate was found to be higher during no construction activity (429 detected clicks/hr) versus active periods of construction (291 detected clicks/hr), although the difference was not statistically significant. Additionally, Kendall and Cornick (2015) conducted visual observations of beluga whales both before and during pile driving activity at the MTR Project. They reported several behavioral changes during pile driving, including a decrease in sighting duration, an increase in traveling behavior relative to other observed activities, and alterations in group composition. These findings shed light on the potential effects of construction, particularly pile driving, on the behavior and presence of beluga whales in the study area.

Any potential impacts on toothed whale behavior are expected to be localized within the activity area and would not lead to significant effects on overall stocks or populations.

#### 7.2.2.2 Baleen Whales

Currently, no specific studies have been conducted focusing on baleen whale responses to pile driving activities. However, the acoustic energy emitted from pile driving activities is predominantly concentrated within the lower frequency range of 100 to 1,000 Hz (Gotz et al. 2009; Hildebrand 2005). This frequency range increases the likelihood of auditory masking effects on LF cetaceans, i.e., baleen whales, thereby interfering with their critical biological functions. Research shows that baleen whales have strong responses to impulsive sounds from sources like seismic operations when subjected to received sound levels at 160 to 173 dB re 1 μPa rms (Richardson et al. 1986; Ljungblad et al. 1988; Miller et al. 2005; McCauley et al. 1998). Conversely, they exhibit lower tolerance towards continuous sounds (Richardson and Malme 1993) and often change their paths to avoid drilling sounds received at levels as low as 119 dB re 1 μPa rms (Malme et al. 1983; Richardson et al. 1985).

Considering the available information on baleen whale disturbance reactions and the infrequent observations of baleen whales in the Action Area, it is plausible that certain baleen whales might experience minor, short-term disturbance responses to underwater sounds generated during pile driving activities. However, any potential impacts on baleen whale behavior would be localized within the activity area and would not lead to significant effects on the overall population.

#### 7.2.2.3 Pinnipeds

A study conducted by Russell et al. (2016) focuses on the avoidance behavior of harbor seals concerning wind farms, with specific attention to the impacts of pile driving activities on pinnipeds. The researchers found that harbor seals' avoidance of wind farms is primarily limited to periods of pile driving. During pile driving activities, the seals displayed clear signs of disturbance, leading to temporary displacement from the vicinity of the wind farm sites. However, outside of these pile driving events, the seals showed little to no avoidance behavior, suggesting that other aspects of wind farm operations might not significantly affect their presence or behavior illustrating the localized and temporal impacts of pile driving on pinnipeds, particularly harbor seals.

Any potential impacts on pinniped behavior from activities listed in this Petition would be localized within the activity area and would not lead to significant effects on the overall population.

## 7.3 POTENTIAL PHYSIOLOGICAL EFFECTS ON MARINE MAMMALS

In addition to behavioral harassment, it is possible that exposure to sound levels above Level B thresholds could result in temporary hearing impairment from TTS and exposure to sound levels above Level A thresholds could result in permanent hearing impairment from PTS. TTS, which represents primarily tissue fatigue and is reversible (Southall et al. 2007), is not considered by NOAA to constitute physical injury (NOAA 2019), because it is within the normal bounds of physiological variability and tolerance (Ward 1997). Because it is non-injurious, NMFS considers TTS as Level B harassment that is mediated by physiological effects on the auditory system (77 FR 59904). PTS, which is defined as "irreversible elevation of the hearing threshold at a specific frequency (Yost 2000) and involves physical damage to the sound receptors in the ear resulting in either total or partial deafness or impaired ability to hear sounds in specific frequency ranges (Kryter 1985). In their latest marine mammal acoustic technical guidance document, NMFS uses the term AUD INJ rather than PTS. AUD INJ, which includes, but is not limited to PTS, is defined as "damage to the inner ear that can result in destruction of tissue, such as the loss of cochlear neuron synapses or auditory neuropathy (Houser 2021; Finneran 2024). AUD INJ may or may not result in PTS. TTS and AUD INJ are described in further detail in the text that follows for different marine mammal taxa.

### 7.3.1 TTS in Toothed Whales

Most studies of TTS in odontocetes have focused on non-impulsive sound and have been conducted on captive animals. A recent review of published TTS data for marine mammals was written in 2019 by Southall et al. as an update to the Southhall et al. 2007 study. In the 2007 paper, published by a panel of scientists that NMFS Ocean Acoustics Program had assembled to address how anthropogenic noise influences marine mammals, the panel reviewed all available information and developed methods to evaluate and quantify noise exposure levels from anthropogenic sources that were expected to cause behavioral responses of varying severity and reductions in auditory sensitivity in marine mammals, including both TTS and PTS. This review resulted in the auditory exposure criteria described in Southall et al. (2007). The following is a summary of the key findings in the 2007 Southall et al. paper as well as some other more recent studies, including the updated Southall et al. (2019) paper that reviewed studies of noise exposure in marine mammals not included in the 2007 paper.

In Southall et al. (2019) the authors state that at frequencies where an animal has sensitive hearing, it is more likely to be more susceptible to auditory effects of noise exposure (i.e. lower TTS-onset thresholds) because the relative difference between noise and hearing threshold is greater for the same exposure level than for frequencies for which the animal has less sensitive hearing (higher thresholds). This means that while effects can occur for frequencies outside of an animal's range of best hearing sensitivity, there is a general relationship between hearing sensitivity and susceptibility to noise exposure. This contention is supported by research into noise-induced hearing loss in marine mammals by Finneran (2016). Southall et al. (2019) derived exposure metrics for continuous (non-impulsive) and impulsive noise criteria, including frequency-weighted SEL (non-impulsive sound sources) and both frequency-weighted SEL and unweighted peak SPL for marine mammal hearing groups (These values are shown in Table 8 in Section 6.1). Exposures exceeding the specific criteria level for any exposure metric are interpreted as resulting in TTS or AUD INJ onset.

Finneran et al. (2005b) measured TTS in bottlenose dolphins exposed to 3 kHz tones with various durations and SPLs in a quiet pool. The degree of TTS was positively correlated with the SEL, and statistically significant degrees of TTS were observed for SELs > 195 dB re 1 $\mu Pa^2 s$. These data agree with those reported by Schlundt et al. (2000) and Nachtigall et al. (2004) and support the use of 195 dB re 1 $\mu Pa^2$ s as a threshold for TTS onset in dolphins and belugas exposed to mid-frequency (MF) sounds. Finneran et al. (2005b) also found that each additional dB of SEL produced an additional 0.4 dB of TTS and that, for TTSs of 3 to 4 dB, recovery was nearly complete within 10 min following exposure. For larger TTSs, longer recovery times were required; however, Finneran et al. (2005b) caution that interpretation of TTS growth and recovery curves is hampered by the very small degrees of TTS measured relative to the variability of the measurements. They also note that not all exposures above a certain TTS threshold will cause TTS. For example, only 18% of exposures to an SEL of 195 dB re 1 $\mu Pa^2$ s resulted in measurable TTSs.

The TTS threshold for odontocetes exposed to a single impulse from a water gun appears to be lower than that for exposure to non-impulse sound (Finneran et al. 2002a). An SEL of 186 dB re 1 $\mu Pa^2$ s resulted in a mild TTS in a beluga whale; however, these measurements were made in the presence of band-limited white sound (masking sound), which may have resulted in a lower TTS than would have been observed in the absence of masking sound. Data from terrestrial mammals also show that broadband pulsed sounds with rapid rise times have a greater auditory effect than non-impulse sounds (Southall et al. 2007). Finneran et al. (2015) exposed three dolphins to sequences of 10 impulses from a seismic air gun (maximum unweighted cumulative SEL = 193 to 195 dB re 1 $\mu Pa^2 s$, peak SPL = 196 to 210 dB re 1 μPa) without measurable TTS. The rms level of an airgun pulse is typically 10 to 15 dB higher than the SEL for the same pulse when received within a few km of the air guns; therefore, a single airgun pulse might need to have a received level of ~196 to 201 dB re 1 μPa rms to produce a brief, mild TTS. Exposure to several strong seismic pulses, each with a flat-weighted received level near 190 dB rms (175 to 180 dB SEL) could result in cumulative exposure of ~186 dB SEL and, thus, a slight TTS in a small odontocete.

The recent discovery of auditory gain control was described for several cetacean species, including the false killer whale (Nachtigall and Supin 2008), bottlenose dolphin (Mooney et al. 2009a) and harbor porpoise (Linnenschmidt et al. 2012). Following conditioning with an auditory cue warning of impending loud sounds, false killer whales, bottlenose dolphins, harbor porpoise, and beluga whales (Nachtigall et al. 2016) were able to change their hearing thresholds during echo location, providing a temporary reduction in susceptibility to noise exposure. Although this evidence is intriguing, it is unknown if the auditory gain control may afford “protection” to odontocetes exposed to noise in contexts that may be predictable. This finding, however, suggests that these species may be able to learn to change their hearing sensation levels when warned that loud sounds are imminent, and could render hearing exposure criteria to be somewhat conservative in these scenarios (Nachtigall et al. 2018).

Lucke et al. (2009) found that TTS occurred in harbor porpoise upon exposure to one airgun pulse with a received level of ~200 dB re 1 µPa peak to peak or an SEL of 164.3 dB re 1 $\mu Pa^2$ s. Kastelein et al. (2012a) exposed harbor porpoise to an octave-band sound centered around 4 kHz at three mean received SPLs (124, 136, and 148 dB re 1 µPa), six durations (7.5, 15.0, 30.0, 60.0, 120.0, and 240.0 min), while the approximate SELs varied from 151 to 190 dB re 1 $\mu Pa^2$ s. The lowest SEL (151 dB re 1 $\mu Pa^2$ s) that caused a significant TTS was the porpoises’ exposure to SPL 124 dB re 1 µPa for 7.5 min. The maximum $TTS_{1\text{-}4}$ induced after 240 min of exposure to 148 dB was around 15 dB re 1 µPa at an SEL of 190 dB re 1 $\mu Pa^2$ s. Depending on the exposure level, duration, and the TTS, recovery time varied from 4 to 96 min; however, the longer the exposure duration, the higher the TTS and the longer the recovery time (Kastelein et al. 2012a and 2012b).

Southall et al. (2019) state that, as in humans, noise exposure criteria for marine mammals should consider potential long-term hearing loss that occurs by cumulative exposure over an animal’s lifetime. They admit that unfortunately the available data for marine mammals are currently inadequate to predict long-term noise-induced hearing loss from cumulative exposure. By studying all available data from evaluations of hearing, auditory anatomy, and sound production from different marine mammal species, Southall et al. (2019) were able to derive audiograms, auditory weighting functions [developed by Finneran (2016)], and TTS/PTS exposure functions. Previous to this, many scientists had used a simple inverse audiogram approach to assess noise exposure susceptibility (Verboom and Kastelein 2005).

When estimating the amount of sound energy required for the onset of TTS, it is generally assumed that the effect of a given cumulative SEL from a series of pulses is the same as if that amount of sound energy were received as a single strong sound (Southall et al. 2007). Data from Finneran et al. (2010a) confirmed potential for accumulation of TTS across multiple exposures and that TTS growth and recovery can occur between exposures (Finneran et al. 2010a); however, for two exposures with equal SELs, the exposure with the longer duration will tend to produce a larger TTS (Finneran et al. 2010b).

### 7.3.2 TTS in Baleen Whales

Most studies on TTS in marine mammals have been conducted on captive animals. Seals, sea lions, and toothed whales are more commonly available for such studies than baleen whales, which are much larger and not typically held in captivity. There are still no direct measurements of underwater hearing available for any mysticete and there are not likely to be any in the near future (Southall et al. 2019). Anatomical data and modeling can be used to estimate audible ranges and frequencies of best hearing but cannot be used to estimate hearing sensitivity.

### 7.3.3 TTS in Pinnipeds

TTS has been measured for only three pinniped species: harbor seals, California sea lions, and northern elephant seals. Of the three species for which data are available, the harbor seal exhibits TTS onset at the lowest SELs to non-pulsed sounds. A 25-min exposure to a 2.5 kHz sound elicited a TTS in a harbor seal at an SPL of 152 dB re 1 µPa (SEL 183 dB re 1 $\mu Pa^2$ s), as compared to 174 dB re 1 µPa (SEL 206 dB re 1 $\mu Pa^2$ s) for the California sea lion and 172 dB re 1 µPa (SEL 204 dB re 1 $\mu Pa^2$ s) for the northern elephant seal (Kastak et al. 2005). Kastelein et al. (2012b) found that harbor seals exhibited statistically significant TTS when exposed to unweighted source levels of 136 dB re 1 $\mu Pa^2$ s for 60 min and 148 dB re 1 $\mu Pa^2$ s for 15 min. Finneran et al. (2003) suggest that the equal energy rule may apply to pinnipeds; however, Kastak et al. (2005) found that for harbor seals, California sea lions and elephant seals exposed to prolonged non-impulse sound, higher SELs were required to elicit a given TTS if exposure duration was short than if it was longer. For example, for a non-impulse sound, doubling the exposure duration from 25 to 50 min (a 3-dB increase in SEL) had a greater effect on TTS than an increase of 15 dB (95 versus 80 dB) in SEL. These results are similar to those reported by Mooney et al. (2009a and 2009b) for bottlenose dolphins and emphasize the need for taking SPL and duration into account when evaluating the effect of sound exposure on marine mammal auditory systems. Sills et al. (2020) evaluated TTS onset levels for impulsive noise in bearded seals. Bearded seal hearing was evaluated at both 100 Hz and 400 Hz. No evidence of a TTS was found following single seismic air gun shots at an SEL of 185 dB re 1 $\mu Pa^2$ unweighted and 207 dB re 1 µPa peak-to-peak sound pressure. As the number of exposures increased from 1 to 10, however, transient shifts in hearing thresholds at 400 Hz became apparent following exposure to four to ten consecutive pulses (SEL 191-195 dB re 1 $\mu Pa^2$ s; 167-171 dB re 1 $\mu Pa^2$ s with frequency weighting for phocid carnivores in water). The largest shift measured following exposure was +9.4 dB. Following exposures, the bearded seal's hearing recovered quickly and always returned to baseline levels during post-exposure testing (16 min).

### 7.3.4 AUD INJ in Marine Mammals

Some causes of AUD INJ which includes but is not limited to PTS, are severe extensions of effects underlying TTS (e.g., irreparable damage to sensory hair cells). Others involve different mechanisms, for example exceeding the elastic limits of certain tissues and membranes in the middle and inner ears and resultant changes in the chemical composition of inner ear fluids (Ward 1997; Yost 2000). The onset of PTS is determined by pulse duration, peak amplitude, rise time, number of pulses, inter-pulse interval, location, species and health of the receiver's ear (Ketten 1994). The relationships between TTS and AUD INJ thresholds have not been extensively studied in marine mammals and there is not conclusive evidence that exposure to loud sound pulses can cause PTS in marine mammals, however, there is speculation that it can (e.g., Richardson et al. 1995; Gedamke et al. 2008). In terrestrial mammals, prolonged exposure to sounds loud enough to elicit TTS can cause PTS. Similarly, shorter term exposure to sound levels well above the TTS threshold can also cause PTS (Kryter 1985). Terrestrial mammal PTS thresholds for impulse sounds are thought to be at least 6 dB higher than TTS thresholds on a peak-pressure basis (Southall et al. 2007). Also, pulses with rapid rise times can result in PTS even when peak levels are only a few dB higher than the level causing slight TTS.

Southall et al. (2019) used available marine mammal TTS data and extrapolation procedures based on audiograms, weighting functions, and underwater noise exposure criteria to estimate exposures that may be associated with TTS and AUD INJ onset. For terrestrial mammals, TTS exceeding 40 dB generally requires a longer recovery time than smaller TTS, which suggests a higher probability of irreversible damage (Ward 1970) and possibly different underlying mechanisms (Kryter 1994; Nordman et al. 2000). Based on this and the similarities in morphology and functional dynamics among mammalian cochleae, Southall et al. (2007) assumed that AUD INJ would be likely if the hearing threshold were increased by more than 40 dB and assumed an increase of 2.3 dB in TTS with each additional dB of sound exposure. This translates to an injury criterion for pulses that is 15 dB above the SEL of exposures causing TTS onset. Finneran et al. (2002) found TTS onset in belugas exposed to a single pulse of sound at an SEL of 183 dB re 1$\mu Pa^2$s.

Therefore, according to the assumptions above, the AUD INJ threshold would be ~198 dB re 1µPa$^2$s SEL for a single pulse.

AUD INJ onset in pinnipeds is not currently well understood. A study by Reichmuth et al. in 2019 looked at long-term noise-induced AUD INJ in a harbor seal (*Phoca vitulina*). In the study, the harbor seal was exposed to a 4.1-kHz underwater tone that was incrementally increased in SPL and duration. The seal's hearing was evaluated to identify noise parameters associated with TTS onset. However, no reliable TTS was measured until a second exposure to a 60-s fatiguing tone of 181 dB re 1 μPa SPL, after which a large threshold shift (> 47dB) was observed. The seal's hearing recovered within 48 hr, though there was a PTS of at least 8 dB at 5.8 kHz. This hearing loss was evident for more than 10 years. Additionally, a residual threshold shift of 11 dB that lasted more than two years was detected one octave above the tonal exposure at 8.2 kHz.

Winter season pile driving is analyzed to occur intermittently for a total of 14 days in Year 1 through Year 5. Exploratory pile driving is analyzed to occur for 6 days in Year 2 and 12 days in Year 4. Soft-start procedures are part of the mitigation plan to alert marine mammals of increasing sound exposure. The seasonal timing of the winter pile driving is such that the animals are less likely to be present especially beluga whales (Castellote et al. 2025). Other mitigation measures, discussed in Section 11, will be implemented to minimize sound exposure to marine mammals during all class of activities.

# 8. DESCRIPTION OF POTENTIAL IMPACT ON SUBSISTENCE USES

*The anticipated impact of the activity on the availability of the species or stocks of marine mammals for subsistence uses.*

## 8.1 DESCRIPTION OF THE COMMUNITIES AND SPECIFIC HUNTS THAT MAY BE AFFECTED

Subsistence communities identified as project stakeholders near Hilcorp's middle Cook Inlet activities include the Kenaitze Indian Tribe, the Village of Salamatof, and the Native Village of Tyonek. A description of subsistence activities in each stakeholder community is discussed in the following sections.

### 8.1.1 Kenai (Yaghanen) – "The Good Land"[13]

Kenai occurs near the southern geographic area of Hilcorp's 2025 to 2029 activities outlined in this Petition. The following provides a brief description of Kenai and stakeholders in Kenai:

- Incorporated as a 2$^{nd}$ Class City in the Kenai Peninsula Borough in 1960
- Federally Recognized Tribe: Kenaitze Indian Tribe
- Village Corporation: Kenai Native Association, Inc.
- Regional Native Corporation: Cook Inlet Region, Inc. (CIRI)
- Population: 7,562 (U.S. Census Bureau 2023)
- Travel is by road and air, year-round

Oil and gas exploration, development, production, and decommissioning activities occurring closest to Kenai are pile driving, plugging and abandonment associated with offshore exploratory drilling, and tugs under load with a jack-up rig in support of offshore production and exploratory drilling. Tugs under load with a jack-up rig will depart from and return to Nikiski and will transit from other platforms in the inlet to within the MGS Unit located in State of Alaska waters north and west ~24 km (15 mi) of Kenai. The last ADF&G subsistence survey conducted in Kenai was in 2008 (Wolfe et al. 2009). In the greater Kenai area, an estimated 13 harbor seals and no sea lions were harvested in 1988 by an estimated 10 households. In the Kenai area, estimated harbor seal harvests have ranged between 13 (1998) and 35 (1997) animals. In 1996, two sea lions and six harbor seals were harvested. No sea otters have been reported harvested in Kenai.

### 8.1.2 Salamatof (Salamatowa/Ken Dech' Etl't) – "Scrub Timber Flat Lake"[14]

Salamatof occurs near the southern geographic area of Hilcorp activities outlined in the Petition. The following provides a brief description of Salamatof and stakeholders in Salamatof:

- Federally Recognized Tribe: Salamatof Tribal Council
- Village Corporation: Salamatof Native Association, Inc.

[13] https://www.ciri.com/our-corporation/ciri-lands/cook-inlet-region-villages/

[14] https://salamatof.com/about-snai

- Regional Native Corporation: CIRI
- Population: 1,201 (U.S. Census Bureau 2023)
- Travel is by road, year-round, also including access to an airstrip near Salamatof (Salamatowa/Ken Dech' Etl't) (Ninilchik Airport)

Oil and gas exploration, development, production, and decommissioning activities occurring closest to Salamatof are pile driving, P&A associated with offshore exploratory drilling, and tugs under load with a jack-up rig in support of offshore production and exploratory drilling. Tugs under load with a jack-up rig will depart from and return to  Rig Tenders Dock in Nikiski and will transit from other platforms in the inlet to within the MGS Unit located in State of Alaska waters north and west ~16 km (10 mi) of Salamatof. ADF&G Community Subsistence Information System harvest data are not available for Salamatof, however, Hilcorp assumes that the subsistence harvest patterns are similar to other communities along the road system on the southern Kenai Peninsula, namely Kenai.

### 8.1.3 Tyonek (Tubughnenq) – "Beach Land"[15]

Tyonek occurs near the northern geographic area of Hilcorp activities. The following provides a brief description of stakeholders in Tyonek:

- Federally Recognized Tribe: Native Village of Tyonek and Tribal Council
- Village Corporation: Tyonek Native Corporation
- Regional Non-Profit: Tebughna Foundation
- Regional Non-Profit: Tyonek Tribal Conservation District
- Regional Native Corporation: CIRI
- Population: 291 (U.S. Census Bureau 2023)
- Travel is by air, year-round (Tyonek Airport)

Oil and gas exploration, development, production, and decommissioning activity occurring closest to Tyonek comprises tugs under load with a jack-up rig in Trading Bay and middle Cook Inlet; pile driving at the Tyonek platform; and pile driving between the Anna and Bruce platform. The Tyonek platform is in the North Cook Inlet Unit in middle Cook Inlet, ~9.7 km (~6 mi) offshore and to the east of Tyonek. The Anna and Bruce platforms are in the Granite Point Unit at the north end of Trading Bay. The Bruce platform is nearer to shore than the Anna which is located ~4.8 km (~3 mi) offshore and to the southeast of Tyonek. On the western side of middle Cook Inlet, Tyonek has a subsistence harvest area that extends south from the Susitna River to Tuxedni Bay (Fall et al. 1984; Stanek et al. 2007). Moose and salmon are the most important subsistence resources measured by harvested weight (Stanek 1994). In Tyonek, harbor seals were harvested between June and September by 6% of the households (Jones et al. 2015). Seals were harvested in several areas, encompassing an area stretching 32 km (20 mi) along the Cook Inlet coastline from the McArthur Flats north to the Beluga River. Seals were searched for or harvested in the Trading Bay areas, as well as, from the beach adjacent to Tyonek (Jones et al. 2015).

[15] https://www.ciri.com/our-corporation/ciri-lands/cook-inlet-region-villages/

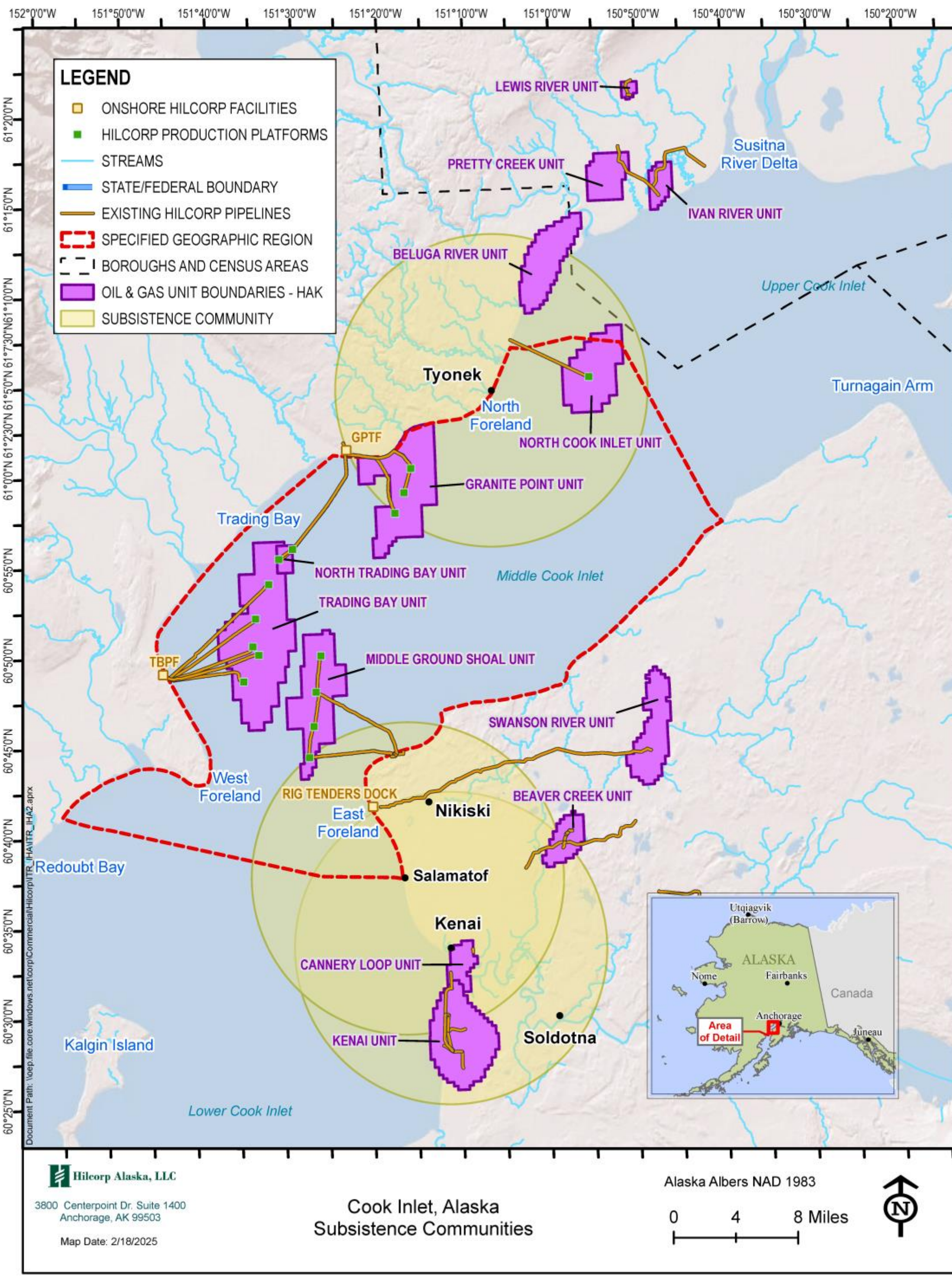
## 8.2 SPATIAL AND TEMPORAL OVERLAP

Currently, whale hunts are not known to occur in Cook Inlet. Hilcorp's class of activities may overlap temporally with subsistence hunting areas for other marine mammals, e.g., seals, because of their occurrence during summer and fall months. However, subsistence harvests typically occur close to shore and are concentrated near the communities and mouths of rivers rather than offshore near where the class of activities will occur. Subsistence use areas within the specific geographic region are shown in Figure 21.

## 8.3 TRADITIONAL KNOWLEDGE

Hilcorp respects and values Alaska Native perspectives and is committed to using traditional/subsistence knowledge to inform planning for 2025 to 2029 activities. Stakeholder outreach, as described in Section 12 and in Appendix B (Stakeholder Engagement Plan), will help Hilcorp understand these perspectives and incorporate them into plans, where applicable, to avoid or mitigate potential impacts on the natural environment, including marine waters and mammals.

## Figure 21. Subsistence Use Areas by Community from ADF&G in the Specific Geographic Region



## 8.4 SUBSISTENCE HUNTING OF BELUGA WHALES

The CIBW has traditionally been hunted by Alaska Natives for subsistence purposes. For several decades prior to the 1980s, residents of the Native Village of Tyonek were the primary subsistence hunters of CIBWs. During the 1980s and 1990s, Alaska Natives from villages in the western, northwestern, and North Slope regions of Alaska either moved to or visited the southcentral region and participated in yearly subsistence harvest (Stanek 1994). From 1994 to 1998, NMFS estimated that 65 whales per year (range 21 to 123) were harvested, including those successfully taken for food and those struck and lost. NMFS has concluded that this number is high enough to account for the estimated 14% annual decline in population during this time (Hobbs et al. 2008). Actual mortality may have been higher, given the difficulty of estimating the number of whales struck and lost during the hunts. In 1999, a moratorium was enacted (Public Law 106-31) prohibiting the subsistence take of CIBWs except through a cooperative agreement between NMFS and the affected Alaska Native organizations.

On October 15, 2008, NMFS published a final rule that established long-term harvest limits on the CIBWs that may be taken by Alaska Natives for subsistence purposes (73 FR 60976). The rule prohibits harvest for a 5-year period (2008 to 2012), if the average abundance for the CIBWs from the prior 5 years (2003 to 2007) is below 350 whales. As of June 2023, the median population estimate for CIBWs was 331 whales. The next 5-year period that could allow for a harvest (2028 to 2032), would require the previous 5-year average (2023 to 2027) to be > 350 whales. Since the CIBW harvest was regulated in 1999 requiring cooperative agreements, five beluga whales have been struck and harvested. Those beluga whales were harvested in 2001 (one animal), 2002 (one animal), 2003 (one animal), and 2005 (two animals). A co-management agreement was not reached in 2007. The Native Village of Tyonek agreed to not hunt or request a hunt during that year (NMFS 2008a).

The 2008 CIBW Subsistence Harvest Final Supplemental Environmental Impact Statement (NMFS 2008a) authorizes the number of beluga whales that can be taken during a 5-year interval based on the 5-year population estimates and 10-year measurement of the population growth rate. Based on the 2008 to 2012 5-year abundance estimates, no hunts occurred between 2008 and 2012 (NMFS 2008a). The Cook Inlet Marine Mammal Council, which managed the Alaska Native Subsistence fishery with NMFS, was disbanded by a unanimous vote of the Tribes' representatives on June 20, 2012. No harvest has occurred since the council was disbanded.

Residents of the Native Village of Tyonek are the primary subsistence users in Knik Arm area (73 FR 60976). No households hunted beluga whales locally in Cook Inlet due to conservation concerns (Jones et al. 2015). The class of activities should not have any effect regarding subsistence use, because no beluga harvest has taken place since 2005 and because beluga hunts are not expected during the requested ITR period.

## 8.5 SUBSISTENCE HUNTING OF COOK INLET PINNIPEDS

The only non-ESA-listed marine mammal available for subsistence harvest in Cook Inlet is the harbor seal (Wolfe et al. 2009). Subsistence hunting for harbor seals in Cook Inlet occurs at a low level (Wolfe et al. 2009). Seal hunting occurs opportunistically among Alaska Natives who may be fishing or traveling in upper Cook Inlet near the mouths of the Susitna River, Beluga River, and Little Susitna River. Data on subsistence harvest of Western DPS Steller sea lion stopped being collected in 2009. The mean annual subsistence take (harvested plus struck and lost) from the Steller sea lion Western DPS from 2004 through 2008, combined with the mean annual take from St. Paul, St. George, Akutan, and Atka Islands, between 2017 and 2021 is 218 sea lions per year (Young et al. 2024).

Harbor seals were harvested in Tyonek between June and September by 6% of the households (Jones et al. 2015). Seals were harvested in several areas, encompassing a region spanning 32 km (20 mi) along the Cook Inlet coastline from the McArthur River Flats north to the Beluga River. Seals were searched for or harvested in the Trading Bay area as well as from the beach adjacent to Tyonek (Jones et al. 2015). Table 45 summarizes findings from Jones et al. (2015) and Jones and Kostick (2016) regarding marine mammal harvest in the community of Tyonek.

**Table 45. Harbor Seal Harvest by Tyonek in "Representative Year" 2013**

| Community | Harbor Seal | | |
|---|---|---|---|
| | Percentage of Harvest | Total Harvest in Pounds | Percentage of Household Usage |
| Tyonek | 100 (100%) | 360 | 14 (14%) |

**Notes:** Sources: Jones et al. 2015

## 8.6 SUBSISTENCE HUNTING OF OTHER MARINE MAMMALS

Quotas for harvesting marine mammals not listed were not found in Cook Inlet. The available data on subsistence harvest of harbor porpoises, humpback whales, and killer whales in Alaska come from assessments covering the Gulf of Alaska, which includes Cook Inlet but does not specifically represent its harvest. Studies by Jones et al. (2015) and Jones and Kostick (2016) did not report subsistence harvest in Tyonek for harbor porpoises, humpback whales, or killer whales. As the proposed activities would cause only temporary disturbances and not affect the availability of these species for subsistence use, there is no expected impact on their harvest.

## 8.7 POTENTIAL IMPACTS ON AVAILABILITY FOR SUBSISTENCE USES

Section 101(a)(5)(A) requires NMFS to determine that taking would not have an unmitigable adverse effect on availability of marine mammal species or stocks for subsistence use. NMFS has defined ''unmitigable adverse impact'' in 50 CFR 216.103 as an impact resulting from the class of activities:

1. That is likely to reduce the availability of the species to a level insufficient for a harvest to meet subsistence needs by:
   a. Causing the marine mammals to abandon or avoid hunting areas;
   b. Directly displacing subsistence users; or
   c. Placing physical barriers between the marine mammals and the subsistence hunters.
2. That cannot be sufficiently mitigated by other measures to increase the availability of marine mammals to allow subsistence needs to be met.

The primary subsistence concern is that the disturbance of marine mammals through the introduction of anthropogenic sound into the marine environment may cause them to be behaviorally harassed and either become more difficult to hunt or temporarily abandon traditional hunting grounds. As Hilcorp's activities are generally offshore and/or away from river mouths, where subsistence hunting occurs, subsistence hunting is not expected to be affected. In addition, mitigation measures would be implemented to minimize the effects of project activities on marine mammals and habitat. Because of the temporary, localized nature of activities and based on the analyses and information presented in the previous sections, impacts to any marine mammal harvest potential are expected to be negligible.

Hilcorp will host an online informational meeting in the spring before activities start. The list of stakeholders who shall be invited and with whom Hilcorp will engage are listed in Attachment A of the Stakeholder Engagement Plan. The online meeting will provide a description of activities, location, duration, and points of contact for questions. Through the online meetings, Hilcorp will consult with stakeholders to heed and address their concerns about the activities' potential impact on subsistence uses, when possible.

Legitimate issues, questions, and problems associated with the proposed actions will be addressed on a case-by-case basis. Hilcorp personnel and associated contractors are instructed to be open and transparent regarding activities. If conflicts arise, Hilcorp will engage and track the proper parties to address and work to find resolution, if possible. Hilcorp has prepared a Stakeholder Engagement Plan outlining engagement with the subsistence communities adjacent to their activities. The Stakeholder Engagement Plan is provided in Appendix B and may be revised, as necessary.

# 9. DESCRIPTION OF IMPACT ON MARINE MAMMAL HABITAT

*The anticipated impact of the activity upon the habitat of the marine mammal populations, and the likelihood of restoration of the affected habitat.*

Section 1 provides an in-depth description of the exploration, production, and pipeline activities slated for the geographic region outlined in Figure 1 and spanning the period of this Petition (2025 through 2029). These activities encompass all significant aspects linked to active oil and gas leases. No temporary or permanent physical impacts on habitats are anticipated resulting from the class of activities proposed; the potential impacts to marine mammal habitat in Cook Inlet from the Petition activities are discussed in the following sections.

## 9.1 PHYSICAL IMPACTS ON HABITAT

### 9.1.1 Seafloor Disturbance

The activities covered in this Petition involve various actions that can cause seafloor disturbance. These include such activities as pinning the legs of jack-up rig on the seafloor, pile driving during production well development and exploratory well drilling, as well as anchor handling and pipe pulling during pipeline replacement or installation. All production drilling will be accomplished through existing well structures. The production well development will involve driving ten 76.2-cm (30-in) diameter (or smaller) steel piles into sediment surrounding the existing platform legs. The total area of soft substrate loss as a result of production well development at the Tyonek platform is estimated to be 3.04 $m^2$ (32.71$ft^2$). The *Spartan-151* jack-up rig has three spudcans (legs) that will make contact with the seafloor. Each spudcan has a diameter measuring 10.6 m (34 ft 8-3/4 in). The spudcans, anchors, and pipe connecting with the seafloor may result in compaction of the sediments. Additionally, some burial and smothering of benthic species may occur temporarily within a radius of ~500 m (0.78 $km^2$) around the production well development site. The strong tidal actions and currents within Cook Inlet, however, will likely resuspend and disperse sediment plumes.

During jack-up rig operations, the Spartan 151 drill rig is estimated to disturb ~0.01 $km^2$ (2.5 acres) of seafloor during rig placement and removal activities at a given site (BOEM 2017). During exploratory drilling one 76.2-centimeter (cm; 30-inch [in]) diameter steel pile will be driven at each well site: 2-at the MGS Unit and 1-between the Anna and Bruce platforms. Seafloor disturbance from jack-up rig legs and pile driving have a relatively small footprint in comparison to the entire seafloor of the action area as detailed above. Some burials and smothering of benthic species may occur within close proximity to the well sites. Sediment resuspension may also occur, although the tidal complexities within Cook Inlet would negate any potential long-term resuspension effects. Local tides and currents disperse suspended sediments at a moderate to rapid rate depending on tidal stage.

### 9.1.2 Drilling Discharges

Waste generated during exploratory drilling, such as drilling fluids (referred to as mud) and rock cuttings, will be circulated from the downhole to the jack-up mud pit system. Non-hydrocarbon-based drilling wastes will either be discharged into the Cook Inlet under an approved APDES general permit or transported to a designated waste disposal facility. Hydrocarbon-based drilling waste will be transported to a permitted onshore location for proper disposal. Hilcorp will use BMPs, and all conditions outlined in the relevant permits governing this Petition's activities.

### 9.1.3 Other Discharges

Vessels equipped with toilet facilities are required to have either Type II or Type III marine sanitation devices (MSDs) that comply with 40 CFR 140 and 33 CFR 159 standards for handling sanitary waste. A Type II MSD processes waste solids through maceration, resulting in a discharge containing < 150 milligrams per liter of suspended solids and a bacteria count of fewer than 200 per 100 milliliters. On the other hand, Type III MSDs are more commonly used systems designed to retain or treat sanitary waste until it can be properly disposed of at onshore facilities. Domestic and gray water discharges, encompassing materials from sinks, showers, laundry, safety showers, eyewash stations, hand-wash stations, and galleys, are subject to regulation by state and local governments. Other authorized discharges from project activities may include desalination unit brine, cooling water, bilge and ballast water, deck drainage and other miscellaneous discharges. Most of these discharges would be rapidly diluted in receiving waters and no effects are expected on marine mammal species. Discharges are regulated through the NPDES permit, and impacts from exposure to pollutants, suspended solids or bacterial or viral loads contained in the effluents discharged in compliance with permit requirements are likely undetectable (BOEM 2017).

### 9.1.4 Invasive Species

Ships have the potential to affect the quality of marine mammal habitats by introducing invasive aquatic organisms. These invasive species can disrupt food webs, outcompete native invertebrates, and lead to habitat degradation. To address this issue, all vessels entering the State of Alaska or federal waters must comply with USCG 33 CFR 151 regulations. These regulations aim to minimize the transfer of aquatic invasive organisms. Specifically, the discharge of untreated ballast water into U.S. waters is prohibited unless the ballast water has undergone a mid-ocean exchange at least 370 km (200 nm) offshore, as mandated by federal regulations (33 CFR 151.2025). Vessel operators are also obligated to regularly remove fouling organisms from the hull, piping, and tanks, disposing of them in accordance with local, state, and federal regulations (33 CFR 151.2035(a)(6)). Adhering to these USCG regulations would decrease the risk of construction-related vessel traffic introducing harmful aquatic invasive species.

## 9.2 POTENTIAL IMPACTS FROM SOUND ON PREY SPECIES

### 9.2.1 Zooplankton

Zooplankton serves as a crucial food source for various marine mammal species and fish, forming a link in the food chain where the fish, in turn, become prey to marine mammals. The potential impacts on zooplankton populations could have indirect consequences on marine mammals. Limited data are available regarding the effects of underwater sound on zooplankton, particularly sound originating from ship traffic and construction activities (Erbe et al. 2019). Sound energy associated with project activities includes sources such as pile driving. Popper and Hastings (2009) conducted a review on the effects of human-generated sound and found insufficient data to determine whether sound levels from activities like pile driving, seismic operations, or other human-made sounds would have physiological effects on invertebrates. Any potential effects would likely be confined to the immediate vicinity (1 to 5 m [3.2 to 16.4 ft]) of the sound source, with no significant population-wide impacts. This is due to the limited area affected at any given time and the reproductive characteristics of most zooplankton species, which feature short generation times, high fecundity, and very high natural mortality.

No significant effect on zooplankton populations is anticipated from project activities. This is attributed to zooplankton's high reproductive rates and the naturally high levels of predation and mortality within their populations. Any mortalities or effects resulting from the activities described in this Petition are expected to be minimal compared to the natural rates of reproduction and mortality.

### 9.2.2 Benthos

No adverse impacts on benthic populations are expected as a result of project activities. The sea floor will not be affected by tugs towing a jack-up rig; however, mild impacts are expected to result from pinning the jack-up rig, well development pile driving, exploratory well drilling and pile driving, anchor handling and pipe pulling. Jack-up legs, anchors or pipe contact with seafloor may result in the death or displacement of some benthic organisms due to direct impact from activity equipment (i.e., jack-up legs, anchors, pipelines, and piles).

The *Spartan-151* jack-up rig's drilling activities are anticipated to have a low impact on benthic organisms due to the relatively small total area of its three spudcans contacting the seafloor. Each spudcan has a footprint diameter of 10.6 m (34 ft 8-3/4 in). All production drilling will be accomplished through existing well structures. Pipe driving and exploratory drilling will have very minimal impact on the seafloor given the small pipe diameter (76.2 cm [30 in]). Benthic organisms have large reproductive capacities and naturally high levels of predation and mortality, and, as a result, mortalities or impacts that might occur in disturbed areas are likely to be recolonized quickly following benthic disturbance. Amphipods, copepods, nematodes, polychaetes, and shrimp species are often among the first animals to recolonize, usually in less than a year (BOEM 2015; Trannum et al. 2011). Based on benthic organisms naturally occurring rates of reproduction and mortality, benthic impacts from Hilcorp’s operations are considered negligible.

Fish represent the principal trophic resource for numerous marine mammal species within Cook Inlet. Beluga whales feed on a spectrum of prey species: fish, shrimp, squid, and octopus (Burns and Seaman 1986). In the confines of Knik Arm, beluga whales primarily target prey such as salmon, eulachon, and cod. Harbor seals, characterized by opportunistic feeding habits, display a diet inclusive of fish like pollock, cod, capelin, eulachon, Pacific herring, and salmon, alongside a varied selection of benthic organisms such as crabs, shrimp, and cephalopods. The dietary composition of harbor seals demonstrates both temporal and spatial variations. Within the Gulf of Alaska, harbor seals exhibit a distinct dietary preference, favoring pollock, octopus, capelin, eulachon, and Pacific herring (Calkins 1989). Furthermore, their diet encompasses additional prey species, including cod, flat fishes, shrimp, salmon, and squid (Hoover 1988). Harbor porpoises are predominantly piscivorous, preying on Pacific herring, cod, whiting (hake), pollock, squid, and octopus (Leatherwood et al. 1982). Killer whales, exhibiting ecotype-dependent dietary habits (resident versus transient), consume either fish or other marine mammals (Shelden et al. 2003). Humpback whales in the North Pacific engage in the consumption of Pacific herring, capelin, juvenile walleye pollock, and sand lance. Humpbacks also feed on diminutive schooling fishes such as eulachon, Atka mackerel, Pacific cod, saffron cod, Arctic cod, juvenile salmon, and rockfish (Hain et al. 1982). Additionally, their diet encompasses euphausiids and other large zooplankton. Minke whales employ specialized feeding strategies, such as lung-feeding and bird-associated feeding, to target a varied assemblage of small schooling fish and euphausiids (summarized by Muto et al. 2017).

In general, fish perceive underwater sounds in the frequency range of 50 to 2,000 Hz, with peak sensitivities of < 800 Hz (Popper et al. 2005). Popper et al. (2005), in a review of 40 years of studies concerning the use of underwater sound to deter salmonids from hazardous areas at hydroelectric dams and other facilities, concluded that salmonids were able to respond to LF sound and react to sound sources within a few feet of the source. They speculated that the reason that underwater sounds had no effect on salmonids at distances greater than a few feet is because they react to water particle motion/acceleration, not sound pressures. Detectable particle motion is produced within very short distances of a sound source, whereas sound pressure waves travel farther. Popper et al. (2019) summarized relevant data from 2005 to mid-2018 on the effects of sounds on fishes. The authors concluded that fish exposed to pile-driving sounds may show alarmed responses, including an increase in swimming speed and changes in ventilation and heart rate; however, these transient, startle responses are unlikely to result in adverse impacts because the fish often rapidly return to normal behavior.

Fish have been observed to react when engine and propeller sounds exceed a certain level (Olsen et al. 1983; Ona 1988; Ona and Godo 1990). Avoidance reactions have been observed in fish, including cod and herring, when vessel sound levels were 110 to 130 dB re 1 μPa rms (Nakken 1992; Olsen 1979; Ona and Godo 1990; Ona and Toresen 1988). Vessel sound source levels in the audible range for fish are typically 150 to 170 dB re 1 μPa per Hz (Richardson et al. 1995). Petition activities could be expected to produce levels in this range during certain operations. Based upon the reports in the literature and the predicted sound levels from activities, some temporary avoidance by fish in the immediate area may occur. Overall, no more than negligible impacts on fish are expected as a result of activities described in this Petition.

# 10. DESCRIPTION OF IMPACT FROM LOSS OR MODIFICATION TO HABITAT

*The anticipated impact of the loss or modification of habitat on the marine mammal populations involved.*

No adverse effects on marine mammal habitat are expected as a result of Hilcorp's project activities, and therefore, no effects on the fitness of a marine mammal species or stocks are expected because of impacts on habitat. Additionally, no adverse impacts are expected from project activities on prey species, e.g., zooplankton, benthic organisms, or fish. No barriers will impede movement through or within constricted or important areas. The most likely effects on marine mammal habitat due to the class of activities are temporary, as the activities are short in duration, and produce elevated, in-water sounds in localized, limited areas. In reference to the discussions outlined in Section 9, there will be no adverse effects on marine mammals arising from the loss or modification of their habitat.

# 11. MITIGATION MEASURES TO PROTECT MARINE MAMMALS AND THEIR HABITAT

*The availability and feasibility [economic and technological] of equipment, methods, and manner of conducting such activity or other means of affecting the least practicable adverse impact upon the affected species or stocks, their habitat, and on their availability for subsistence uses, paying particular attention to rookeries, mating grounds, and areas of similar significance.*

To mitigate the disturbance of marine mammals resulting from the class of activities outlined in Section 1, Hilcorp commits to implementing the mitigation measures outlined in the following sections and further elaborated in Appendix A (Marine Mammal Monitoring and Mitigation Plan [4MP]). PSO roles and responsibilities along with observation locations can be found in Section 13.

Table 46 summarizes the clearance zone (CZ)s and shutdown zone (SZ)s designated for each activity class in this Petition. While every activity has associated CZs, not all activities have SZs.

Anchor handling, pipe pulling, and tugs towing, holding, or positioning a jack-up rig will only utilize CZs as tugs under load with a jack-up rig, anchor handling, and pipe pulling cannot safely shutdown once underway or actively engaged in the activity. Impact pile driving will employ CZs and SZs of varying distances based on activity, as described in the subsequent sections.

Additional measures for beluga whales are specified in the subsequent sections.

## Table 46. Summary of Clearance and Shutdown Zones by Activity

| Activity | Functional Hearing Group | Clearance Zone (m) | Shutdown Zone (m) |
|---|---|---|---|
| **Production and Exploratory Drilling** | | | |
| Tugs Towing, Holding, or Positioning a Jack-Up Rig[1] | Beluga Whales | At any distance | - |
| | All Other Marine Mammals | 1,500 | - |
| **Production Well Development at the Tyonek Platform** | | | |
| Winter Pile Driving | All Marine Mammals | 500 | 500 |
| **Exploratory Drilling: MGS Unit and Between Anna and Bruce[2]** | | | |
| Exploratory Pile Driving | VHF Cetaceans | 1,650 | 1,650 |
| | All Other Marine Mammals | 1,200 | 1,200 |
| **Pipeline Replacement or Installation[3]** | | | |
| Anchor Handling[1] | Beluga Whales | At any distance | - |
| | All Other Marine Mammals | 1,500 | - |
| Pipe Pulling[1] | Beluga Whales | At any distance | - |
| | All Other Marine Mammals | 1,500 | - |

**Notes:**
[1] Activities that cannot shutdown once started and therefore have no shutdown zone.
[2] To determine maximum annual exposure estimates, one exploratory well between Anna and Bruce is analyzed to occur in Year 2 and two exploratory wells in the MGS Unit are analyzed to occur in Year 4; however, the exploratory wells may be developed in any separate years during the Petition period.
[3] To determine maximum annual exposure estimates, two pipeline scenarios are analyzed to occur: *Scenario 1* comprises one project using lay barge methods in Year 2 and one project using pipe pull methods in Year 4; *Scenario 2* comprises two projects using lay barge methods in Year 2 and no additional projects thereafter. A maximum of two pipeline projects will occur during the Petition period. Pipeline projects may occur simultaneously in any one year or in separate years year during the Petition period however, only lay barge methodology can be utilized in the same year (i.e., *Scenario 2*).
m – meter(s)
- (dash) – not applicable

## 11.1 MITIGATION MEASURES IMPLEMENTED DURING ALL CLASSES OF ACTIVITY

The following mitigation measures are applicable to all activities outlined in Section 1 and will be followed during the execution of each activity class. Additional details regarding mitigation measures specific to each type of activity within the class of activities are provided in Sections 11.3 to 11.6.

***Pre-Clearance Protocol***

- Immediately prior to the commencement of activities listed above in Table 46, PSOs will conduct a 30-min pre-clearance of the appropriate CZ relative to the activity.
- In the event the entire zone is not visible (e.g., fog, rain, snow, low light), the specific sound-producing activity may not commence until the zone can be "cleared" (clear), unless otherwise specified (i.e., tugs towing a jack-up rig, anchor handling, pipe pulling). See Section 11.2 for further mitigation measures regarding low- or no-light scenarios.
- The CZ will be confirmed clear by the PSO(s) once the following circumstances are met:
    - The zone is absent of any marine mammal(s) for the entire 30 min immediately prior to activity start; or
    - If a marine mammal(s) is observed within the zone, clearance and activity start will be delayed until either:
        - The animal(s) is observed exiting the zone and 30 min have elapsed from that point with no other sightings within the zone; or
        - The animal(s) has not been seen in the zone for 30 min (e.g., species dove in the zone and then was not seen again).
    - And beluga-specific pre-clearance protocols are met.

***Beluga Specific Pre-Clearance Protocol***

For pre-clearance of activities that cannot shutdown once underway, the additional beluga whale mitigation measure outlined below must be implemented:

- If a PSO observes a beluga whale(s) approaching the work area at any distance, the specific activity (i.e., tugs under load with a jack-up rig, anchor handling, pipe pulling) will be delayed until the animal(s) has not been seen for 30 min, unless the delay interferes with the safety of working conditions.

***Protocol During Operations***

- After the zone is cleared, the activity listed in Table 46 may commence. PSOs will continue to monitor appropriate zones and distances to the greatest extent possible during the activity based on the required number of PSOs, required monitoring locations, and environmental conditions. Additionally, Hilcorp will implement further mitigation measures specific to each activity and described in the subsequent sections (11.3-11.6).
- If a species for which authorization has not been granted or a species for which authorization has been granted but the authorized takes have been reached, is observed approaching, entering, or within the zone, in-water work must be delayed (if during pre-clearance) or shut down (except tugs

towing jack-up rig, pipe pulling, or anchor handling activity if already initiated) and NMFS should be notified. Activities must not resume until directed by the Project Manager or NMFS.

***Shutdown Protocol***

- If a SZ is employed for an activity listed in Table 46:
  - An immediate shutdown of the sound-producing activity will be implemented any time a marine mammal is detected approaching, entering, or within the SZ.
  - Sound-generating activity will not restart until either:
    - The animal is observed exiting and is on a trajectory away from the SZ; or
    - The animal has not been seen in the SZ for at least 15 min (for pinnipeds) or 30 min (for cetaceans).
  - As tugs towing, holding, or positioning a jack-up rig, anchor handling, or pipe pulling activities cannot cease operations once started, this will not apply to those specific activities.

***Post-Clearance Protocol***

- After cessation of the sound-generating activity within the class of activities included in this Petition and listed in Table 46, PSOs will continue to monitor for an additional 30 min.

## 11.2 MITIGATION USING NIGHT VISION DEVICES

During low-light (i.e., twilight) or no-light operations (i.e., darkness), night-vision devices (NVDs) shown to be effective at detecting marine mammals in low-light conditions (e.g., portable visual search (PVS)-7 model with 5x magnifier, or similar) will be provided to PSOs. NMFS has approved the PVS-7 with the 5x magnifier lens for similar Hilcorp projects in Cook Inlet including tugs towing a jack-up rig (2022 and 2023). The PVS-7 model has a Range of Detection of 1,625 m (5,331 ft) and a Range of Recognition of 1,125 m (3,691 ft) when the 5x magnifier is attached.

If the entire zone is not visible with NVDs due to adverse weather conditions such as snow, rain, or fog, operations may not begin or must cease (except tugs under load with a jack-up rig, anchor handling, pipe pulling) until visibility is restored. If the zone exceeds the viewing capabilities of the NVDs, operations during low-light or no-light conditions should not proceed. NVDs will only be utilized when appropriate visibility can be maintained.

## 11.3 PILE DRIVING MITIGATION MEASURES

The following mitigation measures will be applied during all pile driving activities (i.e., Tyonek production well development, exploratory drilling at the MGS Unit, and exploratory drilling between the Anna and Bruce platforms) in addition to those found in Section 11.1.

Prior to initiating pile driving, the CZ will be cleared. However, as pile driving operations are not continuous and involve intermittent pauses for activities such as welding on pipe extensions, the following procedures shall apply:

- If PSOs do not monitor continuously, the CZ will need to be cleared for 30 min before each pile driving session in adherence with pre-clearance protocols; or

- If PSOs remain on watch continuously, the zone does not need to be cleared again.

***Soft-start Procedures***

A soft-start procedure will be implemented for impact pile driving by the impact hammer operator(s) and documented by the PSO. The procedure employs delayed-strike techniques and serves to notify marine mammals and prey species about the impending hammering activity allowing adequate time to evacuate the area. The soft-start procedure will occur as follows:

1. Initiate three reduced energy (40%) strikes of the hammer;
2. Follow with a 1-min waiting period; then,
3. Repeat with two subsequent reduced energy three-strike sets (i.e., repeat steps 1 and 2).

Additional soft-start mitigation will occur as follows:

- Soft-start procedures will be utilized at the beginning of each day's pile driving activity or if pile driving has ceased for periods of 30 min or more (i.e., between sessions of pile driving).
- After a PSO confirms clearance of the CZ, the crew conducting pile driving operations will be alerted and may commence soft-start procedures.
- Pile driving will not begin during periods of low-light visibility (e.g., twilight, darkness) unless NMFS-approved NVDs can be employed, and the entire CZ can be cleared. See Section 11.2 for further mitigation measures regarding low- or no-light scenarios.
- In the event the entire zone loses visibility (e.g., fog, rain, snow, low light) while operations are active, the activities must cease until the entire zone is fully visible and can be cleared once again.
- Any shutdown due to a marine mammal(s) sighting within the SZ must be followed by a 30-min clearance period of the SZ and a full soft-start procedure.
- Any shutdown for other reasons (e.g., mechanical issues, weather) resulting in the cessation of the sound source for a period of > 30 min must also be followed by a full soft-start procedure.

### 11.3.1 Production Well Development: Winter Pile Driving at the Tyonek Platform

| Winter Season Tyonek Pile Driving | | CZ / SZ |
|---|---|---|
| | All Marine Mammals | 500 m |

The following mitigation measures will be employed during production well development pile driving activities at the Tyonek platform in addition to those found in Section 11.1. PSOs will implement and monitor a CZ / SZ of 500 m (1,640 ft) for all marine mammals.

- Soft-start procedures as outlined above (Section 11.3) must be implemented after completion of pre-clearance.
- Project vessels operating in Cook Inlet for Hilcorp will maintain a distance of 2.4 km (1.5 miles) from the mean lower low water (MLLW) line of the Susitna Delta (MLLW line between the Little Susitna River and Beluga River) between April 15 and November 15.

### 11.3.2 Exploratory Drilling: Pile Driving in the MGS Unit and Between the Anna and Bruce Platforms

| | | |
|---|---|---|
| **Exploratory Pile Driving** | | **CZ / SZ** |
| | VHF Cetaceans | 1,650 m |
| | All Other Marine Mammals | 1,200 m |

The following mitigation measures will be employed during exploratory drilling pile driving activities at the MGS Unit and between the Anna and Bruce platforms in addition to those found in Section 11.1.

- During impact hammering, two CZs and two SZs will be implemented as follows:
  - VHF cetaceans: 1,650 m (5,413 ft)
  - All other marine mammals: 1,200 m (3,937 ft)
- Soft-start procedures as outlined above (Section 11.3) must be implemented after completion of pre-clearance.
- Night operations may occur as long as the CZs and SZs are visible and can be cleared in accordance with pre-clearance protocols and Section 11.2.

## 11.4 TUGS UNDER LOAD WITH A JACK-UP RIG MITIGATION MEASURES

| | | |
|---|---|---|
| **Tugs Towing, Holding or Positioning a Jack-Up Rig** | | **CZ** |
| | Beluga Whales | At any distance |
| | All Other Marine Mammals | 1,500 m[1] |

[1]PSOs will monitor out to the greatest extent possible based on the required number of PSOs, required monitoring locations, and environmental conditions once the zone is cleared to inform potential Level B take determinations.

As tugs towing a jack-up rig are not able to shut down while transiting, PSOs will conduct a pre-clearance period before tugs engage in load bearing activities by observing a 1,500 m (4,921 ft) CZ around the jack-up rig. The 1,500 m (4,921 ft) CZ is a distance to which NMFS generally agrees that PSOs can adequately observe the smaller, more cryptic marine mammals (i.e., porpoises, seals, and sea lions).

In addition to the measures described in Section 11.1, the following mitigation measures will be implemented during jack-up rig transport and will be maintained as long as tugs are under load towing, holding, or positioning the jack-up rig. Additional mitigation measures are in place when towing a jack-up rig to the Tyonek platform and are described below.

- Following clearance and activity start, PSOs will monitor out to the greatest extent possible based on the required number of PSOs, required monitoring locations, and environmental conditions.
- Hilcorp will only conduct tug towing rig activities at night if necessary to accommodate a favorable tide. In these circumstances, every effort will be made to clear the CZ with NVDs; however, it may not always be possible to see and clear the entire CZ prior to nighttime transport.
- If a marine mammal is observed during towing, holding, or positioning, the PSOs will monitor and carefully record any reactions observed until jack-up rig towing, holding, or positioning is concluded (i.e., jack-up legs are pinned on the seafloor). No new operational activities may be

started until the animal leaves the CZ. Shifting from towing to holding or positioning without shutting down is not considered a new operational activity.

- If a marine mammal is observed during transit, the PSO will inform the tug captain. The tug captain will then use his discretion to determine if there is ample time and space to safely alter course. While the PSO may request a course change, the ultimate decision lies with the tug captain, who will consider the safety and practicality of the maneuver with the utmost discretion.

- Hilcorp must conduct tugs towing a jack-up rig operations with a favorable tide unless human safety or equipment integrity are at risk.

- Tug operators will maintain a general tug towing jack-up rig speed of 7 kilometers per hour (km/hr; 4 kt) or less, when safe to do so.

- For transportation of a jack-up rig to or from the Tyonek platform, in addition to the PSOs stationed on the jack-up rig during towing, holding, and positioning activities, one PSO will be stationed on the Tyonek platform to monitor for beluga whales. The PSO will be on watch beginning 1 hr before the jack-up rig is expected to arrive (i.e., scheduled to approach the largest Level B threshold [4,453 m {2.77 mi}]) and will closely monitor the Level A zone (360 m [1,181 ft]) and beyond, to the maximum extent practicable based on the required number of PSOs, required monitoring locations, and environmental conditions.

- Project vessels operating in Cook Inlet for Hilcorp will maintain a distance of 2.4 km (1.5 miles) from the mean lower low water (MLLW) line of the Susitna Delta (MLLW line between the Little Susitna River and Beluga River) between April 15 and November 15.

## 11.5 PIPELINE REPLACEMENT/ INSTALLATION MITIGATION MEASURES

Pipeline activities plan to employ either lay barge or pipe pulling methodology or a combination of both. Shutdowns are not feasible and pose safety risks for tug operators when utilizing either method. Specific mitigation measures in addition to those found in Section 11.1 are outlined for each method in the sub-sections below.

### 11.5.1 Pipeline Replacement/Installation: Lay Barge Method

| | | |
|---|---|---|
| **Anchor Handling** | | **CZ** |
| | Beluga Whales | At any distance |
| | All Other Marine Mammals | 1,500 m[1] |

[1]PSOs will monitor out to the greatest extent possible based on the required number of PSOs, required monitoring locations, and environmental conditions once the zone is cleared to inform potential Level B take determinations.

Anchor handling can only occur during the ~1.5-hr period at one of the four slack tides each day. If anchor handling is not completed during this time (particularly during setup and retrieval), the assist tugs may need to hold the barge in place during the next 4.5-hr tide cycle until slack tide occurs again. As the timeframe to position anchors is so brief, shutdowns are impractical; additionally, as the sound generated by tugs holding the barge is louder than anchor handling operations and so pose a greater acoustic risk, PSOs will conduct a 30-min pre-clearance period before tugs engage in load bearing activities by observing a 1,500 m (4,921 ft) CZ, which must be cleared prior to the start of anchor handling operations. Once anchor handling commences (i.e., anchor setting, retrieving, and anchor moving during pipelay), operations will continue until all anchors are set or retrieved and may continue into the night. The following mitigation will also apply to anchor handling:

- After clearance of the CZ, PSOs will monitor out to the greatest extent practicable based on the required number of PSOs, required monitoring locations, and environmental conditions.

- In the event anchor handling operations continue into the night, PSOs will employ NMFS-approved NVDs to clear the CZ and monitor to the maximum extent practicable based on the required number of PSOs, required monitoring locations, and environmental conditions.

During pipelaying (i.e., anchor moving), the CZ will be cleared prior to the start of anchor handling; however, anchor handling operations are not continuous when laying the pipe; periods of time between pipelaying and moving anchors may be long. Consequently, the following applies:

- If PSOs do not monitor continuously, the CZ will need to be cleared for 30 min before each anchor is moved in adherence with pre-clearance protocols; or

- If PSOs remain on watch continuously, the zone will not need to be cleared again.

- If a beluga is observed between placing an anchor and picking up a new one, the next anchor pick-up cannot occur until the animal(s) has not been seen for 30 min, unless the delay interferes with the safety of working conditions.

### 11.5.2 Pipeline Replacement/Installation: Pipe Pull Method

| | | |
|---|---|---|
| **Pipe Pulling** | | **CZ** |
| | Beluga Whales | At any distance |
| | All Other Marine Mammals | 1,500 m[1] |

[1]PSOs will monitor out to the greatest extent possible based on the required number of PSOs, required monitoring locations, and environmental conditions once the zone is cleared to inform potential Level B take determinations.

PSOs will clear a 1,500 m (4,921 ft) CZ 30-min prior to commencing pipe pull operations. As it is not feasible or safe to shutdown tugs while towing a spool of 305 m (1,000 ft) long pipe in the Cook Inlet tidal environment pipe pulling will not employ a SZ. The following mitigation will apply during pipe pulling:

- Once the CZ is cleared, PSOs will monitor out to the greatest extent possible based on the required number of PSOs, required monitoring locations, and environmental conditions.

- Any one or more of the following mitigation measures may be implemented if a marine mammal is observed during pipe pulling operations if, in the captain’s discretion, it is safe and possible to do so:
  - Reduce speed
  - Alter course

## 11.6 GENERAL VESSEL – BASED MARINE MAMMAL AVOIDANCE MITIGATION MEASURES

Standard vessel mitigation procedures are separate from project-specific mitigation measures that will be observed for vessel-based marine mammal avoidance anytime operating a vessel. Vessel operators will adhere to NOAA Alaska Region Marine Mammal Viewing Guidelines (NOAA 2024) as follows:

1. Always maintain a watch for marine mammals while underway.

2. Avoid approaching within 91 m (100 yards) of marine mammals.

3. Reduce general vessel speed to < 9 km/hr (5 kt) when within 274 m (300 yards) of a whale when operationally feasible and safe to do so.

4. Maintain general tug towing jack-up rig speed of 4 kts (7 km/hr) or less, when safe to do so.

5. Adjust speed to 18.5 km/hr (10 kt) or less when weather conditions reduce visibility to 1.6 km (1 mi) or less.

6. Avoid multiple changes in direction and speed when within 274 m (300 yards) of a whale, unless necessary to reduce the risk of collision.

7. Avoid positioning vessel(s) in the path of marine mammals and cutting in front of marine mammals in a manner or at a distance that causes the marine mammal to change their direction of travel or behavior (including breathing/surfacing pattern).

8. Check the waters immediately adjacent to the vessel(s) to ensure no marine mammals will be injured when the propellers are engaged.

9. Place the engine in neutral, if maritime conditions safely permit (as determined by the captain), to allow a whale(s) to pass beyond the vessel in situations where a whale's course and speed indicate that it is likely to cross in front of the vessel while underway or if vessel is approaching within 91 m (100 yards) of the whale(s).

10. Take reasonable steps to alert other vessels in the vicinity of whale(s).

11. Maintain clean lines (i.e., no lines in the water unless both ends are under tension and affixed to vessels or gear).

***Humpback Specific General Mitigation Measures***

Vessel operators will also adhere to the specific Alaska Humpback Whale Approach Regulations (50 CFR §§ 216.18, 223.214, and 224.103(b)) anytime operating a vessel. Vessel operators will not:

1. approach, by any means, including by interception (i.e., placing a vessel in the path of an oncoming humpback whale), within 91m (300 ft) of any humpback whale;

2. cause a vessel or other object to approach within 91m (300 ft) of any humpback whale; or

3. disrupt the normal behavior or prior activity of a whale by any other act or omission.

***Steller Sea Lion Specific General Mitigation Measures***

Vessel operators will additionally adhere to the specific Western DPS Steller Sea Lion Regulations (50 CFR §§ 224.103(d)) anytime operating a vessel. Vessel operators will:

1. avoid approaching within 5.5 km (3.4 mi) of a Steller sea lion rookery or haulout; and

2. avoid approaching within 914 m (3,000 ft) of any Steller sea lion haulout or rookery.

# 12. ARCTIC PLAN OF COOPERATION

*Where the proposed activity would take place in or near a traditional Arctic subsistence hunting area and/or may affect the availability of a species or stock of marine mammal for Arctic subsistence uses, you must submit either a plan of cooperation (POC) or information that identifies what measures have been taken and/or will be taken to minimize any adverse effects on the availability of marine mammals for subsistence uses.*

Regulations in 50 CFR 216.104(a)(12) require incidental take authorization applicants for activities that take place in Arctic waters to provide a POC or information that identifies what measures have been taken and/or will be taken to minimize adverse effects on the availability of marine mammals for subsistence purposes. NMFS regulations define Arctic waters as waters above 60° N. Much of Cook Inlet is north of 60° latitude. NMFS makes distinctions between the waters in Cook Inlet and waters of the Chukchi and Beaufort Seas.

As presented in Section 8, harbor seals are harvested by the Kenai, Salamatof, and Tyonek communities. Steller sea lions are also harvested, (except in the Tyonek community) but at relatively low rates. A moratorium on harvesting of beluga whales in Cook Inlet is in effect. Hilcorp has developed a Stakeholder Engagement Plan to minimize adverse effects on the availability of subsistence marine mammals for subsistence purposes from the activities described in this Petition.

Because of the short-term, temporary, localized nature of sound-producing activities and relatively low marine mammal subsistence harvest, potential impacts to marine mammals and subsistence hunting will be negligible.

Hilcorp will continue to outreach and interact with stakeholders, as described, and will incorporate feedback into operational planning efforts, as appropriate, to avoid interference with marine mammal subsistence activities.

# 13. MONITORING AND REPORTING

*The suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species, the level of taking or impacts on populations of marine mammals that are expected to be present while conducting activities and suggested means of minimizing burdens by coordinating such reporting requirements with other schemes already applicable to persons conducting such activity. Monitoring plans should include a description of the survey techniques that would be used to determine the movement and activity of marine mammals near the activity site(s) including migration and other habitat uses, such as feeding. Guidelines for developing a site-specific monitoring plan may be obtained by writing to the Director, Office of Protected Resources.*

## 13.1 MONITORING

The Applicant will employ monitoring during the listed activities in Table 46 in this Petition. The monitoring will document any presence of marine mammals; the number and type of marine mammals (i.e., species, sex, age); their location, behavior, and reaction, if any, to project activities; their distance and bearing to the sound source and CZ or SZ; subsequent mitigation efforts; and the effectiveness of those mitigation efforts. Mitigation measures are further discussed in Section 11. Additional information to be collected includes weather conditions, sea state, visibility, daylight, or darkness (NVD use), and glare to understand overall observer effort and the effectiveness of the effort. More details on monitoring methods relative to activity can be found in Appendix A.

General monitoring may occur opportunistically while PSOs are awaiting activity start and as their schedule allows. For example, if the jack-up rig's legs are being pinned down and the tugs are not underpower, PSOs may stay on watch for general monitoring provided they are not exceeding any mandated watch limitations (i.e., more than 4 hr at a time and/or 12 hr in a 24-hr period).

### 13.1.1 Protected Species Observers

Mitigation and monitoring will be employed as described in Hilcorp's 4MP (see Appendix A) for marine mammals using NMFS-approved PSOs for all activities for which take authorization has been requested in this Petition.

PSOs will be on watch at all times for the class of activities delineated in this Petition. Generally, work is conducted 24 hr per day. 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.

Every effort will be made to conduct operations during daytime hours; however, in the event nighttime operations are required, PSOs will use NMFS-approved NVDs and the appropriate lens to clear zones and monitor for the presence of marine mammals when possible and within the parameters established in Section 11.

PSOs will be stationed as follows and as summarized in Table 47:

- For tugs towing, holding, or positioning a jack-up rig (Year 1 through Year 5), four PSOs will be staged on the jack-up rig. Two PSOs will be on watch at a time, one on the port and one on the starboard side.

- For tug transportations of a jack-up rig to or from the Tyonek platform (Year 1 through Year 5), in addition to the PSOs stationed on the rig during transport, a PSO will be stationed on the Tyonek platform to monitor for beluga whales 1 hr before tugs are expected to arrive (i.e., scheduled to approach the Level B threshold) and will closely monitor the Level A thresholds and out to the maximum extent practicable based on the required number of PSOs, required monitoring locations, and environmental conditions.

- For Tyonek winter season pile driving, four to six PSOs will be stationed on the Tyonek platform (Year 1 through Year 4), two on watch at a time; one on the port and one on the starboard side. Additionally, a winter weather mitigation plan will be implemented and discussed further in the 4MP.

- For exploratory drilling at the MGS Unit and between the Anna and Bruce platforms, four PSOs will be stationed on the drilling rig (Year 2 and Year 4), two on watch at a time; one on the port and one on the starboard side.

- For anchor handling associated with pipeline replacement/installation activity, two to three PSOs will be stationed on the anchor handling vessel, one on watch at a time.

- For pipe pull associated with pipeline replacement/installation activity, one to three PSOs will be stationed on the pipe pull vessel, one on watch at a time. One to three PSOs will be stationed on the nearest platform, one on watch at a time. The placement of additional PSOs on the pipe pull vessel and platform was evaluated. However, it was determined to be impractical due to the necessity of another vessel to accommodate the extra PSOs. Moreover, the CZ and SZ are able to be adequately monitored between the PSOs on the pipe pull vessel and platform.

## Table 47. PSO Stations and Locations per Activity

| Activity | Number of PSOs | On-Watch Count and Position | PSO Location(s) |
|---|---|---|---|
| Tugs Towing, Holding, or Positioning a Jack-Up Rig | 4 | 2 on watch (1 port, 1 starboard) | Jack-Up Rig |
| Tugs Towing, Holding, or Positioning a Jack-Up Rig at Tyonek Platform | 6-8 | 2 on watch (1 port, 1 starboard) | Jack-Up Rig |
| | | 1 on watch | Tyonek Platform |
| Winter Season Pile Driving for Production Well Development | 4-6 | 2 on watch (1 port, 1 starboard) | Tyonek Platform |
| Pile Driving for Exploratory Drilling | 4 | 2 on watch (1 port, 1 starboard) | Drilling Rig |
| Anchor Handling | 2-3 | 1 on watch | Anchor Handling Vessel |
| Pipe Pulling | 4-6 | 1 on watch | Pipe Pulling Vessel |
| | | 2 on watch (1 port, 1 starboard) | Nearest Platform |

PSOs will record environmental data and observations on data forms or into electronic data sheets, and an electronic copy will be submitted to NMFS in a digital spreadsheet format in the annual report. The following information will be collected:

- Date and time activity and observation efforts begin and end.
- Type and duration of activity (i.e., tugs under load with a jack-up rig, pile driving, anchor handling, pipe pulling).
- Indications of when nighttime operations were required and when NVDs were employed, including which lenses were utilized.
- Weather parameters (e.g., Beaufort Sea State, visibility, sun glare, fog, cloud cover, rain, snow, etc.) will be recorded at the start and end of each observation watch, every 30 min during a watch, and whenever a change occurs in any of the forgoing variables.
- PSO name and location.
- Species, group size, and age/sex categories (if determinable) as well as date, time, and location of the observation.
- Marine mammal behavior when first sighted and after initial sighting, heading (if consistent), bearing and distance from the sound source, closest point of approach (CPA), and behavioral pace.
- Assessment of behavioral response thought to have resulted from the activities (e.g., no response, approach, change in direction, cessation of feeding, etc.)
- Vessel position and speed, water depth, and activity.
- Mitigation measures enacted and duration that operations were impacted by the presence of marine mammals.

PSOs will conduct visual monitoring during operations, as follows:

- Observation will begin 30 min prior to the commencement of the specified activities.
- If the sound-generating activities listed in Table 46 cease for > 30 min, a 30-min observation period is required before sound-generating activity within the class of activities can resume.
- Observations will end 30 min after sound-generating activity within the class of activities listed in this Petition have ceased.
- The PSOs will systematically scan the observation area alternating between naked eye and (7x50) binoculars or NVDs, focusing on varying distances in intervals.
- All zones discussed previously in Section 11 (Table 46) will be monitored to the greatest extent possible based on the required number of PSOs, required monitoring locations, and environmental conditions.
- PSOs will watch for indications of the presence of marine mammals, e.g., blows, fins, splashes, ripples, or feeding sea birds.
- If a marine mammal is observed, the PSO will notify Hilcorp operators as required under the terms of the LOA and/or ITR.

- If mitigation actions are not required, such as in the case of species sighted outside the Level B zone and moving away from the operation area, the PSO will note and monitor the position (including latitude/longitude of the vessel or sound source and relative bearing and estimated range to the animal) until the animal moves out of visual range of the observer.

The following guidelines will apply to these watch periods:

- PSOs will be independent of the activity contractor (for example, employed by a subcontractor) and have no other assigned tasks during monitoring periods.
- PSOs will work in shifts lasting no more than 4 hr without a minimum of a 1-hr break.
- PSOs will be allowed to watch no more than 12 hr in a 24-hr period.

The following guidelines will apply to PSO monitoring position:

- PSOs will be positioned in a location that will not interfere with the navigation or operation of the vessel that also affords an optimal view of the sea surface.
- To the extent possible and between all on watch, PSOs will maintain a 360-degree view from the vessel or monitoring station and will focus on the direction of travel when traveling.
- PSOs will work in coordination with vessel or monitoring station personnel to determine the optimal viewing location that is safe and does not limit operations.

## 13.2 REPORTING

Reporting will be conducted as described in Table 48. All takes will be tabulated, tracked, and summed throughout each annual season and the Petition period and reported to NMFS via the reporting protocol described in Table 48.

## Table 48. Hilcorp's Reporting Matrix for Activities in Cook Inlet Covered under a NMFS ITR

| Scenario | Timeframe for Reporting | Reporting Method | Contact |
|---|---|---|---|
| Notification of commencement of activities | At least 48 hr prior to commencement, annually | Electronic Notification | NMFS OPR, AKR |
| Unauthorized take (Level A or B) | As soon as practicable and within:<br>• 24 hr of the occurrence (NMFS) | A report documenting marine mammal takes will be submitted in a digital format that can be queried. | NMFS OPR, NMFS Chief of the Permits and Conservation Division, NMFS AKR |
| Stranding/injury/mortality not associated with the class of activities | As soon as feasible, within:<br>• 48 hr of discovery (NMFS) | NMFS OPR & NMFS Alaska Region Stranding Network | NMFS OPR and Alaska Regional Stranding Coordinator |
| Stranding/injury/mortality potentially associated with the class of activities | As soon as feasible | Via phone and electronic notification detailing events including photos | NMFS OPR, NMFS AKR and Alaska Regional Stranding Coordinator |
| Monthly reporting | Monthly for all months with project activities. Due the 15th day during the following month. | Electronic Report | NMFS OPR, NMFS AKR |
| Annual reporting | 90 days after cessation of in-water work or the day the LOA expires. | Electronic Report | NMFS OPR, NMFS AKR, USFWS MMM |
| The number of takes for any marine mammal species or stock exceeds the number of authorized takes for that species or stock. | Immediately | Via phone | NMFS OPR, AKR |

**Notes:** AKR – Alaska Region; NMFS – National Marine Fisheries Service; OPR – Office of Protected Resources; MMM – Marine Mammals Management; USFWS – United States Fish and Wildlife Service

# 14. RESEARCH COORDINATION

*Suggested means of learning of, encouraging, and coordinating research opportunities, plans, and activities relating to reducing such incidental taking and evaluating its effects.*

Observations of marine mammals, including any observed reactions to monitored activity will be recorded and reported to NMFS. Additionally, prior to the start of monitored activity, Hilcorp will identify other monitoring programs in middle Cook Inlet or Trading Bay so information on species sightings can be shared among programs to minimize impacts.

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# APPENDIX A

# MARINE MAMMAL MONITORING AND MITIGATION PLAN

Hilcorp Alaska, LLC

# Marine Mammal Mitigation and Monitoring Plan for 2025-2029 Activities in Cook Inlet, Alaska

## Appendix A

February 2025
Rev. 2

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# LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| ~ | approximately |
| ° | degree |
| 2D | two-dimensional |
| 3D | three-dimensional |
| 4MP | Marine Mammal Monitoring and Mitigation Program |
| µPa | microPascal(s) |
| AHT | anchor handling tug(s) |
| CZ | clearance zone |
| dB | decibel(s) |
| DPS | Distinct Population Segment |
| ft | foot (feet) |
| HF | high-frequency |
| Hilcorp | Hilcorp Alaska, LLC |
| HAK | Hilcorp Alaska |
| hr | hour(s) |
| ITR | Incidental Take Regulation |
| km | kilometer(s) |
| $km^2$ | square kilometer(s) |
| km/hr | kilometer(s) per hour |
| kt | knots |
| LF | low-frequency |
| $L_{pk}$ | peak received sound pressure level |
| LOA | Letter of Authorization |
| m | meter(s) |
| mi | mile(s) |
| $mi^2$ | square mile(s) |
| MLLW | mean lower low water |
| min | minute(s) |
| MMPA | Marine Mammal Protection Act |
| MGS | Middle Ground Shoal |
| N/A | not applicable |
| NMFS | National Marine Fisheries Service |
| NOAA | National Oceanic and Atmospheric Administration |
| NVD | night-vision device(s) |
| OPR | Office of Protected Resources |

# LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

| | |
|---|---|
| OW | Otariid pinnipeds |
| Petition | Incidental Take Regulation |
| pk | zero-to-peak sound pressure level |
| PSO | Protected Species Observer |
| PTS | permanent threshold shift |
| PVS | portable visual search |
| PW | Phocid pinnipeds |
| re | referenced to |
| rms | root-mean-square |
| SEL | sound exposure level |
| $SEL_{24h}$ | 24-hour cumulative SEL |
| SPL | sound pressure level |
| SZ | shutdown zone(s) |

# 1. INTRODUCTION

Hilcorp Alaska, LLC (Hilcorp) hereby petitions the National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) to issue regulations pursuant to Section 101(a)(5)(A) of the Marine Mammal Protection Act (MMPA), 16 U.S.C. § 1371(a)(5)(A), for the non-lethal, unintentional taking of small numbers of marine mammals incidental to oil and gas exploration, development, production, and decommissioning activities in Cook Inlet, AK, for an approximate 5-year period beginning August 15, 2025, and extending through December 31, 2029.

The class of activities covered by this marine mammal mitigation and monitoring plan (4MP) includes the following within the Petition's specified geographic area (Figure 1):

1. Tugs towing, holding, or positioning a jack-up rig in support of production drilling at existing platforms in middle Cook Inlet and Trading Bay;
2. Pile driving in support of production well development at the Tyonek platform in middle Cook Inlet;
3. Tugs towing, holding, or positioning a jack-up rig and pile driving in support of exploration drilling at two locations in the Middle Ground Shoal (MGS) Unit in middle Cook Inlet; and one location between the Anna and Bruce platforms on the northern border of Trading Bay; and
4. Pipeline replacement/installation, involving either pipe pulling or anchor handling or a combination of both, at up to two locations in middle Cook Inlet or Trading Bay.

Table 1 summarizes the planned activities within the geographic scope of the Petition and the subsequent sections describe these activities in more detail.

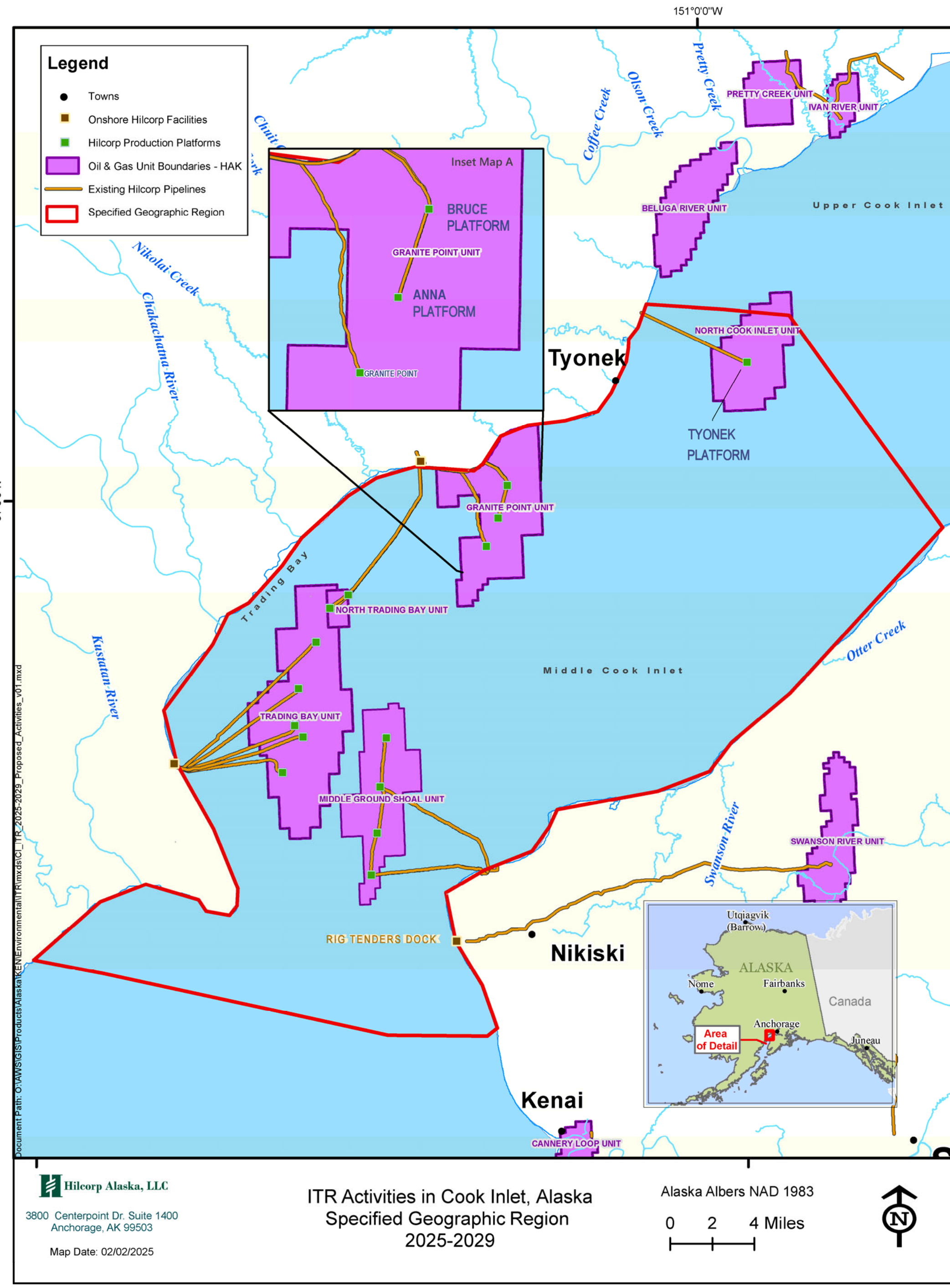
Marine mammal monitoring and mitigation methods have been designed to meet the requirements and objectives of an ITR. As this current 4MP is submitted as part of the Petition, Hilcorp recognizes that some details of the 4MP may change upon receipt of the ITR.

## Table 1. Summary of Planned Activities Included in the ITR Petition Request

| Project Name | Cook Inlet Region | Seasonal Timing | Year(s) Planned[1] | Anticipated Duration of Sound-producing Activity per Year | Anticipated Sound Sources |
|---|---|---|---|---|---|
| Tugs under Load with a Jack-Up Rig in support of Production Drilling | Middle Cook Inlet | April – December | Year 1–Year 5 (2025–2029) | 12 days (Years 1, 3, 5)<br>10 days (Year 2)<br>8 days (Year 4) | 3 to 4 tugs towing, holding, and positioning a jack-up rig |
| Pile Driving in Support of Production Well Development at the Tyonek Platform | Middle Cook Inlet | Mid-November – Mid-April | Year 1–Year 5 (2025–2029) | 14 days (7 days per pile, 2 piles per year) | Pile driving |
| Tugs under Load with a Jack-Up Rig and Pile Driving in Support of Exploratory Drilling[2] | Trading Bay (between Anna and Bruce platforms) | April – December | Year 2 (2026) | 2 days tugs under load with a jack-up rig; 6 days pile driving (one well) | Pile driving, 3 to 4 tugs towing, holding, and positioning a jack-up rig |
| | Middle Cook Inlet (MGS Unit) | April – December | Year 4 (2028) | 4 days tugs under load with a jack-up rig; 12 days pile driving (two wells) | Pile driving, 3 to 4 tugs towing, holding, and positioning a jack-up rig |
| Pipeline Replacement/ Installation[3] | Middle Cook Inlet/Trading Bay | April – November | Year 2 (2026) | *Scenario 1*: 11 days using lay barge methods<br>*Scenario 2*: 22 days using lay barge methods (11 days per project, 2 projects) | *Scenario 1*: Anchor handling<br>*Scenario 2*: Anchor handling |
| | | April – November | Year 4 (2028) | *Scenario 1*: 8 days using pipe pull methods<br>*Scenario 2*: no pipeline replacement/installation | *Scenario 1:* 2 tugs engaged in pipe pulling, bottom impact sounds of pipe connecting with seafloor<br>*Scenario 2*: none |

**Notes:**
[1] The specific years activities are analyzed to occur may or may not coincide with the actual year of execution, therefore, Hilcorp will be requesting up to the annual maximum number of takes per year depending upon the activities planned. For further details, these potential combinations of activities across the five-year action period are analyzed in the *Scenario 1* and *Scenario 2* tab in the Excel workbook submitted in tandem with this ITR.
[2] To determine maximum annual exposure estimates, one exploratory well between Anna and Bruce is analyzed to occur in Year 2 and two exploratory wells in the MGS Unit are analyzed to occur in Year 4; however, the exploratory wells may be developed in any separate years during the Petition period. [3] To determine maximum annual exposure estimates, two pipeline scenarios are analyzed to occur: *Scenario 1* comprises one project using lay barge methods in Year 2 and one project using pipe pull methods in Year 4; *Scenario 2* comprises two projects using lay barge methods in Year 2 and no additional projects thereafter. A maximum of two pipeline projects will occur during the Petition period. Pipeline projects may occur simultaneously in any one year or in separate years year during the Petition period however, only lay barge methodology can be utilized in the same year (i.e., *Scenario 2*). The greatest potential estimated exposure to beluga whales results from the following activities in Year 2: two lay barge projects *(Scenario 2)*, winter pile driving at the Tyonek, tugs under load with a jack-up rig, and exploratory drilling (one well) between the Anna & Bruce platforms. The greatest potential estimated exposure to all other marine mammals results from the following activities in Year 4: exploratory drilling (two wells) in the MGS Unit, tugs under load with a jack-up rig, winter pile driving at Tyonek, and pipe pulling *(Scenario 1)*. These two combinations of activities are used to calculate the maximum annual take authorization requests for each species. Alternative combinations of activities result in fewer estimated exposures, thereby supporting the use of these combinations.

# Figure 1. Specified Geographic Area for the 2025-2029 ITR Petition.



# 2. DESCRIPTION OF ACTIVITIES

## 2.1 PRODUCTION DRILLING AND WELL DEVELOPMENT PILE DRIVING AT THE TYONEK PLATFORM

Hilcorp routinely conducts production drilling activities at offshore platforms to meet production needs; all Hilcorp platforms have the potential for production drilling activity. Drilling activities are accomplished by using conventional drilling equipment from a variety of rig configurations and occur through existing well slots or wellbores located in legs of the existing platforms.

Hilcorp plans to conduct production drilling in middle Cook Inlet and Trading Bay during the open water season, which generally runs from April to November, however, may extend into December depending on ice conditions. Drilling activities will span up to 240 days, with tugboats towing, holding, or positioning a jack-up rig (i.e., the sound-producing activity) for up to 12 days in Years 1, 3, and 5, up to 10 days in Year 2, and up to 8 days in Year 4. The *Spartan 151* (or a similar jack-up rig) will be used for production drilling and will be towed using three ocean-going tugs. Additionally, a fourth tug will be on standby in the event of mechanical issues and may be engaged for an estimated 1 hour (hr) during jack-up rig positioning.

In addition to Year 1 through Year 5 (2025-2029) production drilling activities, 10 drilling conductor pipes (piles) will be driven into the sediment to support future well slots for production well development on the Tyonek platform at an installation rate not to exceed two per year. Pile driving will occur intermittently between mid-November and mid-April. This activity is further discussed in Section 1.2.1.2 of the Petition.

Tug use required to tow, hold, and position the jack-up rig in Years 1 through 5 and pile driving in Years 1 through 5 at the Tyonek platform are the only sound-generating activities associated with production drilling and production well development for which take authorization is being requested. The acoustic characteristics of tugs towing, holding, or positioning a jack-up rig and pile driving are described in Section 6 of the Petition. A summary of these sound-producing activity durations can be found in Section 2 of the Petition.

Details of representative tugs that may be used to tow the jack-up rig are provided in Table 2. Note the exact tugs to be used to tow the jack-up rig may change, depending on availability.

## 2.2 EXPLORATORY DRILLING

Hilcorp plans to drill one exploratory well between the Anna and Bruce platforms near the northern border of Trading Bay and two exploratory wells in the MGS Unit in middle Cook Inlet, based on mapping of subsurface structures from previously collected two-dimensional (2D) and three-dimensional (3D) seismic data and historical well information. The exploration well in Trading Bay is analyzed to occur between April and December in Year 2 (2026); the exploration wells in the MGS Unit are analyzed to occur between April and December in Year 4 (2028). However, they may occur in any separate years during the ITR period. All combinations of activities have been analyzed to determine the highest potential estimated exposures to marine mammals and are used in take authorization request calculations (i.e., the maximum potential exposure estimate is used for the maximum take request). Refer to the Excel workbook submitted in tandem with the Petition.

For all three wells, drilling will begin after the jack-up rig has already mobilized to middle Cook Inlet and before it has demobilized back to Rig Tenders Dock. See Section 1.2.1.1 of the Petition for additional information about the jack-up rig. The exact start dates for drilling the wells are currently unknown and are dependent upon availability of the jack-up rig. It is expected each well will take ~40 to 60 days to drill and test with 2 days of tugs towing a jack-up rig, and 6 days of pile driving. After testing, the wells will undergo plug and abandonment (P&A) for the following 14 to 90 days. See Section 1.2.2.2.2 of the Petition for more information on P&A.

Acoustic sources associated with exploratory drilling for which incidental take authorization is requested include tugs towing, holding, and positioning a jack-up rig and pile driving and are analyzed to occur in Years 2 and 4. The acoustic characteristics of tugs towing, holding, or positioning a jack-up rig and pile driving are described in Section 6 of the Petition. A summary of these sound-producing activity durations can be found in Section 2 of the Petition.

Details of representative tugs that may be used to tow the jack-up rig are provided in Table 2. Note the exact tugs to be used to tow the jack-up rig may change, depending on availability.

### Table 2. Description of Tugs Used for Towing, Holding, or Positioning the Jack-Up Rig

| Tug | Primary Activity | Specifications |
|---|---|---|
| *Bering Wind* (or similar) | Towing, holding, and positioning the jack-up rig. | 22-m length by 10-m breadth (72 ft by 33 ft)<br>144 gross tonnage |
| *Stellar Wind* (or similar) | Towing, holding, and positioning the jack-up rig. | 32-m length by 11-m breadth (105 ft by 36 ft)<br>160 gross tonnage |
| *Glacier Wind* (or similar) | Towing, holding, and positioning the jack-up rig. | 37-m length by 11-m breadth (121 ft by 36 ft)<br>196 gross tonnage |
| *Dr. Hank Kaplan* (or similar) | Standby tug used for positioning the jack-up rig, if needed. | 23-m length by 11-m breadth (75 ft by 36 ft)<br>176 gross tonnage |

**Notes:** This is not intended to be a specific list of tugs. Rather, tugs would be the same or similar such that potential effects of their use would be commensurate with what is presented in this Petition.
m – meter(s)
ft – feet

## 2.3 PIPELINE REPLACEMENT/ INSTALLATION

Hilcorp proposes to execute two pipeline replacement or installation projects in any year between 2025 and 2029. For the purpose of analysis, two pipeline scenarios have been analyzed for Year 2 and Year 4.

In *Scenario 1*, one pipeline project will occur in Year 2 (2026) by lay barge method and one pipeline project will occur in Year 4 (2028) by pipe pull method. In *Scenario 2*, both pipeline projects will occur in Year 2 and use lay barge methodology, and no pipeline project would occur in Year 4.

All combinations of activities have been analyzed to determine the highest potential estimated exposures to marine mammals and are used in take authorization request calculations (i.e., the maximum potential exposure estimate is used for the maximum take request). Refer to the Excel workbook submitted in tandem with this Petition. The combination of activities with the greatest potential Exposure Estimate to marine mammals is used to calculate exposure estimates and represents the annual maximum take request; however, one scenario resulted in the greatest for beluga whales and one resulted in the greatest for all other marine mammals. The greatest potential estimated exposure to beluga whales resulted from the following activities in Year 2: exploratory pile driving at one well site between the Anna & Bruce platform, two pipeline projects using lay barge methodology (*Scenario 2*), tugs under load with a jack-up rig, and winter pile driving at the Tyonek. The greatest potential estimated exposure to all other marine mammals resulted from the following activities in Year 4: exploratory pile driving at two well sites within the MGS Unit, one pipeline project using pipe pull methodology (*Scenario 1*), tugs under load with a jack-up rig, and winter pile driving at the Tyonek. *Scenario 2* results in the greatest potential estimated exposures to beluga whales while *Scenario 1* has the greatest potential estimated exposures to all other marine mammals. Accordingly, *Scenarios 1 and 2* are both used to inform maximum annual take authorization requests (see Excel Exposure Estimate workbook submitted in tandem with this Petition).

The project timelines are subject to weather conditions and equipment readiness. Each project's scope entails the installation or replacement of pipeline in either middle Cook Inlet or Trading Bay or a combination of both. The specific methodology of the pipeline replacement or installation is pending finalization, with both methods—pipe pulling and lay barge positioning—under consideration for implementation. Both methods include replacing or installing ~2,286 m (7,500 ft) of pipeline. Detailed information is presented in subsequent sections and Table 3 provides a summary of activities, purposes, durations, and anticipated sound sources. A summary of pipeline project durations can be found in Section 2 of the Petition.

Pipeline replacement and installation is driven by the need to mitigate corrosion, pipeline fatigue, and abrasion leaks, ensuring alignment with requirements of the Pipeline and Hazardous Materials Safety Administration. Installation of new gas pipelines also addresses the growing consumer demand for natural gas in Southcentral Alaska by allowing larger quantities of natural gas to be extracted for use.

The acoustic sources associated with pipeline replacement/installation activities for which incidental take authorization is requested include tugs engaged in anchor handling and pipe pulling in Years 2 and 4 respectively, and anchor handling in Year 2. The acoustic characteristics of these activities are described in Section 6 of the Petition. A summary of these sound-producing activity durations can be found in Section 2 of the Petition. Table 3 summarizes these activities.

## Table 3. Summary of Pipeline Activities, Purpose, Duration, and Anticipated Sound Sources

| Activity | Purpose | | Duration | Anticipated Sound Sources |
|---|---|---|---|---|
| **Lay Barge Method** | | | | |
| Anchor Setting | Set 8-point anchor system | | 2 days | 2 AHTs, 1 assist tug |
| Pipelay | Lay out pipeline: | 2,286 m (7,500 ft) | 8 days | 2 AHTs |
| Anchor Recovery | Recover 8 anchors | | 1 day | 2 AHTs |
| **Pipe Pull Method** | | | | |
| Pipelay | Pull out pipeline: | 2,286 m (7,500 ft) | 8 days | 1 installation tug, 1 assist tug, seafloor bottom impact sounds |

**Notes:** AHT – anchor-handling tug; m – meter; ft – feet

Details of representative tugs that may be used to anchor handle or pipe pull are provided in Tables 4 and 5, respectively. Note that the exact tugs to be used may change, depending on availability.

## Table 4. Description of Tugs Engaged in Anchor Handling Operations

| Vessel[1] | Length[2] | | Breadth[2] | hp | Operational Use |
|---|---|---|---|---|---|
| **Anchor Handling Assist Tugs[3]** | | | | | |
| *Bering Wind* | m | 22 | 10 | 5,080 | Assist tug used to assist the AHTs in holding the pipelay barge in place against an incoming or outgoing tide during initial barge positioning. |
| | ft | 73 | 34 | | |
| *Dr Hank Kaplan* | m | 24 | 11 | 5,380 | |
| | ft | 80 | 36 | | |
| **AHTs[3]** | | | | | |
| *Denise Foss* | m | 37 | 12 | 7,268 | AHTs used to hold the barge in place during incoming or outgoing tides when anchor setting or retrieving; re-position anchors along the pipeline route; and operate in tandem during pipelay. |
| | ft | 123 | 41 | | |
| *Resolve Pioneer* | m | 63 | 12 | 5,750 | |
| | ft | 207 | 40 | | |

**Notes:**
[1]This is not intended to be a specific list of vessels. Rather, vessels would be the same or similar such that potential effects of their use would be commensurate with what is presented in this Petition.
[2]Rounded to the nearest whole number.
[3]Tugs may range in power from 2,000 to 8,000 horsepower (hp).
m – meters
ft – feet
N/A – not applicable

## Table 5. Description of Tugs Engaged in Pipe Pull Operations

| Vessel Types[1] | Length[2] | | Breadth[2] | hp | Operational Use |
|---|---|---|---|---|---|
| **Pipe Pull Installation Tug[3]** | | | | | |
| *Resolve Pioneer* | m | 63 | 12 | 5,750 | Main tug for installation and is responsible for pulling spools into position. |
| | ft | 207 | 40 | | |
| **Pipe Pull Assist Tug[3]** | | | | | |
| *Steller Wind* | m | 26 | 9 | 3,500 | Assist tug supports the Resolve Pioneer, or similar, in maneuvering the spool of pipe to its designated seabed position, particularly when contending with tidal currents. |
| | ft | 85 | 30 | | |

**Notes:**
[1]This is not intended to be a specific list of tugs. Rather, tugs would be the same or similar such that potential effects of their use would be commensurate with what is presented in this Petition.
[2]Rounded to the nearest whole number.
[3]Tugs may range in power from 2,000 to 8,000 horsepower (hp).
m – meter(s)
ft – foot (feet)

# 3. MITIGATION AND MONITORING

## 3.1 MITIGATION MEASURES

### *3.1.1 Applicable Noise Criteria*

The MMPA defines Level A harassment as "…any act of pursuit, torment, or annoyance which has the potential to injure a marine mammal or marine mammal stock in the wild." The MMPA defines Level B harassment as "…any act of pursuit, torment, or annoyance which 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."[1]

For Level A harassment, the NOAA Technical Memoranda NMFS-OPR-55 and NMFS-OPR-59 (NMFS, 2016 and 2018, respectively) provide guidelines for assessing the onset of permanent threshold shifts (PTSs) from anthropogenic sound. Under these guidelines, marine mammals are separated into five functional hearing groups. Source types are separated into impulsive (e.g., pile driving) and non-impulsive (e.g., tugs towing a jack-up rig). An analysis is performed of the distance to the peak received sound pressure level (SPL) (Lpk) and 24-hr cumulative sound exposure level (SEL) ($SEL_{24h}$) for each hearing group.

In October 2024, NMFS published the NOAA Technical Memorandum NMFS-Office of Protected Resources (OPR)-71 as updated guidance to the 2016 and 2018 documents for assessing the impact of anthropogenic sound on marine mammal hearing, specifically acute cumulative incidental exposures. Key differences include revised acoustic thresholds and updated auditory weighting functions. It specifies the sound levels and criteria at which marine mammals are predicted to experience TTS (Level B harassment) and auditory injury (AUD INJ) (Level A harassment) from acute exposure to underwater and in-air sounds. TTS is defined as a temporary, reversible increase in hearing threshold, while AUD INJ includes damage to the inner ear that may or may not result in a PTS. The analyses presented in this Petition adhere to the updated guidance.

The current threshold used by NMFS to estimate Level B harassment is 160 decibels (dB) referenced to (re) 1 microPascal (µPa) root-mean-square (rms) for impulsive sound (e.g., impact pile driving), and 120 dB re 1 µPa rms for non-impulsive sound (e.g., a tug towing a jack-up rig) for all marine mammals.

Table 6 provides a summary of the updated acoustic thresholds for marine mammals. For the purpose of this section, all underwater sound pressure levels (SPLs) are reported as dB re 1 µPa unless otherwise stated.

[1] Laws & Policies: Marine Mammal Protection Act | NOAA Fisheries

## Table 6. Summary of NMFS Acoustic Thresholds

| Marine Mammal Hearing Groups | Hearing Range | Auditory Injury Onset (Level A) Threshold | | Disturbance (Level B) Threshold | |
|---|---|---|---|---|---|
| | | Impulsive | Non-Impulsive | Impulsive | Non-Impulsive |
| Low-Frequency (LF) Cetaceans | 7 Hz to 36 kHz | 222 dB $L_{pk}$<br>183 dB $SEL_{24h}$ | 197 dB $SEL_{24h}$ | 160 dB rms | 120 dB rms |
| High-Frequency (HF) Cetaceans | 150 Hz to 160 kHz | 230 dB $L_{pk}$<br>193 dB $SEL_{24h}$ | 201 dB $SEL_{24h}$ | | |
| Very High-Frequency (VHF) Cetaceans | 200 Hz to 165 kHz | 202 dB $L_{pk}$<br>159 dB $SEL_{24h}$ | 181 dB $SEL_{24h}$ | | |
| *Phocid-pinnipeds* in water (PW) | 40 Hz to 90 kHz | 223 dB $L_{pk}$<br>183 dB $SEL_{24h}$ | 195 dB $SEL_{24h}$ | | |
| *Otariid-pinnipeds* in water (OW) | 60 Hz to 68 kHz | 230 dB $L_{pk}$<br>185 dB $SEL_{24h}$ | 199 dB $SEL_{24h}$ | | |

**Notes:** Source: NMFS 2024; Hz – hertz; kHz – kilohertz; SEL – sound exposure level; dB – decibels; rms – root mean square; $L_{pk}$ – peak received sound pressure level; $SEL_{24h}$ – weighted cumulative sound exposure level at the recommended 24-hour accumulation period with a reference value of 1 micropascal squared second

## 3.2 NMFS LEVEL A AND LEVEL B ACOUSTIC HARASSMENT THRESHOLDS

Level A and Level B thresholds are calculated for each sound-generating specified activity for which takes are being requested. Table 7 summarizes the Level A thresholds by functional hearing group and Level B thresholds for all marine mammals.

## Table 7. Summary of Level A and Level B Thresholds

| Activity | Level A[1] (m) | | | | | Level B (m) | |
|---|---|---|---|---|---|---|---|
| | LF Cetaceans | HF Cetaceans | VHF Cetaceans | PW | OW | All Marine Mammals | |
| Tyonek Well Development Pile Driving | 3,296 | 421 | 5,100 | 2,928 | 1,091 | 1,000 | |
| Exploratory Pile Driving | 1,042 | 133 | 1,612 | 926 | 345 | 1,000 | |
| Anchor Setting – Day 1 | 222 | 157 | 1,143 | 264 | 190 | Single Tug | 2,890 |
| Anchor Setting – Day 2 | 203 | 139 | 1,005 | 240 | 169 | Two Tugs | 3,740 |
| Anchor Retrieval | 277 | 204 | 1,262 | 324 | 240 | Single Tug | 2,890 |
| | | | | | | Two Tugs | 3,740 |
| Pipe Lay | 84 | 37 | 496 | 120 | 57 | 2,890[2] | |
| Pipe Pulling | 0 | 0 | 0 | 0 | 0 | 5,150 | |
| Tugs holding or positioning a jack-up rig (Stationary) | 146 | 11 | 360 | 70 | 28 | 3 tugs: 4 hours | 3,850 |
| | | | | | | 4 tugs: 1 hour | 4,453 |
| Tugs towing a jack-up rig (Mobile) | 0 | 0 | 0 | 0 | 0 | 3,850 | |

**Notes:** [1] Level A values are displayed as zero-to-peak sound pressure level (pk) or SEL, whichever result is greater and rounded to the nearest whole number;.[2] Single tug only; Thresholds with zero value indicate the exposure zone is within the footprint of the tug; m – meters; LF – low-frequency; HF – high-frequency; VHF – very high-frequency; PW – Phocid pinnipeds in water; OW – Otariid pinnipeds in water

## 3.3 MONITORING AND SHUTDOWN ZONES

Table 8 summarizes clearance zones (CZ) and shutdown zones (SZ) established for each activity class included in the Petition. While every activity has associated CZs, not all activities have SZs.

Anchor handling, pipe pulling, and tugs towing, holding, or positioning a jack-up rig will only utilize CZs as they cannot shutdown once underway. Pile driving will employ multiple CZs and SZs of varying distances based on pile size, activity, and hearing group.

Additional measures for beluga whales are also specified in the subsequent sections.

## Table 8. Summary of Clearance and Shutdown Zones by Activity

| Activity | Functional Hearing Group | Clearance Zone (m) | Shutdown Zone (m) |
|---|---|---|---|
| **Production and Exploratory Drilling** | | | |
| Tugs Towing, Holding, or Positioning a Jack-Up Rig[1] | Beluga Whales | At any distance | - |
| | All Other Marine Mammals | 1,500 | - |
| **Production Well Development at the Tyonek Platform** | | | |
| Winter Pile Driving | All Marine Mammals | 500 | 500 |
| **Exploratory Drilling: MGS Unit and Between Anna and Bruce[2]** | | | |
| Exploratory Pile Driving | VHF Cetaceans | 1,650 | 1,650 |
| | All Other Marine Mammals | 1,200 | 1,200 |
| **Pipeline Replacement or Installation[3]** | | | |
| Anchor Handling[1] | Beluga Whales | At any distance | - |
| | All Other Marine Mammals | 1,500 | - |
| Pipe Pulling[1] | Beluga Whales | At any distance | - |
| | All Other Marine Mammals | 1,500 | - |

**Notes:**
[1] Activities that cannot shutdown once started and therefore have no shutdown zone.
[2] To determine maximum annual exposure estimates, one exploratory well between Anna and Bruce is analyzed to occur in Year 2 and two exploratory wells in the MGS Unit are analyzed to occur in Year 4; however, the exploratory wells may be developed in any separate years during the Petition period.
[3] To determine maximum annual exposure estimates, two pipeline scenarios are analyzed to occur: *Scenario 1* comprises one project using lay barge methods in Year 2 and one project using pipe pull methods in Year 4; *Scenario 2* comprises two projects using lay barge methods in Year 2 and no additional projects thereafter. A maximum of two pipeline projects will occur during the Petition period. Pipeline projects may occur simultaneously in any one year or in separate years year during the Petition period however, only lay barge methodology can be utilized in the same year (i.e., *Scenario 2*).
m – meter(s)
- (dash) – not applicable

## 3.4 MITIGATION MEASURES IMPLEMENTED DURING ALL CLASSES OF ACTIVITY

The following mitigation measures are applicable to all activities outlined in Section 1 of the Petition and will be followed during the execution of each activity class. Additional details regarding mitigation measures specific to each type of activity within the class of activities are provided in Sections 3.6 to 3.9.

***Pre-Clearance Protocol***

- Immediately prior to the commencement of activities listed above in Table 8, PSOs will conduct a 30-min pre-clearance of the appropriate CZ relative to the activity.
- In the event the entire zone is not visible (e.g., fog, rain, snow, low light), the specific sound-producing activity may not commence until the zone can be "cleared" (clear), unless otherwise specified (i.e., tugs towing a jack-up rig, anchor handling, pipe pulling). See Section 3.5 for further mitigation measures regarding low- or no-light scenarios.
- The CZ will be confirmed clear by the PSO(s) once the following circumstances are met:
    - The zone is absent of any marine mammal(s) for the entire 30 min immediately prior to activity start; or
    - If a marine mammal(s) is observed within the zone, clearance and activity start will be delayed until either:
        - The animal(s) is observed exiting the zone and 30 min have elapsed from that point with no other sightings within the zone; or
        - The animal(s) has not been seen in the zone for 30 min (e.g., species dove in the zone and then was not seen again).
    - And beluga-specific pre-clearance protocols are met.

***Beluga Specific Pre-Clearance Protocol***

For pre-clearance of activities that cannot shutdown once underway, the additional beluga whale mitigation measure outlined below must be implemented:

- If a PSO observes a beluga whale(s) approaching the work area at any distance, the specific activity (i.e., tugs under load with a jack-up rig, anchor handling, pipe pulling) will be delayed until the animal(s) has not been seen for 30 min, unless the delay interferes with the safety of working conditions.

***Protocol During Operations***

- After the zone is cleared, the activity listed in Table 8 may commence. PSOs will continue to monitor appropriate zones and distances to the greatest extent possible during the activity based on the required number of PSOs, required monitoring locations, and environmental conditions. Additionally, Hilcorp will implement further mitigation measures specific to each activity and described Sections 3.6-3.8.

- If a species for which authorization has not been granted or a species for which authorization has been granted but the authorized takes have been reached, is observed approaching, entering, or within the zone, in-water work must be delayed (if during pre-clearance) or shut down (except tugs towing jack-up rig, pipe pulling, or anchor handling activity if already initiated) and NMFS should be notified. Activities must not resume until directed by the Project Manager or NMFS.

***Shutdown Protocol***

- If a SZ is employed for an activity listed in Table 8:
    - An immediate shutdown of the sound-producing activity will be implemented any time a marine mammal is detected approaching, entering, or within the SZ.
    - Sound-generating activity will not restart until either:
        - The animal is observed exiting and is on a trajectory away from the SZ; or
        - The animal has not been seen in the SZ for at least 15 min (for pinnipeds) or 30 min (for cetaceans).
    - As tugs towing, holding, or positioning a jack-up rig, anchor handling, or pipe pulling activities cannot cease operations once started, this will not apply to those specific activities.

***Post-Clearance Protocol***

- After cessation of the sound-generating activity within the class of activities included in the Petition and listed in Table 8, PSOs will continue to monitor for an additional 30 min.

## 3.5 MITIGATION USING NIGHT VISION DEVICES

During low-light (i.e., twilight) or no-light operations (i.e., darkness), night-vision devices (NVDs) shown to be effective at detecting marine mammals in low-light conditions (e.g., portable visual search (PVS)-7 model with 5x magnifier, or similar) will be provided to PSOs. NMFS has approved the PVS-7 with the 5x magnifier lens for similar Hilcorp projects in Cook Inlet including tugs towing a jack-up rig (2022 and 2023). The PVS-7 model has a Range of Detection of 1,625 m (5,331 ft) and a Range of Recognition of 1,125 m (3,691 ft) when the 5x magnifier is attached.

If the entire zone is not visible with NVDs due to adverse weather conditions such as snow, rain, or fog, operations may not begin or must cease (except tugs under load with a jack-up rig, anchor handling, pipe pulling) until visibility is restored. If the zone exceeds the viewing capabilities of the NVDs, operations during low-light or no-light conditions should not proceed. NVDs will only be utilized when appropriate visibility can be maintained.

## 3.6 PILE DRIVING MITIGATION MEASURES

The following mitigation measures will be applied during all pile driving activities (i.e., Tyonek production well development, exploratory drilling at the MGS Unit, and exploratory drilling between the Anna and Bruce platforms) in addition to those found in Section 3.4.

Prior to initiating pile driving, the CZ will be cleared. However, as pile driving operations are not continuous and involve intermittent pauses for activities such as welding on pipe extensions, the following procedures shall apply:

- If PSOs do not monitor continuously, the CZ will need to be cleared for 30 min before each pile driving session in adherence with pre-clearance protocols; or

- If PSOs remain on watch continuously, the zone does not need to be cleared again.

***Soft-Start Procedures***

A soft-start procedure will be implemented for impact pile driving by the impact hammer operator(s) and documented by the PSO. The procedure employs delayed-strike techniques and serves to notify marine mammals and prey species about the impending hammering activity allowing adequate time to evacuate the area. The soft-start procedure will occur as follows:

1. Initiate three reduced energy (40%) strikes of the hammer;
2. Follow with a 1-min waiting period; then,
3. Repeat with two subsequent reduced energy three-strike sets (i.e., repeat steps 1 and 2).

Additional soft-start mitigation will occur as follows:

- Soft-start procedures will be utilized at the beginning of each day's pile driving activity or if pile driving has ceased for periods of 30 min or more (i.e., between sessions of pile driving).
- After a PSO confirms clearance of the CZ, the crew conducting pile driving operations will be alerted and may commence soft-start procedures.
- Pile driving will not begin during periods of low-light visibility (e.g., twilight, darkness) unless NMFS-approved NVDs can be employed, and the entire CZ can be cleared. See Section 3.5 for further mitigation measures regarding low- or no-light scenarios.
- In the event the entire zone loses visibility (e.g., fog, rain, snow, low light) while operations are active, the activities must cease until the entire zone is fully visible and can be cleared once again.
- Any shutdown due to a marine mammal(s) sighting within the SZ must be followed by a 30-min clearance period of the SZ and a full soft-start procedure.
- Any shutdown for other reasons (e.g., mechanical issues, weather) resulting in the cessation of the sound source for a period of > 30 min must also be followed by a full soft-start procedure.

### 3.6.1 Production Well Development Pile Driving at the Tyonek Platform

| Winter Season Tyonek Pile Driving | | CZ / SZ |
|---|---|---|
| | All Marine Mammals | 500 |

The following mitigation measures will be employed during production well development pile driving activities at the Tyonek platform in addition to those found in Section 3.4. PSOs will implement and monitor a CZ / SZ of 500 m (1,640 ft) for all marine mammals.

- Soft-start procedures as outlined above must be implemented after completion of pre-clearance.
- Project vessels operating in Cook Inlet for Hilcorp will maintain a distance of 2.4 km (1.5 miles) from the mean lower low water (MLLW) line of the Susitna Delta (MLLW line between the Little Susitna River and Beluga River) between April 15 and November 15.

### *3.6.2 Exploratory Drilling: Pile Driving within the MGS Unit and between the Anna and Bruce Platforms*

| | | |
|---|---|---|
| **Exploratory Pile Driving** | | **CZ / SZ** |
| | VHF Cetaceans | 1,650 m |
| | All Other Marine Mammals | 1,200 m |

The following mitigation measures will be employed during exploratory drilling pile driving activities in the MGS Unit and between the Anna and Bruce platforms in addition to those found in Section 3.4.

- During impact hammering, two CZs and SZs will be implemented:
  - LF cetaceans: 1,650m (5,413 ft)
  - All other marine mammals: 1,200 m (3,937 ft)
- Soft-start procedures as outlined above must be implemented after completion of pre-clearance.
- Night operations may occur as long as the CZs and SZs are visible and can be cleared per pre-clearance protocols and Section 3.5.

## 3.7 TUGS UNDER LOAD WITH A JACK-UP RIG

| | | |
|---|---|---|
| **Tugs Towing, Holding or Positioning a Jack-Up Rig** | | **CZ** |
| | Beluga Whales | At any distance |
| | All Other Marine Mammals | 1,500 m[1] |

[1]PSOs will monitor out to the greatest extent possible based on the required number of PSOs, required monitoring locations, and environmental conditions once the zone is cleared to inform potential Level B take determinations.

As tugs towing a jack-up rig are not able to shut down while transiting, PSOs will conduct a pre-clearance period before tugs engage in load bearing activities by observing a 1,500 m (4,921 ft) CZ around the jack-up rig. The 1,500 m (4,921 ft) CZ is a distance to which NMFS generally agrees that PSOs can adequately observe the smaller, more cryptic marine mammals (i.e., porpoises, seals, and sea lions).

In addition to the measures described in Section 3.4, the following mitigation measures will be implemented during jack-up rig transport and will be maintained as long as tugs are under load towing, holding, or positioning the jack-up rig. Additional mitigation measures are in place when towing a jack-up rig to the Tyonek platform and are described below.

- Following clearance and activity start, PSOs will monitor out to the greatest extent possible based on the required number of PSOs, required monitoring locations, and environmental conditions.
- Hilcorp will only conduct tug towing rig activities at night if necessary to accommodate a favorable tide. In these circumstances, every effort will be made to clear the CZ with NVDs (refer to Section 3.5); however, it may not always be possible to see and clear the entire CZ prior to nighttime transport.

- If a marine mammal is observed during towing, holding, or positioning, the PSOs will monitor and carefully record any reactions observed until jack-up rig towing, holding, or positioning is concluded (i.e., jack-up legs are pinned on the seafloor). No new operational activities may be started until the animal leaves the CZ. Shifting from towing to holding or positioning without shutting down is not considered a new operational activity.

- If a marine mammal is observed during transit, the PSO will inform the tug captain. The tug captain will then use his discretion to determine if there is ample time and space to safely alter course. While the PSO may request a course change, the ultimate decision lies with the tug captain, who will consider the safety and practicality of the maneuver with the utmost discretion.

- Hilcorp must conduct tugs towing a jack-up rig operations with a favorable tide unless human safety or equipment integrity are at risk.

- Tug operators will maintain a general tug towing jack-up rig speed of 7 kilometers per hour (km/hr; 4 kt) or less, when safe to do so.

- For transportation of a jack-up rig to or from the Tyonek platform, in addition to the PSOs stationed on the jack-up rig during towing, holding, and positioning activities, one PSO will be stationed on the Tyonek platform to monitor for beluga whales. The PSO will be on watch beginning 1 hr before the jack-up rig is expected to arrive (i.e., scheduled to approach the largest Level B threshold [4,453 m {2.77 mi}]) and will closely monitor the Level A zone (360 m [1,181 ft]) and beyond, to the maximum extent practicable based on the required number of PSOs, required monitoring locations, and environmental conditions.

- Project vessels operating in Cook Inlet for Hilcorp will maintain a distance of 2.4 km (1.5 miles) from the mean lower low water (MLLW) line of the Susitna Delta (MLLW line between the Little Susitna River and Beluga River) between April 15 and November 15.

## 3.8 PIPELINE REPLACEMENT/ INSTALLATION MITIGATION MEASURES

Pipeline activities plan to employ either lay barge or pipe pulling methodology or a combination of both. Shutdowns are not feasible and pose safety risks for tug operators when utilizing either method. Specific mitigation measures in addition to those found in Section 3.4 are outlined for each method in the sub-sections below.

### *3.8.1 Pipeline Replacement/Installation: Lay Barge Method*

| | | CZ |
|---|---|---|
| **Anchor Handling Activities** | Beluga Whales | At any distance |
| | All Other Marine Mammals | 1,500 m[1] |

[1]PSOs will monitor out to the greatest extent possible based on the required number of PSOs, required monitoring locations, and environmental conditions once the zone is cleared to inform potential Level B take determinations.

Anchor handling can only occur during the ~1.5-hr period at one of the four slack tides each day. If anchor handling is not completed during this time (particularly during setup and retrieval), the assist tugs may need to hold the barge in place during the next 4.5-hr tide cycle until slack tide occurs again. As the timeframe to position anchors is so brief, shutdowns are impractical; additionally, as the sound generated by tugs holding the barge is louder than anchor handling operations and so pose a greater acoustic risk, PSOs will conduct a 30-min pre-clearance period before tugs engage in load bearing activities by observing a 1,500 m (4,921 ft) CZ, which must be cleared prior to the start of anchor handling operations. Once anchor handling commences (i.e., anchor setting, retrieving, and anchor moving during pipelay), operations will continue until all anchors are set or retrieved and may continue into the night. The following mitigation will also apply to anchor handling:

- After clearance of the CZ, PSOs will monitor out to the greatest extent practicable based on the required number of PSOs, required monitoring locations, and environmental conditions.
- In the event anchor handling operations continue into the night, PSOs will employ NMFS-approved NVDs to clear the CZ and monitor to the maximum extent practicable based on the required number of PSOs, required monitoring locations, and environmental conditions.

During pipelaying (i.e., anchor moving), the CZ will be cleared prior to the start of anchor handling; however, anchor handling operations are not continuous when laying the pipe; periods of time between pipelaying and moving anchors may be long. Consequently, the following applies:

- If PSOs do not monitor continuously, the CZ will need to be cleared for 30 min before each anchor is moved in adherence with pre-clearance protocols; or
- If PSOs remain on watch continuously, the zone will not need to be cleared again.
- If a beluga is observed between placing an anchor and picking up a new one, the next anchor pick-up cannot occur until the animal(s) has not been seen for 30 min, unless the delay interferes with the safety of working conditions.

### *3.8.2 Pipeline Replacement/Installation: Pipe Pull Method*

| | | CZ |
|---|---|---|
| **Pipe Pulling Activities** | Beluga Whales | At any distance |
| | All Other Marine Mammals | 1,500 m[1] |

[1]PSOs will monitor out to the greatest extent possible based on the required number of PSOs, required monitoring locations, and environmental conditions once the zone is cleared to inform potential Level B take determinations.

PSOs will clear a 1,500 m (4,921 ft) CZ 30-min prior to commencing pipe pull operations. As it is not feasible or safe to shutdown tugs while towing a spool of 305 m (1,000 ft) long pipe in the Cook Inlet tidal environment pipe pulling will not employ a SZ. The following mitigation will apply during pipe pulling:

- Once the CZ is cleared, PSOs will monitor out to the greatest extent possible based on the required number of PSOs, required monitoring locations, and environmental conditions.
- Any one or more of the following mitigation measures may be implemented if a marine mammal is observed during pipe pulling operations if, in the captain's discretion, it is safe and possible to do so:
    - Reduce speed
    - Alter course

## 3.9 GENERAL VESSEL-BASED MARINE MAMMAL AVOIDANCE MITIGATION MEASURES

Standard vessel mitigation procedures are separate from project-specific mitigation measures that will be observed for vessel-based marine mammal avoidance anytime operating a vessel. Vessel operators will adhere to NOAA Alaska Region Marine Mammal Viewing Guidelines (NOAA 2024) as follows:

4. Always maintain a watch for marine mammals while underway.
5. Avoid approaching within 91 m (100 yards) of marine mammals.
6. Reduce general vessel speed to less than 9 km/hr (5 kt) when within 274 m (300 yards) of a whale when operationally feasible and safe to do so.
7. Maintain general tug towing jack-up rig speed of 7 km/hr (4 kt) or less, when safe to do so.
8. Adjust speed to 18.5 km/hr (10 kt) or less when weather conditions reduce visibility to 1.6 km (1 mi) or less.
9. Avoid multiple changes in direction and speed when within 274 m (300 yards) of a whale, unless necessary to reduce the risk of collision.
10. Avoid positioning vessel(s) in the path of marine mammals and cutting in front of marine mammals in a manner or at a distance that causes the marine mammal to change their direction of travel or behavior (including breathing/surfacing pattern).
11. Check the waters immediately adjacent to the vessel(s) to ensure no marine mammals will be injured when the propellers are engaged.
12. Place the engine in neutral, if maritime conditions safely permit, to allow a whale(s) to pass beyond the vessel in situations where a whale's course and speed indicate that it is likely to cross in front of the vessel while underway or if vessel is approaching within 91 m (100 yards) of the whale(s).
13. Take reasonable steps to alert other vessels in the vicinity of whale(s).
14. Maintain clean lines (i.e., no lines in the water unless both ends are under tension and affixed to vessels or gear).

***Humpback Specific General Mitigation Measures***

Vessel operators will also adhere to the specific Alaska Humpback Whale Approach Regulations (50 CFR §§ 216.18, 223.214, and 224.103(b)) anytime operating a vessel. Vessel operators will not:

1. Approach, by any means, including by interception (i.e., placing a vessel in the path of an oncoming humpback whale), within 91m (300 ft) of any humpback whale;
2. Cause a vessel or other object to approach within 91m (300 ft) of any humpback whale; or
3. Disrupt the normal behavior or prior activity of a whale by any other act or omission.

***Steller Sea Lion Specific General Mitigation Measures***

Vessel operators will additionally adhere to the specific Western Distinct Population Segment (DPS) Steller Sea Lion Regulations (50 CFR §§ 224.103(d)) anytime operating a vessel. Vessel operators will:

1. Avoid approaching within 5.5 km (3.4 mi) of a Steller sea lion rookery or haul-out; and

2. Avoid approaching within 914 m (3,000 ft) of any Steller sea lion haul-out or rookery.

# 4. MONITORING

The Applicant will employ monitoring during the listed activities in Table 8 (Table 46 in the Petition). The monitoring will document any presence of marine mammals; the number and type of marine mammals (i.e., species, sex, age); their location, behavior, and reaction, if any, to project activities; their distance and bearing to the sound source and CZ or SZ; subsequent mitigation efforts; and the effectiveness of those mitigation efforts. Mitigation measures are further discussed in Section 3. Additional information to be collected includes weather conditions, sea state, visibility, daylight, or darkness (NVD use), and glare to understand overall observer effort and the effectiveness of the effort.

General monitoring may occur opportunistically while PSOs are awaiting activity start and as their schedule allows. For example, if the jack-up rig's legs are being pinned down and the tugs are not underpower, PSOs may stay on watch for general monitoring provided they are not exceeding any mandated watch limitations (i.e., more than 4 hr at a time and/or 12 hr in a 24-hr period).

## 4.1 VISUAL MONITORING EQUIPMENT

PSOs will monitor for marine mammals using their naked eye, handheld binoculars, and a range finder. Global Positioning System location and weather information (e.g., wind speed, will be obtained from vessel instruments). A laptop computer will be provided to record sightings, activities, and environmental conditions. NMFS-approved NVDs (e.g., PVS-7) will be provided to aid in monitoring in low-light conditions. If NVDs are required to clear the zone during the start of activity, a magnifier lens extension may be required initially to clear the zone and may then be removed for continued monitoring.

## 4.2 DISTANCE ESTIMATION AND CALIBRATION OF VISUAL MONITORING EQUIPMENT

Reticle binoculars and range finders will be provided for estimating distance from the vessel to a detected animal. Reticle binoculars and range finders will be calibrated throughout the duration of the PSO activities using the vessel radar and/or by comparing estimated distances to known distances. Calibration will be conducted at the beginning of each watch. Reticle use and calibration requires a clear view of the horizon. Reticle binoculars cannot be calibrated if the vessel is surrounded by land or in reduced visibility. In Cook Inlet, the horizon is rarely visible; therefore, a rangefinder and the vessel radar may be the primary distance-finding tools.

## 4.3 PROTECTED SPECIES OBSERVERS

Mitigation and monitoring will be employed as described in Section 11 and 13 of the Petition and here in the 4MP for marine mammals using NMFS-approved PSOs for all activities for which take authorization has been requested in the Petition.

PSOs will be on watch at all times for the class of activities listed in Section 1 of the Petition and Table 8 above. Generally, work is conducted 24 hr per day. 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° view between all PSOs on watch.

Every effort will be made to conduct operations during daytime hours; however, in the event nighttime operations are required, PSOs will use NMFS-approved NVDs and the appropriate lens to clear zones and monitor for the presence of marine mammals when possible and within the parameters established in this 4MP.

PSOs will be stationed as follows and as summarized in Table 9:

- For tugs towing, holding, or positioning a jack-up rig (Year 1 through Year 5), four PSOs will be staged on the jack-up rig. Two PSOs will be on watch at a time, one on the port and one on the starboard side.
- For tug transportations of a jack-up rig to or from the Tyonek platform (Year 1 through Year 5), in addition to the PSOs stationed on the rig during transport, a PSO will be stationed on the Tyonek platform to monitor for beluga whales 1 hr before tugs are expected to arrive (i.e., scheduled to approach the Level B threshold) and will closely monitor the Level A thresholds and out to the maximum extent practicable based on the required number of PSOs, required monitoring locations, and environmental conditions.
- For Tyonek winter season pile driving, four to six PSOs will be stationed on the Tyonek platform (Year 1 through Year 4), two on watch at a time; one on the port and one on the starboard side. Additionally, a winter weather mitigation plan will be implemented and discussed further in the 4MP.
- For exploratory drilling at the MGS Unit and between the Anna and Bruce platforms, four PSOs will be stationed on the drilling rig (Year 2 and Year 4), two on watch at a time; one on the port and one on the starboard side.
- For anchor handling associated with pipeline replacement/installation activity, two to three PSOs will be stationed on the anchor handling vessel, one on watch at a time.
- For pipe pull associated with pipeline replacement/installation activity, one to three PSOs will be stationed on the pipe pull vessel, one on watch at a time. One to three PSOs will be stationed on the nearest platform, one on watch at a time. The placement of additional PSOs on the pipe pull vessel and platform was evaluated. However, it was determined to be impractical due to the necessity of another vessel to accommodate the extra PSOs. Moreover, the CZ and SZ are able to be adequately monitored between the PSOs on the pipe pull vessel and platform.

## Table 9. PSO Stations and Locations per Activity

| Activity | Number of PSOs | On-Watch Count and Position | PSO Location(s) |
|---|---|---|---|
| Tugs Towing, Holding, or Positioning a Jack-Up Rig | 4 | 2 on watch (1 port, 1 starboard) | Jack-Up Rig |
| Tugs Towing, Holding, or Positioning a Jack-Up Rig at Tyonek Platform | 6-8 | 2 on watch (1 port, 1 starboard) | Jack-Up Rig |
| | | 1 on watch | Tyonek Platform |
| Winter Season Pile Driving for Production Well Development | 4-6 | 2 on watch (1 port, 1 starboard) | Tyonek Platform |
| Pile Driving for Exploratory Drilling | 4 | 2 on watch (1 port, 1 starboard) | Drilling Rig |
| Anchor Handling | 2-3 | 1 on watch | Anchor Handling Vessel |
| Pipe Pulling | 4-6 | 1 on watch | Pipe Pulling Vessel |
| | | 2 on watch (1 port, 1 starboard) | Nearest Platform |

PSOs will record environmental data and observations on data forms or into electronic data sheets, and an electronic copy will be submitted to NMFS in a digital spreadsheet format in the annual report. The following information will be collected:

- Date and time activity and observation efforts begin and end.
- Type and duration of activity (i.e., tugs under load with a jack-up rig, pile driving, anchor handling, pipe pulling).
- Indications of when nighttime operations were required and when NVDs were employed, including which lenses were utilized.
- Weather parameters (e.g., Beaufort Sea State, visibility, sun glare, fog, cloud cover, rain, snow, etc.) will be recorded at the start and end of each observation watch, every 30 min during a watch, and whenever a change occurs in any of the forgoing variables.
- PSO name and location.
- Species, group size, and age/sex categories (if determinable) as well as date, time, and location of the observation.
- Marine mammal behavior when first sighted and after initial sighting, heading (if consistent), bearing and distance from the sound source, closest point of approach (CPA), and behavioral pace.
- Assessment of behavioral response thought to have resulted from the activities (e.g., no response, approach, change in direction, cessation of feeding, etc.)
- Vessel position and speed, water depth, and activity.
- Mitigation measures enacted and duration that operations were impacted by the presence of marine mammals.

PSOs will conduct visual monitoring during operations, as follows:

- Observation will begin 30 min prior to the commencement of the specified activities.

- If the sound-generating activities listed in Table 8 cease for > 30 min, a 30-min observation period is required before sound-generating activity within the class of activities can resume.
- Observations will end 30 min after sound-generating activity within the class of activities listed in Table 8 have ceased.
- The PSOs will systematically scan the observation area alternating between naked eye and (7x50) binoculars or NVDs, focusing on varying distances in intervals.
- All zones discussed previously in Section 3.3 (Table 8) will be monitored to the greatest extent possible based on the required number of PSOs, required monitoring locations, and environmental conditions.
- PSOs will watch for indications of the presence of marine mammals, e.g., blows, fins, splashes, ripples, or feeding sea birds.
- If a marine mammal is observed, the PSO will notify Hilcorp operators as required under the terms of the LOA and/or ITR.
- If mitigation actions are not required, such as in the case of species sighted outside the Level B zone and moving away from the operation area, the PSO will note and monitor the position (including latitude/longitude of the vessel or sound source and relative bearing and estimated range to the animal) until the animal moves out of visual range of the observer.

The following guidelines will apply to these watch periods:

- PSOs will be independent of the activity contractor (for example, employed by a subcontractor) and have no other assigned tasks during monitoring periods.
- PSOs will work in shifts lasting no more than 4 hr without a minimum of a 1-hr break.
- PSOs will be allowed to watch no more than 12 hr in a 24-hr period.

▪ The following guidelines will apply to PSO monitoring position:

- PSOs will be positioned in a location that will not interfere with the navigation or operation of the vessel that also affords an optimal view of the sea surface.
- To the extent possible and between all on watch, PSOs will maintain a 360-degree view from the vessel or monitoring station and will focus on the direction of travel when traveling.
- PSOs will work in coordination with vessel or monitoring station personnel to determine the optimal viewing location that is safe and does not limit operations.

# 5. REQUESTED TAKES

The maximum annual requested take authorizations for activities in this Petition as described in Section 1 that exceed NMFS acoustic harassment Level A and Level B criteria are presented in Table 10 and do not account for mitigation of any of the sound-generating activities. Take authorization requests are rounded up in circumstances where exposure estimates are less than a whole number, with the exception of beluga whales, for which the maximum annual Level A exposure estimate is 0.032 (Year 2, *Scenario 2*). However, no Level A takes are requested for beluga whales. As previously mentioned, Pacific white-sided dolphins and California sea lions don't have published density estimates for Cook Inlet, therefore, take requests are based on reported single-event sighting numbers.

The maximum annual Level A take authorization requests for humpback, fin, minke, gray, and killer whales; Dall's porpoises; harbor seals and Steller sea lions are commensurate to calculated exposure estimates. The maximum annual Level A take authorization request for harbor porpoises exceeds the calculated exposure estimates to account for potential group sightings during winter pile driving and limited winter distribution data in Cook Inlet.

Level B take authorization requests generally align with exposure estimates; however, for gregarious species with low exposure estimates, additional Level B take authorizations are requested to account for potential exposures to small groups of animals that travel together.

Pile driving at the Tyonek platform is analyzed for winter (mid-November to mid-April) primarily because most species are less likely to be present in middle Cook Inlet. However, winter distribution data remain limited. Castellote et al. (2016) detected harbor porpoises near the Beluga River until mid-November but recorded no detections through late January, suggesting they may move south to avoid ice formation, which typically begins in November (Mulherin et al., 2001). Castellote et al. (2024) further support this ice displacement hypothesis, showing harbor porpoises were detected almost daily in Tuxedni Bay from September to May, except for a decrease in January. In Chinitna Bay, detections were nearly daily except for most of January, aligning with peak sea ice concentrations in the Bay (National Weather Service Alaska Sea Ice Program[2]).

Humpback whales were only detected once at the end of May in Tuxedni Bay and in Chinitna Bay, detections occurred between mid-December and mid-January and not again until late April. While this is only one area of Cook Inlet, aerial surveys in summer months indicate humpbacks are less common in middle and upper Cook Inlet (Shelden et al. 2013, 2012, 2019, 2022). Additionally, humpback whales from the Mexico-North Pacific, Western North Pacific and Hawai'i stocks are known to migrate to southern waters (Calambokidis et al. 2017; Curtis et al. 2022; Martien et al. 2021; Wade et al. 2021; Young et al. 2023) further reducing their likelihood in middle Cook Inlet in winter months.

Killer whale detections occurred in December and February through May in Chinitna Bay while fewer occurrences (7 days) were recorded in Tuxedni Bay with only one during the winter months (January). However, the likelihood of killer whales in the area during winter season pile driving is still probable.

Castellote et al. (2024) show beluga whales spend a considerable amount of time outside of middle Cook Inlet – moving into lower Cook Inlet – in winter months. Over 120 acoustic detections were documented of beluga whales foraging in the Tuxedni River and Bay between September and April, underscoring the significance of this area as important winter foraging grounds. Tuxedni Bay is approximately 135 km (84 mi) from pile driving activities.

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[2] Ocean Data Explorer: Map portal

Dall's porpoises, fin whales, and Steller sea lions are uncommon in middle Cook Inlet, though winter distribution data for these species is limited. Moran et al. (2018) report seasonal shifts in Dall's porpoise distribution in Prince William Sound (PWS), with a preference for eastern PWS in winter and shallower waters in spring, likely influenced by prey availability, particularly overwintering Pacific herring. Given the presence of Pacific herring in Cook Inlet, occasional sightings remain possible. Steller sea lions primarily prey on pollock and Pacific cod in winter (Sinclair & Zeppelin 2002), species largely concentrated in lower Cook Inlet (Rumble et al. 2023).

## Table 10. Maximum Requested Annual Level A and Level B Take Authorizations

| Species | Stock | Level A Harassment | | Level B Harassment | | Total Annual Take Authorization Requests | |
|---|---|---|---|---|---|---|---|
| | | Maximum Annual Estimated Exposures | Maximum Take Authorization Requests | Maximum Annual Estimated Exposures | Maximum Take Authorization Requests | Level A + B Annual Take Authorization Requests | Combined Level A + B percent of Population |
| Humpback whale[1] | Mexico North Pacific | 0.0370 | 1 | 5.006 | 6 | 7 | 0.76% |
| | Western North Pacific | | | | | | 0.65% |
| | Hawai'i | | | | | | 0.06% |
| Minke whale[1] | Alaska | 0.006 | 1 | 0.076 | 3 | 4 | 0.32% |
| Gray whale[1] | Eastern Pacific | 0.013 | 1 | 0.180 | 5 | 6 | 0.04% |
| Fin whale[1] | Northeastern Pacific | 0.055 | 1 | 0.748 | 3 | 4 | 0.16% |
| Killer whale[1] | Alaska Resident | 0.002 | 1 | 1.659 | 10 | 11 | 0.57% |
| | Alaska Transient | | | | | | 1.87% |
| Beluga whale[2] | Cook Inlet | 0.032 | 0 | 26.565 | 27 | 27 | 8.16% |
| Dall's porpoise[1] | Alaska | 0.066 | 1 | 0.371 | 10 | 11 | 0.01% |
| Harbor porpoise[1] | Gulf of Alaska | 1.821 | 4 | 10.279 | 11 | 15 | 0.05% |
| Pacific white-sided dolphin | North Pacific | 0.000 | 0 | 0.000 | 3 | 3 | 0.01% |
| Harbor seal[1] | Cook Inlet/ Shelikof | 42.366 | 43 | 727.166 | 728 | 771 | 2.71% |
| Steller sea lion[1] | Western United States | 0.147 | 1 | 18.142 | 19 | 20 | 0.04% |
| California sea lion | United States | 0.000 | 0 | 0.000 | 2 | 2 | 0.00% |

**Notes:**
It should be noted that the specific years that activities are analyzed to occur may or may not coincide with the actual year of execution, therefore, Hilcorp will be requesting up to the annual maximum amount of take per year depending upon the activities planned; [1] The greatest potential estimated exposure to beluga whales results from the following activities in Year 2: two lay barge projects *(Scenario 2)*, winter pile driving at the Tyonek, tugs under load with a jack-up rig, and exploratory drilling (one well) between the Anna & Bruce platforms. [2] The greatest potential estimated exposure to all other marine mammals (i.e., humpback, fin, gray, and killer whales, Dall's and harbor porpoises, harbor seals, and Steller sea lions) results from the following activities in Year 4: exploratory drilling (two wells) in the MGS Unit, tugs under load with a jack-up rig, winter pile driving at Tyonek, and pipe pulling *(Scenario 1)*. These two combinations of activities are used to calculate the maximum annual take authorization requests for each species. Alternative combinations of activities result in fewer estimated exposures, thereby supporting the use of these combinations.

Table 11 lists the total take authorization requests over the Petition period. The maximum annual take authorizations that are requested should not be inferred to represent the number of takes that are needed in each of the five years of the Petition. Since the specified activities could shift to a different year, the maximum takes are used to maintain scheduling flexibility for specified activities to occur in years other than those initially estimated (e.g., Year 3 instead of Year 2). For example, the maximum number of beluga whale take authorization requests is 27. However, 27 takes are only projected to be needed, based on exposure estimates, for Year 2 if *Scenario 2* is executed. In all other years (when *Scenario 2* is executed), the requested takes for beluga whales range from 12 to 16. Contrary, when *Scenario 1* is executed, the maximum number of beluga whale take authorization requests (24) is greatest in Year 4 but still less than Year 2, *Scenario 2*.

Hilcorp will develop a request for a Letter of Authorization (LOA) with exposure estimates based on anticipated activities during the specific LOA period. Based on available resources activities may occur in any of the five years. The LOA period may range from annual to multi-year durations, such as three-year or five-year terms. This 4MP will be updated accordingly with each new LOA.

## Table 11. Total Maximum Requested Takes Year 1 - Year 5

| Species | Maximum 5-year Level A | Maximum 5-year Level B | Combined Level A and Level B 5-year Maximum |
|---|---|---|---|
| Humpback whale - MNP<br>Humpback whale - WNP<br>Humpback whale - HS | 5 | 30 | 35 |
| Minke whale | 5 | 15 | 20 |
| Gray whale | 5 | 25 | 30 |
| Fin whale | 5 | 15 | 20 |
| Killer whale - resident<br>Killer whale - transient | 5 | 50 | 55 |
| Beluga whale | 0 | 133 | 133 |
| Dall's porpoise | 5 | 50 | 55 |
| Harbor porpoise | 20 | 55 | 75 |
| Pacific white-sided dolphin | 0 | 15 | 15 |
| Harbor seal | 215 | 3,640 | 3,855 |
| Steller sea lion | 5 | 95 | 100 |
| California sea lion | 0 | 10 | 10 |

**Notes:** The total maximum requested takes assume the maximum take authorizations are requested each year. The specific years activities are analyzed to occur may or may not coincide with the actual year of execution, therefore, Hilcorp will be requesting up to the annual maximum number of takes per year depending upon the activities planned. For further details, these potential combinations of activities across the five-year action period are analyzed in the *Scenario 1* and *Scenario 2* tab in the Excel Exposure Estimate workbook submitted in tandem with this ITR.

# 6. REPORTING

Results of PSO monitoring, including estimates of exposure to key sound levels, will be presented in monthly and 90-day reports. Reporting will address the requirements established by NMFS in the ITR.

## 6.1 MONTHLY REPORTS

A monthly report will be submitted following each month that involves any of the following activities:

- Tugs towing, holding, or positioning a jack-up rig associated with production drilling.
- Pile driving associated with production well development at the Tyonek platform.
- Tugs towing, holding, or positioning a jack-up rig, or pile driving associated with exploratory drilling.
- Tugs engaged in anchor handling or pipe pulling associated with pipeline replacement/installation.

## 6.2 90-DAY REPORT

A 90-day report detailing all activities conducted under each LOA issued under the ITR will be prepared and submitted to NMFS within 90 days of completion of in-water work. The technical report will include the following information:

Summaries of monitoring effort: total hr, total distances, and distribution of marine mammals throughout the study period compared to the Beaufort Sea State as well as other factors affecting the visibility and detectability of marine mammals;

- Analyses of the effects of various factors influencing the detectability of marine mammals: Beaufort Sea State, number of observers, and fog or glare; Effectiveness of NVDs and various lens attachments;
- Species composition, occurrence, and distribution of marine mammal sightings (including date, numbers, age/sex categories, when discernable), and group sizes;
- Analyses of the effects of program activities, including the following:
    - Sighting rates of marine mammals during periods with and without project activities (and other variables that could affect detectability),
    - Initial sighting distances versus project activity,
    - Closest point of approach versus project activity,
    - Behaviors and types of movements versus project activity,
    - Numbers of sightings/individuals observed versus project activity,
    - Summary of implemented mitigation measures, and

- Estimates of "take by harassment."

## 6.3 REPORTING INJURED OR DEAD MARINE MAMMALS

If personnel engaged in Hilcorp's activities encounters an injured or deceased marine mammal, Hilcorp will promptly report the incident to the Office of Protected Resources (OPR) and NMFS at PR.ITP.MonitoringReports@noaa.gov and reny.tyson.moore@noaa.gov, respectively. Additionally, a report will also be called into the Alaska regional stranding network at (877) 925-7773 as soon as feasible. In cases where it is evident that Hilcorp activity caused the injury or death, Hilcorp will immediately halt the activities until NMFS OPR reviews the circumstances of the incident and determines whether any further measures are necessary to ensure compliance with the terms of the ITR. Activity will not resume until Hilcorp is notified by NMFS. Hilcorp's halting of activities because an injured or deceased marine mammal is observed (whatever the cause) is not an express or implied admission that Hilcorp's activity caused the injury or death.

A report will be submitted with the following details:

- The time, date, and location (latitude/longitude) of the initial discovery, including any updated location information if known and applicable.
- Identification of the species involved, if known, or a description of the animal(s).
- The condition of the animal(s), including the state of the carcass(es) if deceased.
- Behaviors observed in the animal(s) if alive.
- If available, photographs or video footage of the animal(s).
- A description of the general circumstances under which the animal was found.

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# APPENDIX B

# STAKEHOLDER ENGAGEMENT PLAN

Hilcorp Alaska, LLC

# Stakeholder Engagement Plan for 2025-2029 Oil and Gas Activities Cook Inlet, Alaska

## Appendix B

February 2025
Rev. 2

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# LIST OF ATTACHMENTS

# LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| ~ | approximately |
| ADF&G | Alaska Department of Fish and Game |
| ANSCA | Alaska Native Claims Settlement Act |
| CIRI | Cook Inlet Region, Inc. |
| Hilcorp | Hilcorp Alaska, LLC |
| ITR | Incidental Take Regulation |
| km | kilometer(s) |
| MGS | Middle Ground Shoal |
| mi | mile(s) |
| NMFS | National Marine Fisheries Service |
| NOAA | National Oceanic and Atmospheric Administration |
| POC | point of contact |
| SEP | Stakeholder Engagement Plan |

# 1. INTRODUCTION

Hilcorp Alaska, LLC (Hilcorp) is submitting a petition for promulgation of an Incidental Take Regulation (ITR) (Petition) from the National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) pursuant to Section 101(a)(5)(A) of the Marine Mammal Protection Act for the non-lethal unintentional taking of small numbers of marine mammals incidental to oil and gas exploration, development, production, and decommissioning activities in Cook Inlet, AK, from August 15, 2025 to December 31, 2029.

Requirements of 50 Code of Federal Regulations 216.104(a)(12) necessitate ITR applicants provide information that identifies measures which have been taken and/or will be taken to minimize adverse effects on the availability of marine mammals for subsistence purposes involving activities that take place in Arctic waters. NMFS regulations define Arctic waters as waters north of 60° N. Much of Cook Inlet is north of 60° N; however, NMFS makes distinctions between waters in Cook Inlet and waters of the Chukchi and Beaufort seas.

Harbor seals and Steller sea lions may be harvested by the Kenai, Salamatof, and Tyonek communities but at relatively low rates. A moratorium on harvesting of beluga whales in Cook Inlet is in effect. Hilcorp has developed this Stakeholder Engagement Plan (SEP) to minimize adverse effects on the availability of subsistence of marine mammals for subsistence purposes from the class of activities specified in the 2025-2029 ITR petition.

This SEP summarizes the strategy for engagement with subsistence groups and communities adjacent to Hilcorp's 2025-2029 anticipated class of activities.

Because of the short-term, temporary, localized nature of the activities and relatively low marine mammal subsistence harvest, potential impacts to marine mammal harvest will be negligible.

Hilcorp will continue to outreach and interact with stakeholders, as described, and will incorporate feedback into operational planning efforts, as appropriate, to avoid interference with marine mammal subsistence activities.

# 2. DESCRIPTION OF ACTIVITIES

Hilcorp plans to carry out the following activities between August 15, 2025, and December 31, 2029:

1. Tugs towing, holding, or positioning a jack-up rig in support of production drilling at existing platforms in middle Cook Inlet and Trading Bay.

2. Pile driving in support of production well development at the Tyonek platform in middle Cook Inlet.

3. Tugs towing, holding, or positioning a jack-up rig and pile driving in support of exploration drilling at two locations in the Middle Ground Shoal (MGS) Unit in middle Cook inlet; and one location between the Anna and Bruce platforms on the northern border of Trading Bay; and

4. Pipeline replacement/installation, involving either pipe pulling or anchor handling or a combination of both, at up to two locations in middle Cook Inlet and/or Trading Bay.

Table 1 summarizes the anticipated class of activities included in the 2025-2029 Petition. Figure 1 displays the specific geographic region in which the class of activities will occur, along with existing Hilcorp assets and locations of planned activities. All Hilcorp's planned activities will occur in middle Cook Inlet and Trading Bay. The specific geographic area extends north from a point on the eastern shoreline ~12 km (7.5 mi) south of the East Foreland to an point approximately (~) 16 kilometers (km) (10 miles [mi]) south of Point Possession on the west side, to the northernmost production platform in middle Cook Inlet (Tyonek, located in the North Cook Inlet Unit) to a point that is 3.5 km (2.2 mi) north of the village of Tyonek near the mouth of the Chuitna River. Then it extends south to a point along the western shoreline ~15 km (9.3 mi) south of the West Foreland, and across the inlet back to a point on the eastern shoreline ~12 km (7.5 mi) south of the East Foreland.

The class of activities is planned to occur in marine waters that support several marine mammal species. Based on the timing and duration of the activities, they may result in incidental, unintentional taking by harassment of marine mammals.

## Table 1. Summary of Planned Activities Included in ITR Petition Request

| Project Name | Cook Inlet Region | Seasonal Timing | Year(s) Planned[1] | Anticipated Duration of Sound-producing Activity per Year | Anticipated Sound Sources |
|---|---|---|---|---|---|
| Tugs under Load with a Jack-Up Rig in support of Production Drilling | Middle Cook Inlet | April – December | Year 1–Year 5 (2025–2029) | 12 days (Years 1, 3, 5)<br>10 days (Year 2)<br>8 days (Year 4) | 3 to 4 tugs towing, holding, and positioning a jack-up rig |
| Pile Driving in Support of Production Well Development at the Tyonek Platform | Middle Cook Inlet | Mid-November – Mid-April | Year 1–Year 5 (2025–2029) | 14 days (7 days per pile, 2 piles per year) | Pile driving |
| Tugs under Load with a Jack-Up Rig and Pile Driving in Support of Exploratory Drilling[2] | Trading Bay (between Anna and Bruce platforms) | April – December | Year 2 (2026) | 2 days tugs under load with a jack-up rig; 6 days pile driving (one well) | Pile driving, 3 to 4 tugs towing, holding, and positioning a jack-up rig |
| | Middle Cook Inlet (MGS Unit) | April – December | Year 4 (2028) | 4 days tugs under load with a jack-up rig; 12 days pile driving (two wells) | Pile driving, 3 to 4 tugs towing, holding, and positioning a jack-up rig |
| Pipeline Replacement/ Installation[3] | Middle Cook Inlet/Trading Bay | April – November | Year 2 (2026) | *Scenario 1*: 11 days using lay barge methods<br>*Scenario 2*: 22 days using lay barge methods (11 days per project, 2 projects) | *Scenario 1*: Anchor handling<br>*Scenario 2*: Anchor handling |
| | | April – November | Year 4 (2028) | *Scenario 1*: 8 days using pipe pull methods<br>*Scenario 2*: no pipeline replacement/installation | *Scenario 1:* 2 tugs engaged in pipe pulling, bottom impact sounds of pipe connecting with seafloor<br>*Scenario 2*: none |

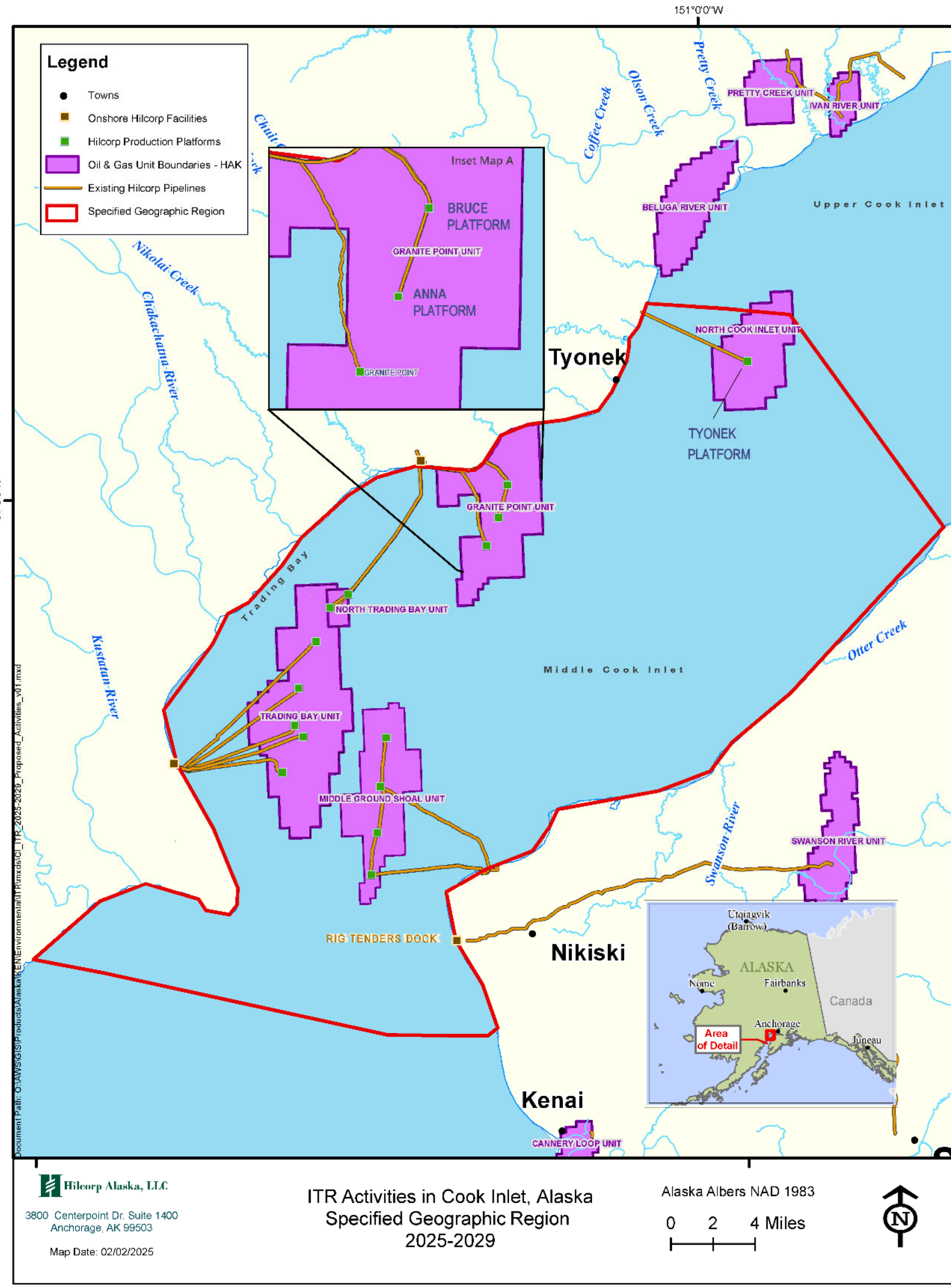
**Notes:**

[1] The specific years activities are analyzed to occur may or may not coincide with the actual year of execution, therefore, Hilcorp will be requesting up to the annual maximum number of takes per year depending upon the activities planned. For further details, these potential combinations of activities across the five-year action period are analyzed in the *Scenario 1* and *Scenario 2* tab in the Excel workbook submitted in tandem with this ITR.

[2] To determine maximum annual exposure estimates, one exploratory well between Anna and Bruce is analyzed to occur in Year 2 and two exploratory wells in the MGS Unit are analyzed to occur in Year 4; however, the exploratory wells may be developed in any separate years during the Petition period.

[3] To determine maximum annual exposure estimates, two pipeline scenarios are analyzed to occur: *Scenario 1* comprises one project using lay barge methods in Year 2 and one project using pipe pull methods in Year 4; *Scenario 2* comprises two projects using lay barge methods in Year 2 and no additional projects thereafter. A maximum of two pipeline projects will occur during the Petition period. Pipeline projects may occur simultaneously in any one year or in separate years year during the Petition period however, only lay barge methodology can be utilized in the same year (i.e., *Scenario 2*). The greatest potential estimated exposure to beluga whales results from the following activities in Year 2: two lay barge projects *(Scenario 2)*, winter pile driving at the Tyonek, tugs under load with a jack-up rig, and exploratory drilling (one well) between the Anna & Bruce platforms. The greatest potential estimated exposure to all other marine mammals results from the following activities in Year 4: exploratory drilling (two wells) in the MGS Unit, tugs under load with a jack-up rig, winter pile driving at Tyonek, and pipe pulling *(Scenario 1)*. These two combinations of activities are used to calculate the maximum annual take authorization requests for each species. Alternative combinations of activities result in fewer estimated exposures, thereby supporting the use of these combinations.

## Figure 1. Specified Geographic Area for the 2025-2029 ITR Petition.



# 3. STAKEHOLDER ENGAGEMENT

Broadly defined, stakeholder engagement is the systematic process designed to provide clear and consistent information to those people who might be affected by the specified activity and to engage people and groups at appropriate, meaningful levels of the decision-making process. Successful activities effectively engage stakeholders through education, involvement, and a mutual understanding of the roles, responsibilities, and ability to influence decisions. Hilcorp's overarching objectives are the following:

- Communicate the scope of the specified activity to stakeholders.
- Demonstrate sensitivity and responsiveness to stakeholder issues and ideas.
- Facilitate communication and cooperation among stakeholders.

Stakeholder groups will have the opportunity to receive informative correspondence in advance of the start of the specified activity. Any action items identified in meetings will be highlighted in the meeting notes, assigned, and addressed. All unanswered questions or concerns from stakeholders will be routed to the appropriate point of contact (POC) for follow-up.

# 4. COOK INLET SUBSISTENCE COMMUNITIES

For the purposes of this SEP, Cook Inlet subsistence communities have subsistence activities that may overlap with Hilcorp's class of activities in Cook Inlet.

Hilcorp respects and values Alaska Native perspectives and is committed to using traditional/subsistence knowledge to inform the development of oil and gas exploration, development, production, and decommissioning activities. These perspectives will be incorporated into plans, where applicable, to avoid or mitigate potential impacts on the natural environment, including to marine waters and mammals.

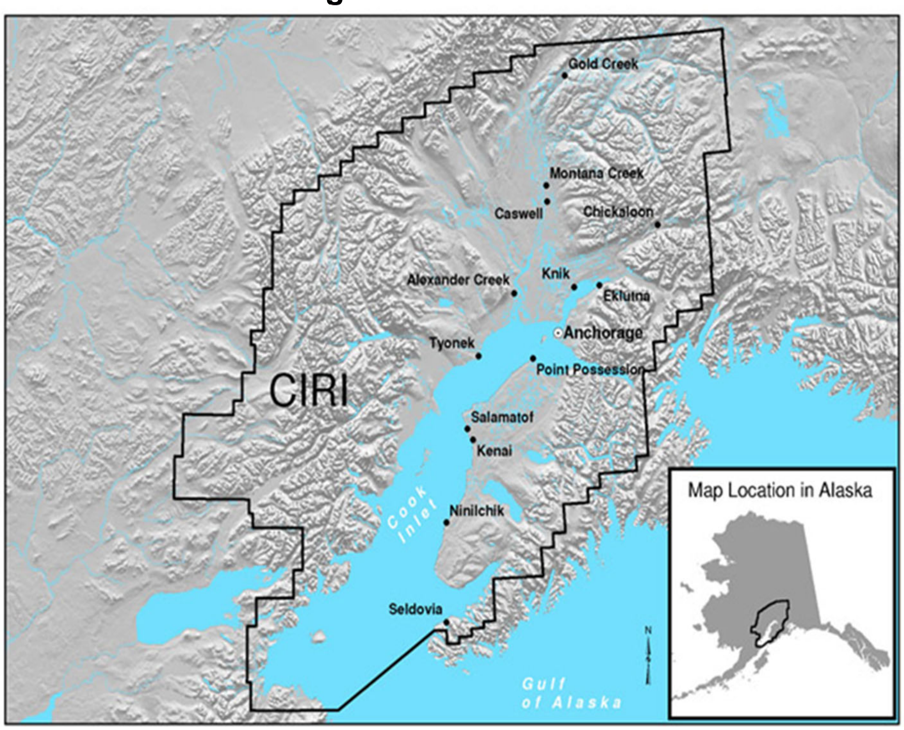
## 4.1 SUBSISTENCE COMMUNITIES WITHIN THE GEOGRAPHIC AREA OF ACTIVITY

Subsistence communities identified as having stakeholder interest in the activity specified in Section 1 include the Kenaitze Indian Tribe, Village of Salamatof, and Native Village of Tyonek (Attachment A). These communities are located near the class of activities or near a transit route. Potential effects of activities on the communities and mitigation methods to eliminate those impacts are identified in the following sections.

### 4.1.1 Regional Organizations

Several regional organizations service the Cook Inlet regions. Cook Inlet Region, Inc. (CIRI) is the Alaska Native Claims Settlement Act (ANSCA) corporation for seven federally recognized tribes in Cook Inlet (Figure 2): Chickaloon, Eklutna, Knik, Ninilchik, Salamatof, Seldovia, and Tyonek. Chickaloon, Eklutna, and Knik are not further discussed in this document due to their lack of proximity to activities. Chugach Alaska Corporation is the ANSCA corporation for two tribes in Cook Inlet, Port Graham and Nanwalek, which fall outside the geographic area of activity as well and are not further discussed.

**Figure 2. CIRI Tribes**



### 4.1.2 CIRI Tribes in the Cook Inlet Geographic Area of Activity

#### *4.1.2.1 Kenai (Yaghanen) – "The Good Land"[1]*

Kenai occurs near the southern geographic area of Hilcorp's 2025-2029 activities outlined in the Petition. The following provides a brief description of Kenai and stakeholders in Kenai:

- Incorporated as a 2nd Class City in the Kenai Peninsula Borough in 1960
- Federally Recognized Tribe: Kenaitze Indian Tribe
- Village Corporation: Kenai Native Association, Inc.
- Regional Native Corporation: CIRI
- Population: 7,562 (U.S. Census Bureau 2023)
- Travel is by road and air, year-round

Oil and gas exploration, development, production, and decommissioning activities occurring closest to Kenai are pile driving, plugging and abandonment associated with offshore exploratory drilling, and tugs under load with a jack-up rig in support of offshore production and exploratory drilling. Tugs under load with a jack-up rig will depart from and return to Nikiski and will transit from other platforms in the inlet to within the MGS Unit located in State of Alaska waters north and west ~24 km (15 mi) of Kenai. The last Alaska Department of Fish and Game (ADF&G) subsistence survey conducted in Kenai was in 2008 (Wolfe et al. 2009). In the greater Kenai area, an estimated 13 harbor seals and no sea lions were harvested in 1988 by an estimated 10 households. In the Kenai area, estimated harbor seal harvests have ranged between 13 (1998) and 35 (1997) animals. In 1996, two sea lions and six harbor seals were harvested. No sea otters have been reported harvested in Kenai.

A list of contacts with whom Hilcorp may coordinate in Kenai is provided in Table 2 and summarized in Attachment A.

**Table 2. Contacts in Kenai, AK**

| Organization | Contact | Mailing Address | Email / Phone |
|---|---|---|---|
| Kenaitze Indian Tribe | Brenda Trefon, Environmental Director | P.O. Box 988, Kenai, AK 99611 | btrefon@kenaitze.org<br>907-398-7933 |
| Kenai Native Association, Inc. | Administrative Office | 215 Fidalgo Ave, Ste. 101, Kenai, AK 99611 | 907-283-4851 |

#### *4.1.2.2 Salamatof (Salamatowa/Ken Dech' Etl't) – "Scrub Timber Flat Lake"[2]*

Salamatof occurs near the southern geographic area of Hilcorp activities outlined in the Petition. The following provides a brief description of Salamatof and stakeholders in Salamatof:

- Federally Recognized Tribe: Salamatof Tribal Council
- Village Corporation: Salamatof Native Association, Inc.
- Regional Native Corporation: CIRI
- Population: 1,201 (U.S. Census Bureau 2023)

[1] https://www.ciri.com/our-corporation/ciri-lands/cook-inlet-region-villages/
[2] https://salamatof.com/about-snai

- Travel is by road, year-round, also including access to an airstrip near Salamatof (Salamatowa/Ken Dech' Etl't) (Ninilchik Airport)

Oil and gas exploration, development, production, and decommissioning activities occurring closest to Salamatof are pile driving, plugging and abandonment associated with offshore exploratory drilling, and tugs under load with a jack-up rig in support of offshore production and exploratory drilling. Tugs under load with a jack-up rig will depart from and return to Rig Tenders Dock in Nikiski and will transit from other platforms in the inlet to within the MGS Unit located in State of Alaska waters north and west ~16 km (10 mi) of Salamatof. ADF&G Community Subsistence Information System harvest data are not available for Salamatof, however, Hilcorp assumes subsistence harvest patterns are similar to other communities along the road system on the southern Kenai Peninsula, namely Kenai.

A list of contacts with whom Hilcorp may coordinate in Salamatof is provided in Table 3 and summarized in Attachment A.

**Table 3. Contacts in Salamatof, AK**

| Organization | Contact | Mailing Address | Email / Phone |
|---|---|---|---|
| Salamatof Tribal Council/Salamatof Native Association, Inc. | Kaarlo Wik, Chair | 230 Main Street Loop<br>Kenai, AK 99611 | info@salamatof.com<br>(907) 283-7864 |

#### *4.1.2.3 Tyonek (Tubughnenq) – "Beach Land"*[3]

Tyonek occurs near the northern geographic area of Hilcorp activities outlined in the Petition. The following provides a brief description of stakeholders in Tyonek:

- Federally Recognized Tribe: Native Village of Tyonek and Tribal Council
- Village Corporation: Tyonek Native Corporation
- Regional Non-Profit: Tebughna Foundation
- Regional Non-Profit: Tyonek Tribal Conservation District
- Regional Native Corporation: CIRI
- Population: 291 (U.S. Census Bureau 2023)
- Travel is by air, year-round (Tyonek Airport)

Oil and gas exploration, development, production, and decommissioning activity occurring closest to Tyonek comprises tugs under load with a jack-up rig in Trading Bay and middle Cook Inlet; pile driving at the Tyonek platform; and pile driving between the Anna and Bruce platform. The Tyonek platform is in the North Cook Inlet Unit in middle Cook Inlet, ~9.7 km (~6 mi) offshore and to the east of Tyonek. The Anna and Bruce platforms are in the Granite Point Unit at the north end of Trading Bay. The Bruce platform is nearer to shore than the Anna which is located ~4.8 km (~3 mi) offshore and to the southeast of Tyonek. On the western side of middle Cook Inlet, Tyonek has a subsistence harvest area that extends south from the Susitna River to Tuxedni Bay (Fall et al. 1984; Stanek et al. 2007). Moose and salmon are the most important subsistence resources measured by harvested weight (Stanek 1994). In Tyonek, harbor seals were harvested between June and September by 6 percent of the households (Jones et al. 2015). Seals were harvested in several areas, encompassing an area stretching 32 km (20 mi) along the Cook Inlet coastline

[3] https://www.ciri.com/our-corporation/ciri-lands/cook-inlet-region-villages/

from the McArthur Flats north to the Beluga River. Seals were searched for or harvested in the Trading Bay areas as well as from the beach adjacent to Tyonek (Jones et al. 2015).

A list of contacts with whom Hilcorp may coordinate in Tyonek is provided in Table 4 and summarized in Attachment A.

## Table 4. Contacts in Tyonek, AK

| Organization | Contact | Mailing Address | Email / Phone |
|---|---|---|---|
| Native Village of Tyonek | Al Goozmer, President | P.O. Box 82009, Tyonek, AK, 99682-0009 | NVTPresident@gmail.com<br>(907) 583-2201 |
| Tyonek Native Corporation | Leo Barlow, Chief Executive Officer | 1689 C Street, Suite 219, Anchorage, AK 99501-5131 | lbarlow@tyonek.com<br>(907) 272-0707 |
| Tyonek Tribal Conservation District | Laurie Stuart, Executive Director | 1689 C Street, Suite 219, Anchorage, AK 99501-5131 | lstuart@ttcd.org<br>(907) 278-1020 |

# 5. SUBSISTENCE STAKEHOLDER ENGAGEMENT PLAN IMPLEMENTATION

By involving stakeholders early in the process, acknowledging concerns, and responding to issues, Hilcorp can incorporate stakeholder-suggested potential solutions or mitigation opportunities into the planned activities. The main components of the stakeholder engagement strategy are as follows:

- Build recognition of Hilcorp and the oil and gas exploration, development, production, and decommissioning activities conducted within Cook Inlet with subsistence stakeholders.
- Set and manage expectations.
- Create transparency.
- Build and maintain acceptance.

The forgoing strategies will be implemented with the following tactics:

- Schedule and host virtual informational meetings for subsistence stakeholders detailing Hilcorp's upcoming activities.
- When requested by stakeholders, establish virtual meetings to provide updated information on ongoing oil and gas exploration, development, production, and decommissioning activities.
- Set up a dedicated email address for stakeholder concerns and comments.
- Send out mailings to stakeholders regarding Hilcorp's activities.

Hilcorp is committed to cultivating long-term relationships with stakeholders. Maniksaq Baumgartner, Alaska Government and Public Affairs Advisor for Hilcorp, serves as the primary POC for stakeholder engagement, including for Alaska Native tribes in the Cook Inlet region. When requested, Mr. Baumgartner will bring in subject matter experts to assist in sharing information and responding to questions from stakeholders. Mr. Baumgartner is responsible for maintaining the stakeholder list, updating the meeting list as meetings occur, and hosting the online meetings. He is also the primary POC for questions.

Hilcorp will host an online informational meeting in the spring before activities start. The list of stakeholders who shall be invited and with whom Hilcorp will engage are listed in Attachment A. The online meeting will provide a description of activities, location, duration, and POCs for questions. Through the online meetings, Hilcorp will consult with stakeholders to heed and address their concerns about the activities' potential impact on subsistence uses, when possible.

Hilcorp commits to continuing participation in meetings as requested and providing information through websites, mailings, and meetings for the life of work in Cook Inlet.

Hilcorp will continue to provide updates as changes or new activities are planned. Stakeholders represented in the distribution list are summarized in Attachment A.

Hilcorp's stakeholder engagement effort is the responsibility of a multifaceted team. The effectiveness and success of engagement effort relies on clear roles and responsibilities of the team members. Table 5 outlines the Hilcorp team members and their roles regarding communication within the scope of stakeholder engagement.

## Table 5. Hilcorp Contacts

| Name | Role | Phone | Email |
|---|---|---|---|
| Maniksaq Baumgartner | External Affairs | 907-564-4667 | maniksaq.baumgartner@hilcorp.com |
| Jen Dushane | Wildlife Specialist | 907-777-8549 | jdushane@hilcorp.com |

# 6. REFERENCES

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# ATTACHMENT A

# STAKEHOLDER CONTACT LIST

## STAKEHOLDER CONTACT LIST

| Stakeholder Type | Stakeholder Name |
|---|---|
| **Regional Corporations** | |
| ANCSA Regional Corporation | Cook Inlet Region, Inc. |
| **Regional Non-Profit Organizations** | |
| Regional Non-Profit Organization | Alaska Native Harbor Seal Commission (may no longer be active) |
| Regional Non-Profit Organization | Alaska Sea Otter and Steller Sea Lion Commission |
| Regional Non-Profit Organization | Indigenous People's Council for Marine Mammals |
| **Kenai** | |
| Alaska Native Tribal Organization | Kenaitze Indian Tribe |
| Alaska Native Tribal Organization | Kenaitze Native Association |
| ANCSA Historical Villages | Kenai Native Association, Inc. |
| **Ninilchik** | |
| Village | Ninilchik Village Tribe/Traditional Council |
| Village Corporation | Ninilchik Native Association, Inc. |
| **Salamatof** | |
| Village | Village of Salamatoff |
| Village Corporation | Salamatof Native Association, Inc. |
| **Tyonek** | |
| Village Corporation | Tyonek Native Corporation |
| Village | Native Village of Tyonek |
| Regional Non-Profit Organization | Tyonek Tribal Conservation District |
| **Other** | |
| Agency | NMFS Office of Protected Resources |
| Agency | NMFS Regional Office |