DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

[RTID 0648–XD960]

Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to Hilcorp Alaska, LLC Production Drilling Support in Cook Inlet, Alaska

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Notice; proposed incidental harassment authorization; request for comments on proposed authorization and possible renewal.

SUMMARY: NMFS has received a request from Hilcorp Alaska, LLC (Hilcorp) for authorization to take marine mammals incidental to production drilling support activities in Cook Inlet, Alaska. Pursuant to the Marine Mammal Protection Act (MMPA), NMFS is requesting comments on its proposal to issue an incidental harassment authorization (IHA) to incidentally take marine mammals during the specified activities. NMFS is also requesting comments on a possible one-time, 1-year renewal that could be issued under certain circumstances and if all requirements are met, as described in Request for Public Comments at the end of this notice. NMFS will consider public comments prior to making any final decision on the issuance of the requested MMPA authorization and agency responses will be summarized in the final notice of our decision.

DATES: Comments and information must be received no later than August 23, 2024.

ADDRESSES: Comments should be addressed to Jolie Harrison, Chief, Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service and should be submitted via email to *ITP.tyson.moore@noaa.gov.* Electronic copies of the application and supporting documents, as well as a list of the references cited in this document, may be obtained online at: *https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-oil-and-gas.* In case of problems accessing these documents, please call the contact listed below.

Instructions: NMFS is not responsible for comments sent by any other method, to any other address or individual, or received after the end of the comment period. Comments, including all attachments, must not exceed a 25-megabyte file size. All comments received are a part of the public record and will generally be posted online at *https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-oil-and-gas* without change. All personal identifying information (*e.g.,* name, address) voluntarily submitted by the commenter may be publicly accessible. Do not submit confidential business information or otherwise sensitive or protected information.

FOR FURTHER INFORMATION CONTACT: Reny Tyson Moore, Office of Protected Resources, NMFS, (301) 427–8401.

SUPPLEMENTARY INFORMATION:

Background

The MMPA prohibits the ''take'' of marine mammals, with certain exceptions. Sections 101(a)(5)(A) and (D) of the MMPA (16 U.S.C. 1361 *et seq.*) direct the Secretary of Commerce (as delegated to NMFS) to allow, upon request, the incidental, but not intentional, taking of small numbers of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if certain findings are made and either regulations are proposed or, if the taking is limited to harassment, a notice of a proposed IHA is provided to the public for review.

Authorization for incidental takings shall be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s) and will not have an unmitigable adverse impact on the availability of the species or stock(s) for taking for subsistence uses (where relevant). Further, NMFS must prescribe the permissible methods of taking and other ''means of effecting the least practicable adverse impact'' on the affected species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of the species or stocks for taking for certain subsistence uses (referred to in shorthand as ''mitigation''); and requirements pertaining to the monitoring and reporting of the takings. The definitions of all applicable MMPA statutory terms cited above are included in the relevant sections below.

National Environmental Policy Act

To comply with the National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. 4321 *et seq.*) and NOAA Administrative Order (NAO) 216–6A, NMFS must review our proposed action (*i.e.,* the issuance of an IHA) with respect to potential impacts on the human environment. Accordingly, NMFS is preparing an Environmental Assessment (EA) to consider the environmental impacts associated with the issuance of the proposed IHA. NMFS' draft EA will be made available at *https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-oil-and-gas* at the time of publication of this notice. We will review all comments submitted in response to this notice prior to concluding our NEPA process or making a final decision on the IHA request.

Summary of Request

On August 2, 2023, NMFS received a request from Hilcorp for an IHA to take marine mammals incidental to production drilling support activities in Cook Inlet, Alaska. Following NMFS' review of the application, Hilcorp submitted revised versions on September 29, 2023, December 27, 2023, February 29, 2024, and April 8, 2024. The application was deemed adequate and complete on April 12, 2024. Hilcorp's request is for take of 12 species of marine mammals, by Level B harassment. Neither Hilcorp nor NMFS expect serious injury or mortality to result from this activity and, therefore, an IHA is appropriate.

NMFS previously issued an IHA to Hilcorp for similar work (87 FR 62364, October 1, 2022). Hilcorp complied with all the requirements (*e.g.,* mitigation, monitoring, and reporting) of the previous IHA, and information regarding their monitoring results may be found in the Potential Effects of Specified Activities on Marine Mammals and their Habitat section of this notice.

Description of Proposed Activity

Overview

Hilcorp plans to use three tug boats to tow and hold, and up to four tug boats to position, a jack-up rig to support production drilling at existing platforms in middle Cook Inlet and Trading Bay, Alaska, on 6 non-consecutive days between September 14, 2024, and September 13, 2025. Noise produced by tugs under load with a jack-up rig may result in take, by Level B harassment, of twelve marine mammal species.

Dates and Duration

The IHA would be effective from September 14, 2024, through September 13, 2025. As noted above, Hilcorp proposes to conduct the jack-up rig towing, holding, and positioning activities on 6 non-consecutive days during the authorization period. Hilcorp would only conduct tug towing rig activities at night if necessary to accommodate a favorable tide.

Specific Geographic Region

Hilcorp's proposed activities would take place in middle Cook Inlet and Trading Bay, Alaska, extending north from Rig Tenders Dock on the eastern side of Cook Inlet near Nikiski to an area approximately 32 kilometers (km) south of Point Possession, west to the Tyonek platform in middle Cook Inlet, south to the Dolly Varden platform in Trading Bay, and across Cook Inlet to the Rig Tenders Dock. For the purposes of this project, lower Cook Inlet refers to waters south of the East and West Forelands; middle Cook Inlet refers to waters north of the East and West Forelands and south of Threemile River on the west and Point Possession on the east; Trading Bay refers to waters from approximately the Granite Point Tank Farm on the north to the West Foreland on the south; and upper Cook Inlet refers to waters north and east of Beluga River on the west and Point Possession on the east. A map of the specific area in which Hilcorp plans to operate is provided in figure 1 below.

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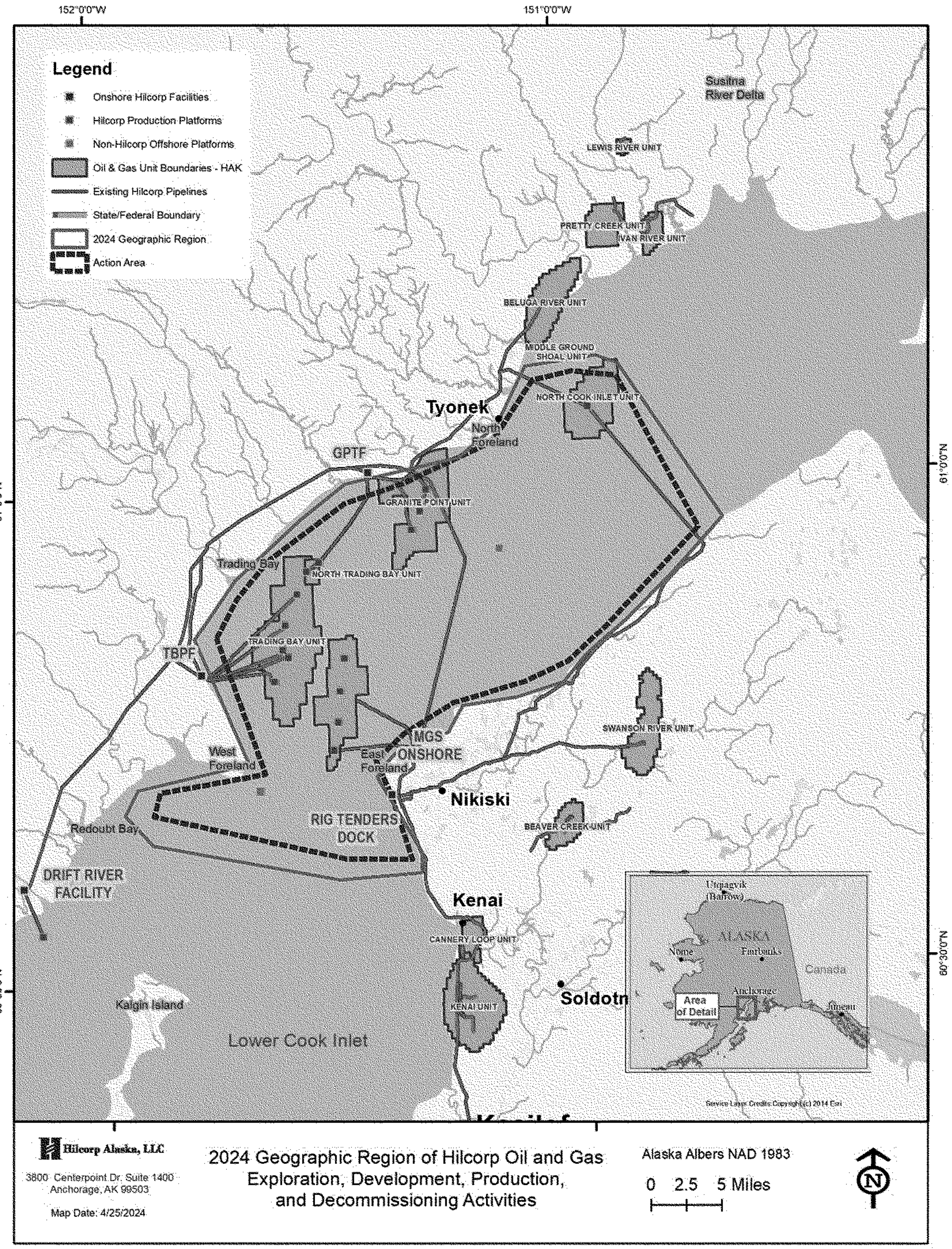

Figure 1-- Hilcorp's Proposed Activity Location

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Detailed Description of the Specified Activity

Hilcorp proposes to conduct production drilling activities from existing platforms in middle Cook Inlet and Trading Bay between September 14, 2024, and September 13, 2025, during which period there would be a need for an estimated six days of tug activity. For the preceding months (September 2023 to September 2024), Hilcorp is operating under an existing IHA (See 87 FR 62364, October 14, 2022). In 2024, the Spartan 151 jack-up rig (or an equivalent rig) will be mobilized for production drilling from the Rig Tenders Dock in Nikiski and towed to an existing platform under the aforementioned 2023–2024 IHA. Tug activities associated with the current IHA request would include one demobilization effort of a jack-up rig (Spartan 151 or equivalent rig) from an existing platform to Rig Tenders Dock in Nikiski, one jack-up rig relocation between existing platforms, and one remobilization effort of the jack-up rig from Rig Tenders Dock in Nikiski to middle Cook Inlet. A jack-up rig is a type of mobile offshore drill unit used in offshore oil and gas drilling activities. It is comprised of a buoyant mobile platform or hull with moveable legs that are adjusted to raise and lower the hull over the surface of the water. Three tugs are needed to safely and effectively tow the jack-up rig during moves and to hold it into the correct position where it can be temporarily secured to the seafloor. A fourth tug may be needed to assist with the positioning of the jack-up rig on location.

Development drilling activities occur from existing platforms within Cook Inlet through either well slots or existing wellbores in existing platform legs, and no well construction occurs during production drilling. All Hilcorp platforms have potential for development drilling activities. Drilling activities from platforms within Cook Inlet are accomplished by using conventional drilling equipment from a variety of rig configurations.

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.

While traveling with the jack-up rig during the proposed moves, the most common configuration is two tugs positioned side by side (approximately 30 to 60 m apart), pulling from the front of the jack-up rig, and one tug approximately 200 m 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, the tugs may be fanned out around the jack-up rig to provide the finer control of movement necessary to safely position the jack-up rig on the platform.

Upon arrival and readiness to position the rig adjacent to a platform, a fourth tug would be on standby to provide assistance. The fourth tug would not be expected to extend assistance beyond one hour. The horsepower of each of the tugs used during the proposed activities may range between 4,000 and 8,000. Specifications of the tugs anticipated for use are provided in table 1 below. If these specific tugs are not available, the tugs contracted would be of similar size and power to those listed in table 1.

TABLE 1—DESCRIPTION OF TUGS (OR SIMILAR) USED FOR TOWING, HOLDING, AND POSITIONING THE JACK-UP RIG

Vessel	Activity	Length (m)	Width (m)	Gross tonnage
Bering Wind	Towing, holding, and positioning the jack-up rig	22	10	144
Stellar Wind	Towing, holding, and positioning the jack-up rig	32	11	160
Glacial Wind	Towing, holding, and positioning the jack-up rig	37	11	196
Dr. Hank Kaplan	Standby tug used only for positioning the jack-up rig, if needed.	23	11	196

Note: m = meters.

The amount of time the tugs are under load transiting, holding, and positioning the jack-up rig in Cook Inlet would be tide-dependent. The amount of operational effort (*i.e.,* power output) the tugs use for transiting would depend on whether the tugs are towing with or against the tide and could vary across a tidal cycle as the current increases or decreases in speed over time. Hilcorp would make every effort to transit with the tide (which requires lower power output) and minimize transit against the tide (which requires higher power output).

A high slack tide would be preferred to position the jack-up rig on an existing platform or well site. The relatively slow current and calm conditions at a slack tide would enable the tugs to perform the fine movements necessary to safely position the jack-up rig within several feet of the platform. Additionally, positioning and securing the jack-up rig at high slack tide rather than low slack tide would allow for the legs to be pinned down (jack the legs down onto the sea floor) at an adequate height to ensure that the hull of the jack-up rig remains above the water level of the subsequent incoming high tide. Because 12 hours elapse between each high slack tide, tugs are generally under load for those 12 hours, even if the towed distance is small, as high slack tides are preferred to both 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 hours from the previous departure), there is a 1 to 2-hour window when the tide is slow enough for the tugs to initiate positioning the jack-up rig and pin the legs to the seafloor on location. The tugs are estimated to be under load, generally at half-power conditions or less, for up to 14 hours 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 hour at half power.

If the first positioning attempt takes longer than anticipated, the increasing current speed would prevent the tugs from safely positioning the jack-up rig on location. If the first positioning attempt is not successful, the jack-up rig would be pinned down at a nearby location and the tugs would be released from the jack-up rig and no longer under load. The tugs would remain nearby, generally floating with the current. Approximately an hour before the next high slack tide, the tugs would re-attach to the jack-up rig and reattempt positioning over a period of 2 to 3 hours. Positioning activities would generally be at half power. If a second attempt is needed, the tugs would be under load holding or positioning the jack-up rig on a second day for up to 5 hours. 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), the tugs would 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 integrity. In a north-to-south transit, the tugs would tow the jack-up rig with the outgoing tide and would typically 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 south-to-north transit, Hilcorp would prefer to pull the jack-up rig from the platform on a low slack tide to begin transiting north following the incoming tide. This would maximize their control over the jack-up rig and would require half power or a lower power output. There may be a situation wherein the tugs pulling the jack-up rig begin transiting with the tide to their next location, miss the tide window to safely set the jack-up rig on the platform or pin it nearby, and so have to transport the jack-up rig against the tide to a safe harbor. Tugs may also need to transport the jack-up rig against the tide if large pieces of ice or extreme wind events threaten the stability of the jack-up rig on the platform. All tug towing, holding, or positioning would be done in a manner implementing best management practices to preserve water quality, and no work would occur around creek mouths or river systems leading to prey abundance reductions.

Although the variability in power output from the tugs can range from an estimated 20 percent to 90 percent throughout the hours under load with the jack-up rig, as described above, the majority of the hours (spent transiting, holding, and positioning) occur at half power or less. See the Estimated Take of Marine Mammals section of this proposed notice of issuance for more detail on assumptions related to power output.

Proposed mitigation, monitoring, and reporting measures are described in detail later in this document (please see Proposed Mitigation and Proposed Monitoring and Reporting).

Description of Marine Mammals in the Area of Specified Activities

Sections 3 and 4 of the application summarize available information regarding status and trends, distribution and habitat preferences, and behavior and life history of the potentially affected species. NMFS fully considered all of this information, and we refer the reader to these descriptions, instead of reprinting the information. Additional information regarding population trends and threats may be found in NMFS' Stock Assessment Reports (SARs; *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments*) and more general information about these species (*e.g.,* physical and behavioral descriptions) may be found on NMFS' website (*https://www.fisheries.noaa.gov/find-species*).

Table 2 lists all species or stocks for which take is expected and proposed to be authorized for this activity and summarizes information related to the population or stock, including regulatory status under the MMPA and Endangered Species Act (ESA) and potential biological removal (PBR), where known. PBR is defined by the MMPA as the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population (as described in NMFS' SARs). While no serious injury or mortality is anticipated or proposed to be authorized here, PBR and annual serious injury and mortality from anthropogenic sources are included here as gross indicators of the status of the species or stocks and other threats.

Marine mammal abundance estimates presented in this document represent the total number of individuals that make up a given stock or the total number estimated within a particular study or survey area. NMFS' stock abundance estimates for most species represent the total estimate of individuals within the geographic area, if known, that comprises that stock. For some species, this geographic area may extend beyond U.S. waters. All managed stocks in this region are assessed in NMFS' U.S. 2022 SARs. All values presented in table 2 are the most recent available at the time of publication (including from the draft 2023 SARs) and are available online at: *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments.*

TABLE 2—SPECIES [1] LIKELY IMPACTED BY THE SPECIFIED ACTIVITIES

Common name	Scientific name	Stock	ESA/MMPA status; Strategic (Y/N) [2]	Stock abundance (CV, N_{min}, most recent abundance survey) [3]	PBR	Annual M/SI [4]
Order Artiodactyla—Cetacea—Mysticeti (baleen whales)						
Family Eschrichtiidae:						
Gray Whale	*Eschrichtius robustus*	Eastern N Pacific	-, -, N	26,960 (0.05, 25,849, 2016).	801	131
Family Balaenidae						
Family Balaenopteridae (rorquals):						
Fin Whale	*Balaenoptera physalus*	Northeast Pacific	E, D, Y	UND [5] (UND, UND, 2013).	UND	0.6
Humpback Whale	*Megaptera novaeangliae*	Hawai'i	-, -, N	11,278 (0.56, 7,265, 2020).	127	27.09
		Mexico-North Pacific	T, D, Y	N/A [6] (N/A, N/A, 2006)	UND	0.57
		Western North Pacific	E, D, Y	1,084 (0.088, 1,007, 2006).	3.4	5.82
Minke Whale	*Balaenoptera acutorostrata*	Alaska	-, -, N	N/A [7] (N/A, N/A, N/A)	UND	0
Odontoceti (toothed whales, dolphins, and porpoises)						
Family Delphinidae:						
Killer Whale	*Orcinus orca*	Eastern North Pacific Alaska Resident.	-, -, N	1,920 (N/A, 1,920, 2019)	19	1.3
		Eastern North Pacific Gulf of Alaska, Aleutian Islands and Bering Sea Transient.	-, -, N	587 (N/A, 587, 2012)	5.9	0.8
Pacific White-Sided Dolphin	*Lagenorhynchus obliquidens*	North Pacific	-, -, N	26,880 (N/A, N/A, 1990)	UND	0
Family Monodontidae (white whales):						
Beluga Whale	*Delphinapterus leucas*	Cook Inlet	E, D, Y	279 [8] (0.061, 267, 2018)	0.53	0
Family Phocoenidae (porpoises):						

TABLE 2—SPECIES [1] LIKELY IMPACTED BY THE SPECIFIED ACTIVITIES—Continued

Common name	Scientific name	Stock	ESA/ MMPA status; Strategic (Y/N) [2]	Stock abundance (CV, N_{min}, most recent abundance survey) [3]	PBR	Annual M/SI [4]
Dall's Porpoise	*Phocoenoides dalli*	Alaska	-, -, N	UND [9] (UND, UND, 2015).	UND	37
Harbor Porpoise	*Phocoena phocoena*	Gulf of Alaska	-, -, Y	31,046 (0.21, N/A, 1998)	UND	72
Order Carnivora—Pinnipedia						
Family Otariidae (eared seals and sea lions):						
CA Sea Lion	*Zalophus californianus*	U.S.	-, -, N	257,606 (N/A, 233,515, 2014).	14,011	>321
Steller Sea Lion	*Eumetopias jubatus*	Western	E, D, Y	49,837 [10] (N/A, 49,837, 2020).	299	267
Family Phocidae (earless seals):						
Harbor Seal	*Phoca vitulina*	Cook Inlet/Shelikof Strait	-, -, N	28,411 (N/A, 26,907, 2018).	807	107

[1] Information on the classification of marine mammal species can be found on the web page for The Society for Marine Mammalogy's Committee on Taxonomy (*https://marinemammalscience.org/science-and-publications/list-marine-mammal-species-subspecies/;* Committee on Taxonomy (2022)).

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

[3] NMFS marine mammal stock assessment reports online at: *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region.* CV is coefficient of variation; Nmin is the minimum estimate of stock abundance.

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

[5] The best available abundance estimate for this stock is not considered representative of the entire stock as surveys were limited to a small portion of the stock's range. Based upon this estimate and the N_{min}, the PBR value is likely negatively biased for the entire stock.

[6] Abundance estimates are based upon data collected more than 8 years ago and, therefore, current estimates are considered unknown.

[7] Reliable population estimates are not available for this stock. Please see Friday *et al.* (2013) and Zerbini *et al.* (2006) for additional information on numbers of minke whales in Alaska.

[8] On June 15, 2023, NMFS released an updated abundance estimate for endangered CIBWs in Alaska (Goetz *et al.,* 2023). Data collected during NOAA Fisheries' 2022 aerial survey suggest that the whale population is stable or may be increasing slightly. Scientists estimated that the population size is between 290 and 386, with a median best estimate of 331. In accordance with the MMPA, this population estimate will be incorporated into the CIBW SAR, which will be reviewed by an independent panel of experts, the Alaska Scientific Review Group. After this review, the SAR will be made available as a draft for public review before being finalized.

[9] The best available abundance estimate is likely an underestimate for the entire stock because it is based upon a survey that covered only a small portion of the stock's range.

[10] Nest is best estimate of counts, which have not been corrected for animals at sea during abundance surveys.

As indicated above, all 12 species (with 15 managed stocks) in table 2 temporally and spatially co-occur with the activity to the degree that take is reasonably likely to occur. In addition, the northern sea otter may be found in Cook Inlet, Alaska. However, northern sea otters are managed by the U.S. Fish and Wildlife Service and are not considered further in this document.

Gray Whale

The stock structure for gray whales in the Pacific has been studied for a number of years and remains uncertain as of the most recent (2022) Pacific SARs (Carretta *et al.,* 2023). Gray whale population structure is not determined by simple geography and may be in flux due to evolving migratory dynamics (Carretta *et al.,* 2023). Currently, the SARs delineate a western North Pacific (WNP) gray whale stock and an eastern North Pacific (ENP) stock based on genetic differentiation (Carretta *et al.,* 2023). WNP gray whales are not known to feed in or travel to upper Cook Inlet (Conant and Lohe, 2023; Weller *et al.,* 2023). Therefore, we assume that gray whales near the project area are members of the ENP stock.

An Unusual Mortality Event (UME) for gray whales along the West Coast and in Alaska occurred from December 17, 2018 through November 9, 2023. During that time, 146 gray whales stranded off the coast of Alaska. The investigative team concluded that the preliminary cause of the UME was localized ecosystem changes in the whale's Subarctic and Arctic feeding areas that led to changes in food, malnutrition, decreased birth rates, and increased mortality (see *https://www.fisheries.noaa.gov/national/marine-life-distress/2019-2023-gray-whale-unusual-mortality-event-along-west-coast-and* for more information).

Gray whales are infrequent visitors to Cook Inlet, but may be seasonally present during spring and fall in the lower inlet (Bureau of Ocean Energy Management (BOEM), 2021). Migrating gray whales pass through the lower inlet during their spring and fall migrations to and from their primary summer feeding areas in the Bering, Chukchi, and Beaufort seas (Swartz, 2018; Silber *et al.,* 2021; BOEM, 2021). Several surveys and monitoring programs have sighted gray whales in lower Cook Inlet (Shelden *et al.,* 2013; Owl Ridge, 2014; Lomac-MacNair *et al.,* 2013, 2014; Kendall *et al.,* 2015, as cited in Weston and SLR, 2022). Gray whales are occasionally seen in mid- and upper Cook Inlet, Alaska, but they are not common. 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 SAExploration seismic survey in 2015 (Kendall and Cornick, 2015), the 2018 Cook Inlet Pipeline (CIPL) Extension Project (Sitkiewicz *et al.,* 2018), the 2019 Hilcorp seismic survey in lower Cook Inlet (Fairweather Science, 2020), and Hilcorp's 2023 aerial and rig-based monitoring efforts.

In 2020, a young male gray whale was stranded in the Twentymile River near Girdwood for over a week before swimming back into Turnagain Arm. The whale did not survive and was found dead in west Cook Inlet later that month (NMFS, 2020). One gray whale was sighted in Knik Arm near the Port of Alaska (POA) in Anchorage in upper Cook Inlet in May of 2020 during observations conducted during construction of the Petroleum and Cement Terminal project (61N Environmental, 2021). The sighting occurred less than a week before the reports of the gray whale stranding in the Twentymile River and was likely the same animal. In 2021, one small gray whale was sighted in Knik Arm near Ship Creek, south of the POA (61N Environmental, 2022a). Although some sightings have been documented in the middle and upper Inlet, the gray whale range typically only extends into the lower Cook Inlet region.

Humpback Whale

The 2022 NMFS Alaska and Pacific SARs described a revised stock structure for humpback whales which modifies the previous designated stocks to align more closely with the ESA-designated Distinct Population Segments (DPSs) (Carretta *et al.,* 2023; Young *et al.,* 2023). Specifically, the three previous North Pacific humpback whale stocks (Central and Western North Pacific stocks and a CA/OR/WA stock) were replaced by five stocks, largely corresponding with the ESA-designated DPSs. These include Western North Pacific and Hawaii stocks and a Central America/Southern Mexico-California (CA)/Oregon (OR)/Washington (WA) stock (which corresponds with the Central America DPS). The remaining two stocks, corresponding with the Mexico DPS, are the Mainland Mexico-CA/OR/WA and Mexico-North Pacific stocks (Carretta *et al.,* 2023; Young *et al.,* 2023). The former stock is expected to occur along the west coast from California to southern British Columbia, while the latter stock may occur across the Pacific, from northern British Columbia through the Gulf of Alaska and Aleutian Islands/Bering Sea region to Russia.

The Hawaii stock consists of one demographically independent population (DIP) (Hawaii—Southeast Alaska/Northern British Columbia DIP) and the Hawaii—North Pacific unit, which may or may not be composed of multiple DIPs (Wade *et al.,* 2021). The DIP and unit are managed as a single stock at this time, due to the lack of data available to separately assess them and lack of compelling conservation benefit to managing them separately (NMFS 2019, 2022c, 2023a). The DIP is delineated based on two strong lines of evidence: genetics and movement data (Wade *et al.,* 2021). Whales in the Hawaii—Southeast Alaska/Northern British Columbia DIP winter off Hawaii and largely summer in Southeast Alaska and Northern British Columbia (Wade *et al.,* 2021). The group of whales that migrate from Russia, western Alaska (Bering Sea and Aleutian Islands), and central Alaska (Gulf of Alaska excluding Southeast Alaska) to Hawaii have been delineated as the Hawaii—North Pacific unit (Wade *et al.,* 2021). There are a small number of whales that migrate between Hawaii and southern British Columbia/Washington, but current data and analyses do not provide a clear understanding of which unit these whales belong to (Wade *et al.,* 2021; Carretta *et al.,* 2023; Young *et al.,* 2023).

The Mexico—North Pacific stock is likely composed of multiple DIPs, based on movement data (Martien *et al.,* 2021, Wade, 2021, Wade *et al.,* 2021). However, because currently available data and analyses are not sufficient to delineate or assess DIPs within the unit, it was designated as a single stock (NMFS, 2019, 2022d, 2023a). Whales in this stock winter off Mexico and the Revillagigedo Archipelago and summer primarily in Alaska waters (Martien *et al.,* 2021; Carretta *et al.,* 2023; Young *et al.,* 2023).

The Western North Pacific stock consists of two units—the Philippines/Okinawa—North Pacific unit and the Marianas/Ogasawara—North Pacific unit. The units are managed as a single stock at this time, due to a lack of data available to separately assess them (NMFS, 2019, 2022d, 2023a). Recognition of these units is based on movements and genetic data (Oleson *et al.,* 2022). Whales in the Philippines/Okinawa—North Pacific unit winter near the Philippines and in the Ryukyu Archipelago and migrate to summer feeding areas primarily off the Russian mainland (Oleson *et al.,* 2022). Whales that winter off the Mariana Archipelago, Ogasawara, and other areas not yet identified and then migrate to summer feeding areas off the Commander Islands, and to the Bering Sea and Aleutian Islands comprise the Marianas/Ogasawara—North Pacific unit.

The most comprehensive photo-identification data available suggest that approximately 89 percent of all humpback whales in the Gulf of Alaska are from the Hawaii stock, 11 percent are from the Mexico stock, and less than 1 percent are from the Western North Pacific stock (Wade, 2021). Individuals from different stocks are known to intermix in feeding grounds. There is no designated critical habitat for humpback whales in or near the Project area (86 FR 21082, April 21, 2021), nor does the project overlap with any known biologically important areas.

Humpback whales are encountered regularly in lower Cook Inlet and occasionally in mid-Cook Inlet; sightings are rare in upper Cook Inlet. Eighty-three groups containing an estimated 187 humpbacks were sighted during the Cook Inlet beluga whale aerial surveys conducted by NMFS from 1994 to 2012 (Shelden *et al.,* 2013). Surveys conducted north of the forelands have documented small numbers in middle Cook Inlet. During the 2014 Apache seismic surveys in Cook Inlet, five groups (six individuals) were reported, with three groups north of the forelands on the east side of the inlet (Lomac-MacNair *et al.,* 2014). In 2015, during the construction of the Furie Operating Alaska, LLC (Furie) platform and pipeline, four groups of humpback whales were documented. Another group of 6 to 10 unidentified whales, thought to be either humpback or gray whales, was sighted approximately 15 km northeast of the Julius R. Platform. Large cetaceans were visible near the project (*i.e.,* whales or blows were visible) for 2 hours out of the 1,275 hours of observation conducted (Jacobs, 2015). During SAExploration's 2015 seismic program, three humpback whales were observed in Cook Inlet, including two near the Forelands and one in lower Cook Inlet (Kendall *et al.,* 2015 as cited in Weston and SLR, 2022). Hilcorp did not record any sightings of humpback whales from their aerial or rig-based monitoring efforts in 2023 (Horsley and Larson, 2023).

Minke Whale

Two stocks of minke whales occur within U.S. waters: Alaska and California/Oregon/Washington (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).

Minke whales are most abundant in the Gulf of Alaska during summer and occupy localized feeding areas (Zerbini *et al.,* 2006). During the NMFS annual and semiannual surveys of Cook Inlet, minke whales were observed near

Anchor Point in 1998, 1999, 2006, and 2021 (Shelden *et al.,* 2013, 2015b, 2017, 2022; Shelden and Wade, 2019) and near Ninilchik and the middle of lower Cook Inlet in 2021 (Shelden *et al.,* 2022). Minkes were sighted southeast of Kalgin Island and near Homer during Apache's 2014 survey (Lomac-MacNair *et al.,* 2014), and one was observed near Tuxedni Bay in 2015 (Kendall *et al.,* 2015, as cited in Weston and SLR, 2022). During Hilcorp's seismic survey in lower Cook Inlet in the fall of 2019, eight minke whales were observed (Fairweather Science, 2020). In 2018, no minke whales were observed during observations conducted for the CIPL project near Tyonek (Sitkiewicz *et al.,* 2018). Minke whales were also not recorded during Hilcorp's aerial or rig-based monitoring efforts in 2023 (Horsley and Larson, 2023).

Fin Whale

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). Several surveys have been conducted to assess the distribution and habitat preferences of fin whales within parts of their range in the North Pacific. In coastal waters of the Aleutians and the Alaska Peninsula, they were 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 that 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' range extends into lower Cook Inlet; however, their sightings are infrequent, and they are mostly spotted near the inlet's entrance. Fin whales are usually observed as individuals traveling alone, although they are sometimes observed in small groups. Rarely, large groups of 50 to 300 fin whales can travel together during migrations (NMFS, 2010). Fin whales in Cook Inlet have only been observed as individuals or in small groups. From 2000 to 2022, 10 sightings of 26 estimated individual fin whales in lower Cook Inlet were observed during NMFS aerial surveys (Shelden *et al.,* 2013, 2015b, 2017, 2022; Shelden and Wade, 2019). No fin whales were observed during the 2018 Harvest's 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 three-dimensional (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 the offshore waters of lower Cook Inlet may be more heavily used than previously believed, especially during the fall season (Fairweather Science, 2020). Hilcorp did not record any sightings of fin whales from their aerial or rig-based monitoring efforts in 2023 (Horsley and Larson, 2023).

Beluga Whale

Five stocks of beluga whales are recognized in Alaska: the Beaufort Sea stock, eastern Chukchi Sea stock, eastern Bering Sea stock, Bristol Bay stock, and Cook Inlet stock (Young *et al.,* 2023). The Cook Inlet stock is geographically and genetically isolated from the other stocks (O'Corry-Crowe *et al.,* 1997; Laidre *et al.,* 2000) and resides year-round in Cook Inlet (Laidre *et al.,* 2000; Castellote *et al.,* 2020). Only the Cook Inlet stock inhabits the proposed project area. Cook Inlet beluga whales (CIBWs) were designated as depleted under the MMPA in 2000 (65 FR 34950, May 31, 2000), and as a DPS and listed as endangered under the ESA in October 2008 (73 FR 62919, October 10, 2008) when the species failed to recover following a moratorium on subsistence harvest. Between 2008 and 2018, CIBWs experienced a decline of about 2.3 percent per year (Wade *et al.,* 2019). The decline overlapped with the northeast Pacific marine heatwave that occurred from 2014 to 2016 in the Gulf of Alaska, significantly impacting the marine ecosystem (Suryan *et al.,* 2021, as cited in Goetz *et al.,* 2023).

In June 2023, NMFS released an updated abundance estimate for CIBWs in Alaska that incorporates aerial survey data from June 2021 and 2022 and accounted for visibility bias (Goetz *et al.,* 2023). This report estimated that CIBW abundance is between 290 and 386, with a median best estimate of 331. Goetz *et al.* (2023) also present an analysis of population trends for the most recent 10-year period (2012–2022). The addition of data from the 2021 and 2022 survey years in the analysis resulted in a 65.1 percent probability that the CIBW population is now increasing at 0.9 percent per year (95 percent prediction interval of −3 to 5.7 percent). This increase drops slightly to 0.2 percent per year (95 percent prediction interval of −1.8 to 2.6 percent) with a 60 percent probability that the CIBW population is increasing more than 1 percent per year when data from 2021, which had limited survey coverage due to poor weather, are excluded from the analysis. Median group size estimates in 2021 and 2022 were 34 and 15, respectively (Goetz *et al.,* 2023). For management purposes, NMFS has determined that the carrying capacity of Cook Inlet is 1,300 CIBWs (65 FR 34590, May 31, 2000) based on historical CIBW abundance estimated by Calkins (1989).

Threats that have the potential to impact this stock and its habitat include the following: changes in prey availability due to natural environmental variability, ocean acidification, and commercial fisheries; climatic changes affecting habitat; predation by killer whales; contaminants; noise; ship strikes; waste management; urban runoff; construction projects; and physical habitat modifications that may occur as Cook Inlet becomes increasingly urbanized (Moore *et al.,* 2000; Hobbs *et al.,* 2015; NMFS, 2016b). Another source of CIBW mortality in Cook Inlet is predation by transient-type (mammal-eating) killer whales (NMFS, 2016b; Shelden *et al.,* 2003). No human-caused mortality or serious injury of CIBWs through interactions with commercial, recreational, and subsistence fisheries, takes by subsistence hunters, and or human-caused events (*e.g.,* entanglement in marine debris, ship strikes) has been recently documented and harvesting of CIBWs has not occurred since 2008 (NMFS, 2008b).

Recovery Plan. In 2010, a Recovery Team, consisting of a Science Panel and Stakeholder Panel, began meeting to develop a Recovery Plan for the CIBW. The Final Recovery Plan was published in the **Federal Register** on January 5, 2017 (82 FR 1325). In September 2022, NMFS completed the ESA 5-year review for the CIBW DPS and determined that the CIBW DPS should remain listed as endangered (NMFS, 2022d).

In its Recovery Plan (82 FR 1325, January 5, 2017), NMFS identified several potential threats to CIBWs, including: (1) high concern: catastrophic events (*e.g.,* natural disasters, spills, mass strandings), cumulative effects of multiple stressors, and noise; (2) medium concern: disease agents (*e.g.,* pathogens, parasites, and harmful algal blooms), habitat loss or degradation, reduction in prey, and unauthorized take; and (3) low concern: pollution, predation, and subsistence harvest. The recovery plan did not treat climate change as a distinct threat but rather as a consideration in the threats of high and medium concern. Other potential threats most likely to result in direct human-caused mortality or serious injury of this stock include vessel strikes.

Critical Habitat. On April 11, 2011, NMFS designated two areas of critical habitat for CIBW (76 FR 20179). The designation includes 7,800 square kilometers (km^2) of marine and estuarine habitat within Cook Inlet, encompassing approximately 1,909 km^2 in Area 1 and 5,891 km^2 in Area 2 (see figure 1 in 76 FR 20179). Area 1 of the CIBW critical habitat encompasses all marine waters of Cook Inlet north of a line connecting Point Possession (lat. 61.04° N, long. 150.37° W) and the mouth of Three Mile Creek (lat. 61.08.55° N, long. 151.04.40° W), including waters of the Susitna, Little Susitna, and Chickaloon Rivers below mean higher high water (MHHW). From spring through fall, Area 1 critical habitat has the highest concentration of CIBWs due to its important foraging and calving habitat. Critical Habitat Area 2 encompasses some of the fall and winter feeding grounds in middle Cook Inlet. This area has a lower concentration of CIBWs in spring and summer but is used by CIBWs in fall and winter. More information on CIBW critical habitat can be found at *https://www.fisheries.noaa.gov/action/critical-habitat-cook-inlet-beluga-whale.*

The designation identified the following Primary Constituent Elements, essential features important to the conservation of the CIBW:

(1) Intertidal and subtidal waters of Cook Inlet with depths of less than 9 m mean lower-low water (MLLW) and within 8 km of high- and medium-flow anadromous fish streams;

(2) Primary prey species, including four of the five species of Pacific salmon (chum (*Oncorhynchus keta*), sockeye (*Oncorhynchus nerka*), Chinook (*Oncorhynchus tshawytscha*), and coho (*Oncorhynchus kisutch*)), Pacific eulachon (*Thaleichthys pacificus*), Pacific cod (*Gadus macrocephalus*), walleye Pollock (*Gadus chalcogrammus*), saffron cod (*Eleginus gracilis*), and yellowfin sole (*Limanda aspera*);

(3) The absence of toxins or other agents of a type or amount harmful to CIBWs;

(4) Unrestricted passage within or between the critical habitat areas; and

(5) The absence of in-water noise at levels resulting in the abandonment of habitat by CIBWs.

Biologically Important Areas. Wild *et al.* (2023) delineated a Small and Resident Population Biologically Important Area (BIA) in Cook Inlet that is active year-round and overlaps Hilcorp's proposed project area. The authors assigned the BIA an importance score of 2, an intensity score of 2, a data support score of 3, and a boundary certainty score of 2 (scores range from 1 to 3, with a higher score representing an area of more concentrated or focused use and higher confidence in the data supporting the BIA; Harrison et al., 2023). These scores indicate that the BIA is of moderate importance and intensity, the authors have high confidence that the population is small and resident and in the abundance and range estimates of the population, and the boundary certainty is medium (see Harrison *et al.* (2023) for additional information about the scoring process used to identify BIAs). The boundary of the CIBW BIA is consistent with NMFS' critical habitat designation (Wild *et al.,* 2023).

Ecology. Generally, female beluga whales reach sexual maturity at 9 to 12 years old, while males reach maturity later (O'Corry-Crowe, 2009); however, this can vary between populations. For example, in Greenland, males in a population of beluga whales were found to reach sexual maturity at 6 to 7 years of age and females at 4 to 7 years (Heide-Joregensen and Teilmann, 1994). Suydam (2009) estimated that 50 percent of females were sexually mature at age 8.25 and the average age at first birth was 8.27 years for belugas sampled near Point Lay. Mating behavior in beluga whales typically occurs between February and June, peaking in March (Burns and Seaman, 1986; Suydam, 2009). In the Chukchi Sea, the gestation period of beluga whales was determined to be 14.9 months, with a calving interval of 2 to 3 years and a pregnancy rate of 0.41, declining after 25 years of age (Suydam, 2009). Calves are born between mid-June and mid-July and typically remain with the mother for up to 2 years of age (Suydam, 2009).

CIBWs feed on a wide variety of prey species, particularly those that are seasonally abundant. From late spring through summer, most CIBW stomachs sampled contained salmon, which corresponded to the timing of fish runs in the area. Anadromous smolt and adult fish aggregate at river mouths and adjacent intertidal mudflats (Calkins, 1989). All five Pacific salmon species (*i.e.,* Chinook, pink (*Oncorhynchus gorbuscha*), coho, sockeye, and chum) spawn in rivers throughout Cook Inlet (Moulton, 1997; Moore *et al.,* 2000). Overall, Pacific salmon represent the highest percent frequency of occurrence of prey species in CIBW stomachs. This suggests that their spring feeding in upper Cook Inlet, principally on fat-rich fish such as salmon and eulachon, is important to the energetics of these animals (NMFS, 2016b).

The nutritional quality of Chinook salmon in particular is unparalleled, with an energy content four times greater than that of a Coho salmon. It is suggested the decline of the Chinook salmon population has left a nutritional void in the diet of the CIBWs that no other prey species can fill in terms of quality or quantity (Norman *et al.,* 2020, 2022).

In fall, as anadromous fish runs begin to decline, CIBWs return to consume fish species (cod and bottom fish) found in nearshore bays and estuaries. Stomach samples from CIBWs are not available for winter (December through March), although dive data from CIBWs tagged with satellite transmitters suggest that they feed in deeper waters during winter (Hobbs *et al.,* 2005), possibly on such prey species as flatfish, cod, sculpin, and pollock.

Distribution in Cook Inlet. The CIBW stock remains within Cook Inlet throughout the year, showing only small seasonal shifts in distribution (Goetz *et al.,* 2012a; Lammers *et al.,* 2013; Castellotte *et al.,* 2015; Shelden *et al.,* 2015a, 2018; Lowry *et al.,* 2019). The ecological range of CIBWs has contracted significantly since the 1970s. From late spring to fall, nearly the entire population is now found in the upper inlet north of the forelands, with a range reduced to approximately 39 percent of the size documented in the late 1970s (Goetz *et al.,* 2023). The recent annual and semiannual aerial surveys (since 2008) found that approximately 83 percent of the population inhabits the area between the Beluga River and Little Susitna River during the survey period, typically conducted in early June. Some aerial survey counts were performed in August, September, and October, finding minor differences in the numbers of belugas in the upper inlet compared to June, reinforcing the importance of the upper inlet habitat area (Young *et al.,* 2023).

During spring and summer, CIBWs generally aggregate near the warmer waters of river mouths along the northern shores of middle and upper Cook Inlet where prey availability is high and predator occurrence is low (Moore *et al.,* 2000; Shelden and Wade, 2019; McGuire *et al.,* 2020). In particular, CIBW groups are seen in the

Susitna River Delta, the Beluga River and along the shore to the Little Susitna River, Knik Arm, and along the shores of Chickaloon Bay. Small groups were recorded farther south in Kachemak Bay, Redoubt Bay (Big River), and Trading Bay (McArthur River) prior to 1996, but rarely thereafter. Since the mid-1990s, most CIBWs (96 to 100 percent) aggregate in shallow areas near river mouths in upper Cook Inlet, and they are only occasionally sighted in the central or southern portions of Cook Inlet during summer (Hobbs *et al.,* 2008). Almost the entire population can be found in northern Cook Inlet from late spring through the summer and into the fall (Muto *et al.,* 2020), shifting into deeper waters in middle Cook Inlet in winter (Hobbs *et al.,* 2008).

Data from tagged whales (14 tags deployed July 2000 through March 2003) show that CIBWs use upper Cook Inlet intensively between summer and late autumn (Hobbs *et al.,* 2005). CIBWs tagged with satellite transmitters continue to use Knik Arm, Turnagain Arm, and Chickaloon Bay as late as October, but some range into lower Cook Inlet to Chinitna Bay, Tuxedni Bay, and Trading Bay (McArthur River) in fall (Hobbs *et al.,* 2005, 2012). From September through November, CIBWs move between Knik Arm, Turnagain Arm, and Chickaloon Bay (Hobbs *et al.,* 2005; Goetz *et al.,* 2012b). By December, CIBWs are distributed throughout the upper to mid-inlet. From January into March, they move as far south as Kalgin Island and slightly beyond in central offshore waters. CIBWs make occasional excursions into Knik Arm and Turnagain Arm in February and March in spite of ice cover (Hobbs *et al.,* 2005). Although tagged CIBWs move widely around Cook Inlet throughout the year, there is no indication of seasonal migration in and out of Cook Inlet (Hobbs *et al.,* 2005). Data from NMFS aerial surveys, opportunistic sighting reports, and corrected satellite-tagged CIBWs confirm that they are more widely dispersed throughout Cook Inlet during winter (November–April), with animals found between Kalgin Island and Point Possession. Generally fewer observations of CIBWs are reported from the Anchorage and Knik Arm area from November through April (76 FR 20179, April 11, 2011; Rugh *et al.,* 2000, 2004). Later in winter (January into March), belugas were sighted near Kalgin Island and in deeper waters offshore. However, even when ice cover exceeds 90 percent in February and March, belugas travel into Knik Arm and Turnagain Arm (Hobbs *et al.,* 2005).

The NMFS Marine Mammal Lab has conducted long-term passive acoustic monitoring demonstrating seasonal shifts in CIBW concentrations throughout Cook Inlet. Castellote *et al.* (2015) conducted long-term acoustic monitoring at 13 locations throughout Cook Inlet between 2008 and 2015: North Eagle Bay, Eagle River Mouth, South Eagle Bay, Six Mile, Point MacKenzie, Cairn Point, Fire Island, Little Susitna, Beluga River, Trading Bay, Kenai River, Tuxedni Bay, and Homer Spit; the former 6 stations being located within Knik Arm. In general, the observed seasonal distribution is in accordance with descriptions based on aerial surveys and satellite telemetry: CIBW detections are higher in the upper inlet during summer, peaking at Little Susitna, Beluga River, and Eagle Bay, followed by fewer detections at those locations during winter. Higher detections in winter at Trading Bay, Kenai River, and Tuxedni Bay suggest a broader CIBW distribution in the lower inlet during winter.

Goetz *et al.* (2012b) modeled habitat preferences using NMFS' 1994–2008 June abundance survey data. In large areas, such as the Susitna Delta (Beluga to Little Susitna Rivers) and Knik Arm, there was a high probability that CIBWs were in larger groups. CIBW presence and acoustic foraging behavior also increased closer to rivers with Chinook salmon runs, such as the Susitna River (*e.g.,* Castellote *et al.,* 2021). Movement has been correlated with the peak discharge of seven major rivers emptying into Cook Inlet. Boat-based surveys from 2005 to the present (McGuire and Stephens, 2017) and results from passive acoustic monitoring across the entire inlet (Castellote *et al.,* 2015) also support seasonal patterns observed with other methods. Based on long-term passive acoustic monitoring, foraging behavior was more prevalent during summer, particularly at upper inlet rivers, than during winter. The foraging index was highest at Little Susitna, with a peak in July–August and a secondary peak in May, followed by Beluga River and then Eagle Bay; monthly variation in the foraging index indicates CIBWs shift their foraging behavior among these three locations from April through September. The location of the towing routes are areas of predicted low density in the summer months.

CIBWs are believed to mostly calve in the summer, and breed between late spring and early summer (NMFS, 2016b), primarily in upper Cook Inlet. The only known observed occurrence of calving occurred on July 20, 2015, in the Susitna Delta area (T. McGuire, personal communication, March 27, 2017). The first neonates encountered during each field season from 2005 through 2015 were always seen in the Susitna River Delta in July. The photographic identification team's documentation of the dates of the first neonate of each year indicate that calving begins in mid-late July/early August, generally coinciding with the observed timing of annual maximum group size. Probable mating behavior of CIBWs was observed in April and May of 2014, in Trading Bay. Young CIBWs are nursed for 2 years and may continue to associate with their mothers for a considerable time thereafter (Colbeck *et al.,* 2013). Important calving grounds are thought to be located near the river mouths of upper Cook Inlet.9

During Apache's seismic test program in 2011 along the west coast of Redoubt Bay, lower Cook Inlet, a total of 33 CIBWs were sighted during the survey (Lomac-MacNair *et al.,* 2013). During Apache's 2012 seismic program in mid-inlet, a total of 151 groups consisting of an estimated 1,463 CIBWs were observed (note individuals were likely observed more than once) (Lomac-MacNair *et al.,* 2014). During SAExploration's 2015 seismic program, a total of eight groups of 33 estimated individual CIBWs were visually observed during this time period and there were two acoustic detections of CIBWs (Kendall *et al.,* 2015). During Harvest Alaska's recent CIPL project on the west side of Cook Inlet in between Ladd Landing and Tyonek Platform, a total of 143 CIBW groups (814 individuals) were observed almost daily from May 31 to July 11, even though observations spanned from May 9 through September 15 (Sitkiewicz *et al.,* 2018). There were two CIBW carcasses observed by the project vessels in the 2019 Hilcorp lower Cook Inlet seismic survey in the fall which were reported to the NMFS Marine Mammal Stranding Network (Fairweather Science, 2020). Both carcasses were moderately decomposed when they were sighted by the Protected Species Observers (PSO). Daily aerial surveys specifically for CIBWs were flown over the lower Cook Inlet region, but no beluga whales were observed. In 2023, Hilcorp recorded 21 groups of more than 125 beluga whales during aerial surveys in middle Cook Inlet, and an additional 21 opportunistic groups which included approximately 81 CIBWs (Horsley and Larson, 2023). Hilcorp did not record any sightings of CIBWs from their rig-based monitoring efforts (Horsley and Larson, 2023)

Killer Whale

Along the west coast of North America, seasonal and year-round occurrence of killer whales has been noted along the entire Alaska coast (Braham and Dahlheim, 1982), in British Columbia and Washington inland waterways (Bigg *et al.,* 1990), and along the outer coasts of Washington, Oregon, and California (Green *et al.,* 1992; Barlow 1995, 1997; Forney *et al.,* 1995). Killer whales from these areas have been labeled as ''resident,'' ''transient,'' and ''offshore'' type killer whales (Bigg *et al.,* 1990; Ford *et al.,* 2000; Dahlheim *et al.,* 2008) based on aspects of morphology, ecology, genetics, and behavior (Ford and Fisher, 1982; Baird and Stacey, 1988; Baird *et al.,* 1992; Hoelzel *et al.,* 1998, 2002; Barrett-Lennard, 2000; Dahlheim *et al.,* 2008). Based on data regarding association patterns, acoustics, movements, and genetic differences, eight killer whale stocks are now recognized within the U.S. Pacific, two of which have the potential to be found in the proposed project area: the Eastern North Pacific Alaska Resident stock and the Gulf of Alaska, Aleutian Islands, and the Bering Sea Transient stock. Both stocks occur in lower Cook Inlet, but rarely in middle and upper Cook Inlet (Shelden *et al.,* 2013). While stocks overlap the same geographic area, they maintain social and reproductive isolation and feed on different prey species. Resident killer whales are primarily fish-eaters, while transients primarily hunt and consume marine mammals, such as harbor seals, Dall's porpoises, harbor porpoises, beluga whales and sea lions. Killer whales are not harvested for subsistence in Alaska. Potential threats most likely to result in direct human-caused mortality or serious injury of killer whales in this region include oil spills, vessel strikes, and interactions with fisheries.

Killer whales have been sighted near Homer and Port Graham in lower Cook Inlet (Shelden *et al.,* 2003, 2022; Rugh *et al.,* 2005). Resident killer whales from pods often sighted near Kenai Fjords and Prince William Sound have been occasionally photographed in lower Cook Inlet (Shelden *et al.,* 2003). The availability of salmon influences when resident killer whales are more likely to be sighted in Cook Inlet. Killer whales were observed in the Kachemak and English Bay three times during aerial surveys conducted between 1993 and 2004 (Rugh *et al.,* 2005). Passive acoustic monitoring efforts throughout Cook Inlet documented killer whales at the Beluga River, Kenai River, and Homer Spit, although they were not encountered within Knik Arm (Castellote *et al.,* 2016). These detections were likely resident killer whales. Transient killer whales likely have not been acoustically detected due to their propensity to move quietly through waters to track prey (Small, 2010; Lammers *et al.,* 2013). Transient killer whales were increasingly reported to feed on belugas in the middle and upper Cook Inlet in the 1990s.

During the 2015 SAExploration seismic program near the North Foreland, two killer whales were observed (Kendall *et al.,* 2015, as cited in Weston and SLR, 2022). Killer whales were observed in lower Cook Inlet in 1994, 1997, 2001, 2005, 2010, 2012, and 2022 during the NMFS aerial surveys (Shelden *et al.,* 2013, 2022). Eleven killer whale strandings have been reported in Turnagain Arm: 6 in May 1991 and 5 in August 1993. During the Hilcorp lower Cook Inlet seismic survey in the fall of 2019, 21 killer whales were documented (Fairweather Science, 2020). Throughout 4 months of observation in 2018 during the CIPL project in middle Cook Inlet, no killer whales were observed (Sitkiewicz *et al.,* 2018). In September 2021, two killer whales were documented in Knik Arm in upper Cook Inlet, near the POA (61N Environmental, 2022a). Hilcorp did not record any sightings of killer whales from their aerial or rig-based monitoring efforts in 2023 (Horsley and Larson, 2023).

Pacific White-Sided Dolphin

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. Pacific white-sided dolphins are common in the Gulf of Alaska's pelagic waters and Alaska's nearshore areas, British Columbia, and Washington (Ferrero and Walker, 1996, as cited in Muto *et al.,* 2022). They do not typically occur in Cook Inlet, but in 2019, Castellote *et al.* (2020) documented short durations of Pacific white-sided dolphin presence using passive acoustic recorders near Iniskin Bay (6 minutes) and at an offshore mooring located approximately midway between Port Graham and Iniskin Bay (51 minutes). Detections of vocalizations typically lasted on the order of minutes, suggesting the animals did not remain in the area and/or continue vocalizing for extended durations. Visual monitoring conducted during the same period by marine mammal observers on seismic vessels near the offshore recorder did not detect any Pacific white-sided dolphins (Fairweather Science, 2020). These observational data, combined with anecdotal information, indicate that there is a small potential for Pacific white-sided dolphins to occur in the Project area. On May 7, 2014, Apache Alaska observed three Pacific white-sided dolphins during an aerial survey near Kenai. This is one of the only recorded visual observations of Pacific white-sided dolphins in Cook Inlet; they have not been reported in groups as large as those estimated in other parts of Alaska (Muto *et al.,* 2022).

Harbor Porpoise

In the eastern North Pacific Ocean, harbor porpoise range from Point Barrow, along the Alaska coast, and down the west coast of North America to Point Conception, California. The 2022 Alaska SARs describe a revised stock structure for harbor porpoises (Young *et al.,* 2023). Previously, NMFS had designated three stocks of harbor porpoises: the Bering Sea stock, the Gulf of Alaska stock, and the Southeast Alaska stock (Muto *et al.,* 2022; Zerbini *et al.,* 2022). The 2022 Alaska SARs splits the Southeast Alaska stock into three separate stocks, resulting in five separate stocks in Alaskan waters for this species. This update better aligns harbor porpoise stock structure with genetics, trends in abundance, and information regarding discontinuous distribution trends (Young *et al.,* 2023). Harbor porpoises found in Cook Inlet are assumed to be members of the Gulf of Alaska stock (Young *et al.,* 2023).

Harbor porpoises occur most frequently in waters less than 100 m deep (Hobbs and Waite, 2010) and are common in nearshore areas of the Gulf of Alaska, Shelikof Strait, and lower Cook Inlet (Dahlheim *et al.,* 2000). Harbor porpoises are often observed in lower Cook Inlet in Kachemak Bay and from Cape Douglas to the West Foreland (Rugh *et al.,* 2005). They can be opportunistic foragers but consume primarily schooling forage fish (Bowen and Siniff, 1999). Given their shallow water distribution, harbor porpoise are vulnerable to physical modifications of nearshore habitats resulting from urban and industrial development (including waste management and nonpoint source runoff) and activities such as construction of docks and other over-water structures, filling of shallow areas, dredging, and noise (Linnenschmidt *et al.,* 2013). Subsistence users have not reported any harvest from the Gulf of Alaska harbor porpoise stock since the early 1900s (Shelden *et al.,* 2014). Calving occurs from May to August; however, this can vary by region. Harbor porpoises are often found traveling alone, or in small groups of less than 10 individuals (Schmale, 2008).

Harbor porpoises occur throughout Cook Inlet, with passive acoustic detections being more prevalent in lower Cook Inlet. Although harbor porpoises have been frequently observed during aerial surveys in Cook Inlet (Shelden *et al.,* 2014), most sightings are of single animals and are concentrated at Chinitna and Tuxedni bays on the west side of lower Cook Inlet (Rugh *et al.,* 2005), with smaller numbers observed in upper Cook Inlet between April and October. The occurrence of larger numbers of porpoise in the lower Cook Inlet may be driven by greater availability of preferred prey and possibly less competition with CIBWs, as CIBWs move into upper inlet waters to forage on Pacific salmon during the summer months (Shelden *et al.,* 2014).

An increase in harbor porpoise sightings in upper Cook Inlet was observed over recent decades (*e.g.,* 61N Environmental, 2021, 2022a; Shelden *et al.,* 2014). Small numbers of harbor porpoises have been consistently reported in upper Cook Inlet between April and October (Prevel-Ramos *et al.,* 2008). The overall increase in the number of harbor porpoise sightings in upper Cook Inlet is unknown, although it may be an artifact of increased studies and marine mammal monitoring programs in upper Cook Inlet. It is also possible that the contraction in the CIBW's range has opened up previously occupied CIBW range to harbor porpoises (Shelden *et al.,* 2014).

During Apache's 2012 seismic program in middle Cook Inlet, 137 groups of harbor porpoises comprising 190 individuals were documented between May and August (Lomac-MacNair *et al.,* 2013). In June 2012, Shelden *et al.* (2015b) documented 65 groups of 129 individual harbor porpoises during an aerial survey, none of which were in upper Cook Inlet. Kendall *et al.* (2015, as cited in Weston and SLR, 2022) documented 52 groups comprising 65 individuals north of the Forelands during SAExploration's 2015 seismic survey. 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. Observations occurred in middle and lower Cook Inlet with a majority in Kachemak Bay. There were two sightings of three harbor porpoises observed during the 2019 Hilcorp lower Cook Inlet seismic survey in the fall (Fairweather Science, 2020). A total of 29 groups (44 individuals) were observed north of the Forelands from May to September during the CIPL Extension Project (Sitkiewicz *et al.,* 2018). During jack-up rig moves in 2021, a PSO observed two individual harbor porpoises in middle Cook Inlet: one in July and one in October. Four monitoring events were conducted at the POA in Anchorage between April 2020 and August 2022, during which 42 groups of harbor porpoises comprising 50 individual porpoises were documented over 285 days of observation (61N Environmental 2021, 2022a, 2022b, and 2022c). One harbor porpoise was observed during Hilcorp's boat-based monitoring efforts in June 2023 (Horsley and Larson, 2023).

Dall's Porpoise

Dall's porpoises are found throughout the North Pacific, from southern Japan to southern California north to the Bering Sea. All Dall's porpoises in Alaska are of the Alaska stock. This species can be found in offshore, inshore, and nearshore habitat. The Dall's porpoise range in Alaska includes lower Cook Inlet, but very few sightings have been reported in upper Cook Inlet. Observations have been documented near Kachemak Bay and Anchor Point (Owl Ridge, 2014; BOEM, 2015). Shelden *et al.* (2013) and Rugh *et al.* (2005) collated data from aerial surveys conducted between 1994 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 porpoise were observed on subsequent surveys in June and/or July 2014, 2016, 2018, 2021, and 2022 (Shelden *et al.,* 2015b, 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). In August 2015, one Dall's porpoise was reported in the mid-inlet north of Nikiski in middle Cook Inlet during SAExploration's seismic program (Kendall *et al.,* 2015 as cited in Weston and SLR, 2022). During aerial surveys in Cook Inlet, they were observed in Iniskin Bay, Barren Island, Elizabeth Island, and Kamishak Bay (Shelden *et al.,* 2013). 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 the fall 2019 (Fairweather Science, 2020). Hilcorp recorded three sightings of Dall's porpoises in 2021 and one sighting of a Dall's porpoise in 2023 from their rig-based monitoring efforts in the project area (Korsmo et al., 2022; Horsley and Larson, 2023). This higher number of sightings suggests 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.

Steller Sea Lion

Two DPSs of Steller sea lion occur in Alaska: the western DPS and the eastern DPS. The western DPS includes animals that occur west of Cape Suckling, Alaska, and therefore includes individuals within the Project area. The western DPS was listed under the ESA as threatened in 1990 (55 FR 49204, November 26, 1990), and its continued population decline resulted in a change in listing status to endangered in 1997 (62 FR 24345, May 5, 1997). Since 2000, studies indicate that the population east of Samalga Pass (*i.e.,* east of the Aleutian Islands) has increased and is potentially stable (Young *et al.,* 2023).

There is uncertainty regarding threats currently impeding the recovery of Steller sea lions, particularly in the Aleutian Islands. Many factors have been suggested as causes of the steep decline in abundance of western Steller sea lions observed in the 1980s, including competitive effects of fishing, environmental change, disease, contaminants, killer whale predation, incidental take, and illegal and legal shooting (Atkinson *et al.,* 2008; NMFS, 2008a). A number of management actions have been implemented since 1990 to promote the recovery of the Western U.S. stock of Steller sea lions, including 5.6-km (3-nautical mile) no-entry zones around rookeries, prohibition of shooting at or near sea lions, and regulation of fisheries for sea lion prey species (*e.g.,* walleye pollock, Pacific cod, and Atka mackerel (*Pleurogrammus monopterygius*)) (Sinclair *et al.,* 2013; Tollit *et al.,* 2017). Additionally, potentially deleterious events, such as harmful algal blooms (Lefebvre *et al.,* 2016) and disease transmission across the Arctic (VanWormer *et al.,* 2019) that have been associated with warming waters, could lead to potentially negative population-level impacts on Steller sea lions.

NMFS designated critical habitat for Steller sea lions on August 27, 1993 (58 FR 45269), including portions of the southern reaches of lower Cook Inlet. The critical habitat designation for the Western DPS of was determined to include a 37-km (20-nautical mile) buffer around all major haul-outs and rookeries, and associated terrestrial, atmospheric, and aquatic zones, plus three large offshore foraging areas, none of which occurs in the project area. There is no designated critical habitat for Steller sea lions in the mid- or upper inlet, nor are there any known BIAs for Steller sea lions within the project area. Rookeries and haul out sites in lower

Cook Inlet include those near the mouth of the inlet, which are approximately 56 km or more south of the closest action area.

Steller sea lions are opportunistic predators, feeding primarily on a wide variety of seasonally abundant fishes and cephalopods, including Pacific herring (*Clupea pallasi*), walleye pollock, capelin (*Mallotus villosus*), Pacific sand lance (*Ammodytes hexapterus*), Pacific cod, salmon (*Oncorhynchus spp.*), and squid (*Teuthida spp.*); (Jefferson *et al.,* 2008; Wynne *et al.,* 2011). Steller sea lions do not generally eat every day, but tend to forage every 1–2 days and return to haulouts to rest between foraging trips (Merrick and Loughlin, 1997; Rehberg *et al.,* 2009). Steller sea lions feed largely on walleye pollock, salmon, and arrowtooth flounder during the summer, and walleye pollock and Pacific cod during the winter (Sinclair and Zeppelin, 2002).

Most Steller sea lions in Cook Inlet occur south of Anchor Point on the east side of lower Cook Inlet, with concentrations near haulout sites at Shaw Island and Elizabeth Island and by Chinitna Bay and Iniskin Bay on the west side (Rugh *et al.,* 2005). Steller sea lions are rarely seen in upper Cook Inlet (Nemeth *et al.,* 2007). About 3,600 sea lions use haulout sites in the lower Cook Inlet area (Sweeney *et al.,* 2017), with additional individuals venturing into the area to forage.

Several surveys and monitoring programs have documented Steller sea lions throughout Cook Inlet, including in upper Cook Inlet in 2012 (Lomac-MacNair *et al.,* 2013), near Cape Starichkof in 2013 (Owl Ridge, 2014), in middle and lower Cook Inlet in 2015 (Kendall *et al.,* 2015, as cited in Weston and SLR, 2022), in middle Cook Inlet in 2018 (Sitkiewicz *et al.,* 2018), in lower Cook Inlet in 2019 (Fairweather Science, 2020), and near the POA in Anchorage in 2020, 2021, and 2022 (61N Environmental, 2021, 2022a, 2022b, and 2022c). During NMFS Cook Inlet beluga whale aerial surveys from 2000 to 2016, 39 sightings of 769 estimated individual Steller sea lions in lower Cook Inlet were recorded (Shelden *et al.,* 2017). 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). In 2012, during Apache's 3D Seismic surveys, three sightings of approximately 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 SAExploration'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). Five sightings of five Steller sea lions were recorded during Hilcorp's lower Cook Inlet seismic survey in the fall of 2019 (Fairweather Science, 2020). Additionally, one sighting of two individuals occurred during the CIPL Extension Project in 2018 in middle Cook Inlet (Sitkiewicz *et al.,* 2018). 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 Cook Inlet. (K. Lindberg, personal communication, August 15, 2022). Steller sea lions have also been reported near the POA in Anchorage in 2020, 2021, and 2022 (61N 2021, 2022a, 2022b, and 2022c). Hilcorp did not record any sightings of Steller sea lions from their aerial or rig-based monitoring efforts in 2023 (Horsley and Larson, 2023).

Harbor Seal

Harbor seals inhabit waters all along the western coast of the United States, British Columbia, and north through Alaska waters to the Pribilof Islands and Cape Newenham. NMFS currently identifies 12 stocks of harbor seals in Alaska based largely on genetic structure (Young *et al.,* 2023). Harbor seals in the proposed project area are members of the Cook Inlet/Shelikof stock, which ranges from the southwest tip of Unimak Island east along the southern coast of the Alaska Peninsula to Elizabeth Island off the southwest tip of the Kenai Peninsula, including Cook Inlet, Knik Arm, and Turnagain Arm. Distribution of the Cook Inlet/Shelikof stock extends from Unimak Island, in the Aleutian Islands archipelago, north through all of upper and lower Cook Inlet (Young *et al.,* 2023).

Harbor seals inhabit the coastal and estuarine waters of Cook Inlet and are observed in both upper and lower Cook Inlet throughout most of the year (Boveng *et al.,* 2012; Shelden *et al.,* 2013). High-density areas include Kachemak Bay, Iniskin Bay, Iliamna Bay, Kamishak Bay, Cape Douglas, and Shelikof Strait. Up to a few hundred seals seasonally occur in middle and upper Cook Inlet (Rugh *et al.* 2005), with the highest concentrations found near the Susitna River and other tributaries within upper Cook Inlet during eulachon and salmon runs (Nemeth *et al.,* 2007; Boveng *et al.,* 2012), but most remain south of the forelands (Boveng *et al.,* 2012).

Harbor seals haul out on rocks, reefs, beaches, and drifting glacial ice (Young *et al.,* 2023). Their movements are influenced by tides, weather, season, food availability, and reproduction, as well as individual sex and age class (Lowry *et al.,* 2001; Small *et al.,* 2003; Boveng *et al.,* 2012). The results of past and recent satellite tagging studies in Southeast Alaska, Prince William Sound, Kodiak Island, and Cook Inlet are also consistent with the conclusion that harbor seals are non-migratory (Lowry *et al.,* 2001; Small *et al.,* 2003; Boveng *et al.,* 2012). However, some long-distance movements of tagged animals in Alaska have been recorded (Pitcher and McAllister, 1981; Lowry *et al.,* 2001; Small *et al.,* 2003; Womble, 2012; Womble and Gende, 2013). Strong fidelity of individuals for haulout sites during the breeding season has been documented in several populations (Härkönen and Harding, 2001), including in Cook Inlet (Pitcher and McAllister, 1981; Small *et al.,* 2005; Boveng *et al.,* 2012; Womble, 2012; Womble and Gende, 2013). Harbor seals usually give birth to a single pup between May and mid-July; birthing locations are dispersed over several haulout sites and not confined to major rookeries (Klinkhart *et al.,* 2008). More than 200 haulout sites are documented in lower Cook Inlet (Montgomery *et al.,* 2007) and 18 in middle and upper Cook Inlet (London *et al.,* 2015). Of the 18 in middle and upper Cook Inlet, nine are considered ''key haulout'' locations where aggregations of 50 or more harbor seals have been documented. Seven key haulouts are in the Susitna River delta, and two are near the Chickaloon River.

Recent research on satellite-tagged harbor seals observed several movement patterns within Cook Inlet (Boveng *et al.,* 2012), including a strong seasonal pattern of more coastal and restricted spatial use during the spring and summer (breeding, pupping, molting) and more wide-ranging movements within and outside of Cook Inlet during the winter months, with some seals ranging as far as Shumagin Islands. During summer months, movements and distribution were mostly confined to the west side of Cook Inlet and Kachemak Bay, and seals captured in lower Cook Inlet generally exhibited site fidelity by remaining south of the Forelands in lower Cook Inlet after release (Boveng *et al.,* 2012). In the fall, a portion of the harbor seals appeared to move out of Cook Inlet and into Shelikof Strait, northern Kodiak Island, and coastal habitats of the Alaska Peninsula. The western coast of Cook Inlet had higher usage by harbor seals than eastern coast habitats, and seals captured in lower Cook Inlet generally exhibited site fidelity by remaining south of the Forelands in lower Cook Inlet after release (south of Nikiski; Boveng *et al.,* 2012).

Harbor seals have been sighted in Cook Inlet during every year of the aerial surveys conducted by NMFS and during all recent mitigation and monitoring programs in lower, middle, and upper Cook Inlet (61N Environmental, 2021, 2022a, 2022b, and 2022c; Fairweather Science, 2020; Kendall *et al.,* 2015 as cited in Weston and SLR, 2022; Lomac-MacNair *et al.,* 2013, 2014; Sitkiewicz *et al.,* 2018). In addition, Hilcorp recorded one sighting of a harbor seal in 2021 and three sightings of harbor seals in 2023 from their aerial and rig-based monitoring efforts in the project area (Korsmo et al. 2022; Horsley and Larson, 2023).

California Sea Lion

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

Few observations of California sea lions have been reported in Alaska and most observations have been limited to solitary individuals, typically males that are known to migrate long distances. Occasionally, California sea lions can be found in small groups of two or more and are usually associated with Steller sea lions at their haul outs and rookeries (Maniscalco *et al.,* 2004). The few California sea lions observed in Alaska typically do not travel further north than Southeast Alaska. They are often associated with Steller sea lion haulouts and rookeries (Maniscalco *et al.,* 2004). Sightings in Cook Inlet are rare, with two documented during the Apache 2012 seismic survey (Lomac-MacNair *et al.,* 2013) and anecdotal sightings in Kachemak Bay. None were sighted during the 2019 Hilcorp lower Cook Inlet seismic survey (Fairweather Science, 2020), the CIPL project in 2018 (Sitkiewicz *et al.,* 2018), or the 2023 Hilcorp aerial or rig-based monitoring efforts (Horsley and Larson, 2023).

Marine Mammal Hearing

Hearing is the most important sensory modality for marine mammals underwater, and exposure to anthropogenic sound can have deleterious effects. To appropriately assess the potential effects of exposure to sound, it is necessary to understand the frequency ranges marine mammals are able to hear. Not all marine mammal species have equal hearing capabilities (*e.g.,* Richardson *et al.,* 1995; Wartzok and Ketten, 1999; Au and Hastings, 2008). To reflect this, Southall *et al.* (2007, 2019) recommended that marine mammals be divided into hearing groups based on directly measured (behavioral or auditory evoked potential techniques) or estimated hearing ranges (behavioral response data, anatomical modeling, *etc.*). Subsequently, NMFS (2018) described generalized hearing ranges for these marine mammal hearing groups. Generalized hearing ranges were chosen based on the approximately 65 decibel (dB) threshold from the normalized composite audiograms, with the exception for lower limits for low-frequency cetaceans where the lower bound was deemed to be biologically implausible and the lower bound from Southall *et al.* (2007) retained. Marine mammal hearing groups and their associated hearing ranges are provided in table 3. Specific to this action, gray whales, fin whales, minke whales, and humpback whales are considered low-frequency (LF) cetaceans, beluga whales, pacific white-sided dolphins, and killer whales are considered mid-frequency (MF) cetaceans, harbor porpoises and Dall's porpoises are considered high-frequency (HF) cetaceans, Steller sea lions and California sea lions are otariid pinnipeds (OW), and harbor seals are phocid pinnipeds (PW).

TABLE 3—MARINE MAMMAL HEARING GROUPS

[NMFS, 2018]

Hearing group	Generalized hearing range *
Low-frequency (LF) cetaceans (baleen whales)	7 Hz to 35 kHz.
Mid-frequency (MF) cetaceans (dolphins, toothed whales, beaked whales, bottlenose whales)	150 Hz to 160 kHz.
High-frequency (HF) cetaceans (true porpoises, *Kogia,* river dolphins, Cephalorhynchid, *Lagenorhynchus cruciger* & *L. australis*).	275 Hz to 160 kHz.
Phocid pinnipeds (PW) (underwater) (true seals)	50 Hz to 86 kHz.
Otariid pinnipeds (OW) (underwater) (sea lions and fur seals)	60 Hz to 39 kHz.

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

The pinniped functional hearing group was modified from Southall *et al.* (2007) on the basis of data indicating that phocid species have consistently demonstrated an extended frequency range of hearing compared to otariids, especially in the higher frequency range (Hemilä *et al.,* 2006; Kastelein *et al.,* 2009; Reichmuth and Holt, 2013). This division between phocid and otariid pinnipeds is now reflected in the updated hearing groups proposed in Southall *et al.* (2019).

For more detail concerning these groups and associated frequency ranges, please see NMFS (2018) for a review of available information.

Potential Effects of Specified Activities on Marine Mammals and Their Habitat

This section provides a discussion of the ways in which components of the specified activity may impact marine mammals and their habitat. The Estimated Take of Marine Mammals section later in this document includes a quantitative analysis of the number of individuals that are expected to be taken by this activity. The Negligible Impact Analysis and Determination section considers the content of this section, the Estimated Take of Marine Mammals section, and the Proposed Mitigation section, to draw conclusions regarding the likely impacts of these activities on the reproductive success or survivorship of individuals and whether those impacts are reasonably expected to, or reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival.

Effects on marine mammals during the specified activity are expected to potentially occur from three to four tugs towing, holding, and or positioning a jack-up rig. Underwater noise from Hilcorp's proposed activities have the potential to result in Level B harassment of marine mammals in the action area.

Background on Sound

This section contains a brief technical background on sound, on the characteristics of certain sound types, and on metrics used relevant to the specified activity and to a discussion of the potential effects of the specified activity on marine mammals found later in this document. For general information on sound and its interaction with the marine environment, please see: Erbe and Thomas (2022); Au and Hastings (2008); Richardson *et al.* (1995); Urick (1983); as well as the Discovery of Sound in the Sea website at *https://dosits.org/.*

Sound is a vibration that travels as an acoustic wave through a medium such as a gas, liquid or solid. Sound waves alternately compress and decompress the medium as the wave travels. In water, sound waves radiate in a manner similar to ripples on the surface of a pond and may be either directed in a beam (narrow beam or directional sources) or sound may radiate in all directions (omnidirectional sources), as is the case for sound produced by tugs under load with a jack-up rig considered here. The compressions and decompressions associated with sound waves are detected as changes in pressure by marine mammals and human-made sound receptors such as hydrophones.

Sound travels more efficiently in water than almost any other form of energy, making the use of sound as a primary sensory modality ideal for inhabitants of the aquatic environment. In seawater, sound travels at roughly 1,500 meters per second (m/s). In air, sound waves travel much more slowly at about 340 m/s. However, the speed of sound in water can vary by a small amount based on characteristics of the transmission medium such as temperature and salinity.

The basic characteristics of a sound wave are frequency, wavelength, velocity, and amplitude. Frequency is the number of pressure waves that pass by a reference point per unit of time and is measured in hertz (Hz) or cycles per second. Wavelength is the distance between two peaks or corresponding points of a sound wave (length of one cycle). Higher frequency sounds have shorter wavelengths than lower frequency sounds, and typically attenuate (decrease) more rapidly with distance, except in certain cases in shallower water. The amplitude of a sound pressure wave is related to the subjective ''loudness'' of a sound and is typically expressed in dB, which are a relative unit of measurement that is used to express the ratio of one value of a power or pressure to another. A sound pressure level (SPL) in dB is described as the ratio between a measured pressure and a reference pressure, and is a logarithmic unit that accounts for large variations in amplitude; therefore, a relatively small change in dB corresponds to large changes in sound pressure. For example, a 10-dB increase is a 10-fold increase in acoustic power. A 20-dB increase is then a 100-fold increase in power and a 30-dB increase is a 1000-fold increase in power. However, a 10-fold increase in acoustic power does not mean that the sound is perceived as being 10 times louder. The dB is a relative unit comparing two pressures; therefore, a reference pressure must always be indicated. For underwater sound, this is 1 microPascal (μPa). For in-air sound, the reference pressure is 20 microPascal (μPa). The amplitude of a sound can be presented in various ways; however, NMFS typically considers three metrics: sound exposure level (SEL), root-mean-square (RMS) SPL, and peak SPL (defined below). The source level represents the SPL referenced at a standard distance from the source, typically 1 m (Richardson *et al.,* 1995; American National Standards Institute (ANSI), 2013), while the received level is the SPL at the receiver's position. For tugging activities, the SPL is typically referenced at 1 m.

SEL (represented as dB referenced to 1 micropascal squared second (re 1 μPa^2-s)) represents the total energy in a stated frequency band over a stated time interval or event, and considers both intensity and duration of exposure. SEL can also be a cumulative metric; it can be accumulated over a single pulse (*i.e.,* during activities such as impact pile driving) or calculated over periods containing multiple pulses (SEL_{cum}). Cumulative SEL (SEL_{cum}) represents the total energy accumulated by a receiver over a defined time window or during an event. The SEL metric is useful because it allows sound exposures of different durations to be related to one another in terms of total acoustic energy. The duration of a sound event and the number of pulses, however, should be specified as there is no accepted standard duration over which the summation of energy is measured.

RMS SPL is equal to 10 times the logarithm (base 10) of the ratio of the mean-square sound pressure to the specified reference value, and given in units of dB (International Organization for Standardization (ISO), 2017). RMS is calculated by squaring all of the sound amplitudes, averaging the squares, and then taking the square root of the average (Urick, 1983). RMS accounts for both positive and negative values; squaring the pressures makes all values positive so that they may be accounted for in the summation of pressure levels (Hastings and Popper, 2005). This measurement is often used in the context of discussing behavioral effects, in part because behavioral effects, which often result from auditory cues, may be better expressed through averaged units than by peak SPL. For impulsive sounds, RMS is calculated by the portion of the waveform containing 90 percent of the sound energy from the impulsive event (Madsen, 2005).

Peak SPL (also referred to as zero-to-peak sound pressure or 0-pk) is the maximum instantaneous sound pressure measurable in the water, which can arise from a positive or negative sound pressure, during a specified time, for a specific frequency range at a specified distance from the source, and is represented in the same units as the RMS sound pressure (ISO, 2017). Along with SEL, this metric is used in evaluating the potential for permanent threshold shift (PTS) and temporary threshold shift (TTS) associated with impulsive sound sources.

Sounds are also characterized by their temporal components. Continuous sounds are those whose sound pressure level remains above that of the ambient or background sound with negligibly small fluctuations in level (ANSI, 2005) while intermittent sounds are defined as sounds with interrupted levels of low or no sound (National Institute for Occupational Safety and Health (NIOSH), 1998). A key distinction between continuous and intermittent sound sources is that intermittent sounds have a more regular (predictable) pattern of bursts of sounds and silent periods (*i.e.,* duty cycle), which continuous sounds do not. Tugs under load are considered sources of continuous sound.

Sounds may be either impulsive or non-impulsive (defined below). The distinction between these two sound types is important because they have differing potential to cause physical effects, particularly with regard to noise-induced hearing loss (*e.g.,* Ward, 1997 in Southall *et al.,* 2007). Please see

NMFS (2018) and Southall *et al.* (2007, 2019) for an in-depth discussion of these concepts.

Impulsive sound sources (*e.g.,* explosions, gunshots, sonic booms, seismic airgun shots, impact pile driving) produce signals that are brief (typically considered to be less than 1 second), broadband, atonal transients (ANSI, 1986, 2005; NIOSH, 1998) and occur either as isolated events or repeated in some succession. Impulsive sounds are all characterized by a relatively rapid rise from ambient pressure to a maximal pressure value followed by a rapid decay period that may include a period of diminishing, oscillating maximal and minimal pressures, and generally have an increased capacity to induce physical injury as compared with sounds that lack these features. Impulsive sounds are intermittent in nature. The duration of such sounds, as received at a distance, can be greatly extended in a highly reverberant environment.

Non-impulsive sounds can be tonal, narrowband, or broadband, brief or prolonged, and may be either continuous or non-continuous (ANSI, 1995; NIOSH, 1998). Some of these non-impulsive sounds can be transient signals of short duration but without the essential properties of impulses (*e.g.,* rapid rise time). Examples of non-impulsive sounds include those produced by vessels (including tugs under load), aircraft, machinery operations such as drilling or dredging, vibratory pile driving, and active sonar systems.

Even in the absence of sound from the specified activity, the underwater environment is characterized by sounds from both natural and anthropogenic sound sources. Ambient sound is defined as a composite of naturally-occurring (*i.e.,* non-anthropogenic) sound from many sources both near and far (ANSI, 1995). Background sound is similar, but includes all sounds, including anthropogenic sounds, minus the sound produced by the proposed activities (NMFS, 2012, 2016a). The sound level of a region is defined by the total acoustical energy being generated by known and unknown sources. These sources may include physical (*e.g.,* wind and waves, earthquakes, ice, atmospheric sound), biological (*e.g.,* sounds produced by marine mammals, fish, and invertebrates), and anthropogenic (*e.g.,* vessels, dredging, construction) sound.

A number of sources contribute to background and ambient sound, including wind and waves, which are a main source of naturally occurring ambient sound for frequencies between 200 Hz and 50 kilohertz (kHz) (Mitson, 1995). In general, background and ambient sound levels tend to increase with increasing wind speed and wave height. Precipitation can become an important component of total sound at frequencies above 500 Hz, and possibly down to 100 Hz during quiet times. Marine mammals can contribute significantly to background and ambient sound levels, as can some fish and snapping shrimp. The frequency band for biological contributions is from approximately 12 Hz to over 100 kHz. Sources of background sound related to human activity include transportation (surface vessels), dredging and construction, oil and gas drilling and production, geophysical surveys, sonar, and explosions. Vessel noise typically dominates the total background sound for frequencies between 20 and 300 Hz. In general, the frequencies of many anthropogenic sounds, particularly those produced by construction activities, are below 1 kHz (Richardson *et al.,* 1995). When sounds at frequencies greater than 1 kHz are produced, they generally attenuate relatively rapidly (Richardson *et al.,* 1995), particularly above 20 kHz due to propagation losses and absorption (Urick, 1983).

Transmission loss (*TL*) defines the degree to which underwater sound has spread in space and lost energy after having moved through the environment and reached a receiver. It is defined as the reduction in a specified level between two specified points that are within an underwater acoustic field (ISO, 2017). Careful consideration of transmission loss and appropriate propagation modeling is a crucial step in determining the impacts of underwater sound, as it helps to define the ranges (isopleths) to which impacts are expected and depends significantly on local environmental parameters such as seabed type, water depth (bathymetry), and the local speed of sound. Geometric spreading laws are powerful tools which provide a simple means of estimating *TL,* based on the shape of the sound wave front in the water column. For a sound source that is equally loud in all directions and in deep water, the sound field takes the form of a sphere, as the sound extends in every direction uniformly. In this case, the intensity of the sound is spread across the surface of the sphere, and thus we can relate intensity loss to the square of the range (as area = $4*pi*r^2$). When expressing logarithmically in dB as *TL,* we find that $TL = 20*Log_{10}(range)$, this situation is known as spherical spreading. In shallow water, the sea surface and seafloor will bound the shape of the sound, leading to a more cylindrical shape, as the top and bottom of the sphere is truncated by the largely reflective boundaries. This situation is termed cylindrical spreading, and is given by $TL = 10*Log_{10}(range)$ (Urick, 1983). An intermediate scenario may be defined by the equation $TL = 15*Log_{10}(range)$, and is referred to as practical spreading. Though these geometric spreading laws do not capture many often important details (scattering, absorption, *etc.*), they offer a reasonable and simple approximation of how sound decreases in intensity as it is transmitted. Cook Inlet is a particularly complex acoustic environment with strong currents, large tides, variable sea floor and generally changing conditions.

The sum of the various natural and anthropogenic sound sources at any given location and time depends not only on the source levels, but also on the propagation of sound through the environment. Sound propagation is dependent on the spatially and temporally varying properties of the water column and sea floor, and is frequency-dependent. As a result of the dependence on a large number of varying factors, background and ambient sound levels can be expected to vary widely over both coarse and fine spatial and temporal scales. Sound levels at a given frequency and location can vary by 10 to 20 dB from day to day (Richardson *et al.,* 1995). The result is that, depending on the source type and its intensity, sound from a specified activity may be a negligible addition to the local environment or could form a distinctive signal that may affect marine mammals.

Description of Sound Sources for the Specified Activities

In-water activities associated with the project that have the potential to incidentally take marine mammals through exposure to sound would be tugs towing, holding, and positioning the jack-up rig. Unlike discrete noise sources with known potential to harass marine mammals (*e.g.,* pile driving, seismic surveys), both the noise sources and impacts from the tugs towing the jack-up rig are less well documented. Sound energy associated with the specified activity is produced by vessel propeller cavitation. Bow thrusters would be occasionally used for a short duration (20 to 30 seconds) to either push or pull a vessel in or away from a dock or platform. Other sound sources include onboard diesel generators and sound from the main engine, but both are subordinate to the thruster and main propeller blade rate harmonics (Gray and Greeley, 1980). The various scenarios that may occur during this project include tugs in a stationary mode positioning the drill rig and pulling the jack-up rig at nearly full power against strong tides. Our assessments of the likelihood for harassment of marine mammals incidental to Hilcorp's tug activities specified here are conservative in light of the general Level B harassment exposure thresholds, the fact that NMFS is still in the process of developing analyses of the impact that non-quantitative contextual factors have on the likelihood of Level B harassment occurring, and the nature and duration of the particular tug activities analyzed here.

Acoustic Impacts

The introduction of anthropogenic noise into the aquatic environment from tugs under load is the primary means by which marine mammals may be harassed from Hilcorp's specified activity. In general, animals exposed to natural or anthropogenic sound may experience physical and psychological effects, ranging in magnitude from none to severe (Southall *et al.,* 2007, 2019). Exposure to anthropogenic noise has the potential to result in auditory threshold shifts and behavioral reactions (*e.g.,* avoidance, temporary cessation of foraging and vocalizing, changes in dive behavior). It can also lead to non-observable physiological responses, such as an increase in stress hormones. Additional noise in a marine mammal's habitat can mask acoustic cues used by marine mammals to carry out daily functions, such as communication and predator and prey detection. The effects of noise on marine mammals are dependent on several factors, including but not limited to sound type (*e.g.,* impulsive vs. non-impulsive), the species, age and sex class (*e.g.,* adult male vs. mom with calf), duration of exposure, the distance between the vessel and the animal, received levels, behavior at time of exposure, and previous history with exposure (Wartzok *et al.,* 2004; Southall *et al.,* 2007). Here we discuss physical auditory effects (threshold shifts) followed by behavioral effects and potential impacts on habitat.

NMFS defines a noise-induced threshold shift (TS) as a change, usually an increase, in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level (NMFS, 2018). The amount of threshold shift is customarily expressed in dB. A TS can be permanent or temporary. As described in NMFS (2018) there are numerous factors to consider when examining the consequence of TS, including but not limited to the signal temporal pattern (*e.g.,* impulsive or non-impulsive), likelihood an individual would be exposed for a long enough duration or to a high enough level to induce a TS, the magnitude of the TS, time to recovery (seconds to minutes or hours to days), the frequency range of the exposure (*i.e.,* spectral content), the hearing frequency range of the exposed species relative to the signal's frequency spectrum (*i.e.,* how animal uses sound within the frequency band of the signal; *e.g.,* Kastelein *et al.,* 2014), and the overlap between the animal and the source (*e.g.,* spatial, temporal, and spectral).

Permanent Threshold Shift (PTS). NMFS defines PTS as a permanent, irreversible increase in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level (NMFS, 2018). PTS does not generally affect more than a limited frequency range, and an animal that has incurred PTS has incurred some level of hearing loss at the relevant frequencies; typically animals with PTS are not functionally deaf (Au and Hastings, 2008; Finneran, 2016). Available data from humans and other terrestrial mammals indicate that a 40-dB threshold shift approximates PTS onset (see Ward *et al.,* 1958, 1959; Ward 1960; Kryter *et al.,* 1966; Miller, 1974; Ahroon *et al.,* 1996; Henderson *et al.,* 2008). PTS levels for marine mammals are estimates, as with the exception of a single study unintentionally inducing PTS in a harbor seal (Kastak *et al.,* 2008), there are no empirical data measuring PTS in marine mammals largely due to the fact that, for ethical reasons, experiments involving anthropogenic noise exposure at levels inducing PTS are not typically pursued or authorized (NMFS, 2018).

Temporary Threshold Shift (TTS). TTS is a temporary, reversible increase in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level (NMFS, 2018). Based on data from marine mammal TTS measurements (see Southall *et al.,* 2007, 2019), a TTS of 6 dB is considered the minimum threshold shift clearly larger than any day-to-day or session-to-session variation in a subject's normal hearing ability (Finneran *et al.,* 2000, 2002; Schlundt *et al.,* 2000). As described in Finneran (2015), marine mammal studies have shown the amount of TTS increases with SEL_{cum} in an accelerating fashion: at low exposures with lower SEL_{cum}, the amount of TTS is typically small and the growth curves have shallow slopes. At exposures with higher SEL_{cum}, the growth curves become steeper and approach linear relationships with the noise SEL.

Depending on the degree (elevation of threshold in dB), duration (*i.e.,* recovery time), and frequency range of TTS, and the context in which it is experienced, TTS can have effects on marine mammals ranging from discountable to serious (similar to those discussed in auditory masking, below). For example, a marine mammal may be able to readily compensate for a brief, relatively small amount of TTS in a non-critical frequency range that takes place during a time when the animal is traveling through the open ocean, where ambient noise is lower and there are not as many competing sounds present. Alternatively, a larger amount and longer duration of TTS sustained during time when communication is critical for successful mother/calf interactions could have more serious impacts. We note that reduced hearing sensitivity as a simple function of aging has been observed in marine mammals, as well as humans and other taxa (Southall *et al.,* 2007), so we can infer that strategies exist for coping with this condition to some degree, though likely not without cost.

Many studies have examined noise-induced hearing loss in marine mammals (see Finneran (2015) and Southall *et al.* (2019) for summaries). TTS is the mildest form of hearing impairment that can occur during exposure to sound (Kryter, 2013). While experiencing TTS, the hearing threshold rises, and a sound must be at a higher level in order to be heard. In terrestrial and marine mammals, TTS can last from minutes or hours to days (in cases of strong TTS). In many cases, hearing sensitivity recovers rapidly after exposure to the sound ends. For cetaceans, published data on the onset of TTS are limited to captive bottlenose dolphin (*Tursiops truncatus*), beluga whale, harbor porpoise, and Yangtze finless porpoise (*Neophocoena asiaeorientalis*) (Southall *et al.,* 2019). For pinnipeds in water, measurements of TTS are limited to harbor seals, elephant seals (*Mirounga angustirostris*), bearded seals (*Erignathus barbatus*) and California sea lions (Kastak *et al.,* 1999, 2007; Kastelein *et al.,* 2019b, 2019c, 2021, 2022a, 2022b; Reichmuth *et al.,* 2019; Sills *et al.,* 2020). TTS was not observed in spotted (*Phoca largha*) and ringed (*Pusa hispida*) seals exposed to single airgun impulse sounds at levels matching previous predictions of TTS onset (Reichmuth *et al.,* 2016). These studies examine hearing thresholds measured in marine mammals before and after exposure to intense or long-duration sound exposures. The difference between the pre-exposure and post-exposure thresholds can be used to determine the amount of threshold shift at various post-exposure times.

The amount and onset of TTS depends on the exposure frequency. Sounds below the region of best sensitivity for a species or hearing group are less hazardous than those near the region of best sensitivity (Finneran and Schlundt, 2013). At low frequencies, onset-TTS exposure levels are higher compared to those in the region of best sensitivity (*i.e.,* a low frequency noise would need to be louder to cause TTS onset when TTS exposure level is higher), as shown for harbor porpoises and harbor seals (Kastelein *et al.,* 2019a, 2019c). Note that in general, harbor seals and harbor porpoises have a lower TTS onset than other measured pinniped or cetacean species (Finneran, 2015). In addition, TTS can accumulate across multiple exposures, but the resulting TTS will be less than the TTS from a single, continuous exposure with the same SEL (Mooney *et al.,* 2009; Finneran *et al.,* 2010; Kastelein *et al.,* 2014, 2015). This means that TTS predictions based on the total, cumulative SEL will overestimate the amount of TTS from intermittent exposures, such as sonars and impulsive sources. Nachtigall *et al.* (2018) describe measurements of hearing sensitivity of multiple odontocete species (bottlenose dolphin, harbor porpoise, beluga, and false killer whale (*Pseudorca crassidens*)) when a relatively loud sound was preceded by a warning sound. These captive animals were shown to reduce hearing sensitivity when warned of an impending intense sound. Based on these experimental observations of captive animals, the authors suggest that wild animals may dampen their hearing during prolonged exposures or if conditioned to anticipate intense sounds. Another study showed that echolocating animals (including odontocetes) might have anatomical specializations that might allow for conditioned hearing reduction and filtering of low-frequency ambient noise, including increased stiffness and control of middle ear structures and placement of inner ear structures (Ketten *et al.,* 2021). Data available on noise-induced hearing loss for mysticetes are currently lacking (NMFS, 2018). Additionally, the existing marine mammal TTS data come from a limited number of individuals within these species.

Relationships between TTS and PTS thresholds have not been studied in marine mammals, and there is no PTS data for cetaceans, but such relationships are assumed to be similar to those in humans and other terrestrial mammals. PTS typically occurs at exposure levels at least several decibels above that inducing mild TTS (*e.g.,* a 40-dB threshold shift approximates PTS onset (Kryter *et al.,* 1966; Miller, 1974), while a 6-dB threshold shift approximates TTS onset (Southall *et al.,* 2007, 2019). Based on data from terrestrial mammals, a precautionary assumption is that the PTS thresholds for impulsive sounds are at least 6 dB higher than the TTS threshold on a peak-pressure basis and PTS cumulative sound exposure level thresholds are 15 to 20 dB higher than TTS cumulative sound exposure level thresholds (Southall *et al.,* 2007, 2019). Given the higher level of sound or longer exposure duration necessary to cause PTS as compared with TTS, it is considerably less likely that PTS could occur. Given the nature of tugging, a transient activity, and the fact that many marine mammals are likely moving through the project areas and not remaining for extended periods of time, the potential for threshold shift is low.

Non-acoustic Stressors. HiIlcorp's proposed activities on marine mammals could also involve non-acoustic stressors. Potential non-acoustic stressors could result from the physical presence of the equipment (*e.g.,* tug configuration) and personnel; however, given there are no known pinniped haul-out sites in the vicinity of the project site, visual and other non-acoustic stressors would be limited, and any impacts to marine mammals are expected to primarily be acoustic in nature.

Behavioral Harassment. Exposure to noise also has the potential to behaviorally disturb marine mammals to a level that rises to the definition of Level B harassment under the MMPA. Behavioral disturbance may include a variety of effects, including subtle changes in behavior (*e.g.,* minor or brief avoidance of an area or changes in vocalizations), more conspicuous changes in similar behavioral activities, and more sustained and/or potentially severe reactions, such as displacement from or abandonment of high-quality habitat. Behavioral responses may include changing durations of surfacing and dives, changing direction and/or speed; reducing/increasing vocal activities; changing/cessation of certain behavioral activities (such as socializing or feeding); eliciting a visible startle response or aggressive behavior (such as tail/fin slapping or jaw clapping); and avoidance of areas where sound sources are located (Erbe *et al.,* 2019). In addition, pinnipeds may increase their haul out time, possibly to avoid in-water disturbance (Thorson and Reyff, 2006).

Behavioral responses to sound are highly variable and context-specific and any reactions depend on numerous intrinsic and extrinsic factors (*e.g.,* species, state of maturity, experience, current activity, reproductive state, auditory sensitivity, time of day), as well as the interplay between factors (*e.g.,* Richardson *et al.,* 1995; Wartzok *et al.,* 2004; Southall *et al.,* 2007, 2019; Weilgart, 2007; Archer *et al.,* 2010; Erbe *et al.* 2019). Behavioral reactions can vary not only among individuals but also within an individual, depending on previous experience with a sound source, context, and numerous other factors (Ellison *et al.,* 2012), and can vary depending on characteristics associated with the sound source (*e.g.,* whether it is moving or stationary, number of sources, distance from the source). For example, animals that are resting may show greater behavioral change in response to disturbing sound levels than animals that are highly motivated to remain in an area for feeding (Richardson *et al.,* 1995; Wartzok *et al.,* 2004; National Research Council (NRC), 2005). In general, pinnipeds seem more tolerant of, or at least habituate more quickly to, potentially disturbing underwater sound than do cetaceans, and generally seem to be less responsive to exposure to industrial sound than most cetaceans. Please see appendices B and C of Southall *et al.* (2007) and Gomez *et al.* (2016) for reviews of studies involving marine mammal behavioral responses to sound.

Habituation can occur when an animal's response to a stimulus wanes with repeated exposure, usually in the absence of unpleasant associated events (Wartzok *et al.,* 2004). Animals are most likely to habituate to sounds that are predictable and unvarying. It is important to note that habituation is appropriately considered as a ''progressive reduction in response to stimuli that are perceived as neither aversive nor beneficial,'' rather than as, more generally, moderation in response to human disturbance (Bejder *et al.,* 2009). The opposite process is sensitization, when an unpleasant experience leads to subsequent responses, often in the form of avoidance, at a lower level of exposure.

Available studies show wide variation in response to underwater sound; therefore, it is difficult to predict specifically how any given sound in a particular instance might affect marine mammals perceiving the signal (*e.g.,* Erbe *et al.* 2019). If a marine mammal does react briefly to an underwater sound by changing its behavior or moving a small distance, the impacts of the change are unlikely to be significant to the individual, let alone the stock or population. If a sound source displaces marine mammals from an important feeding or breeding area for a prolonged period, impacts on individuals and populations could be significant (*e.g.,* Lusseau and Bejder, 2007; Weilgart, 2007; NRC, 2005). However, there are broad categories of potential response, which we describe in greater detail here, that include alteration of dive behavior, alteration of foraging behavior, effects to breathing, interference with or alteration of vocalization, avoidance, and flight.

Changes in dive behavior can vary widely and may consist of increased or decreased dive times and surface intervals as well as changes in the rates of ascent and descent during a dive (*e.g.,* Frankel and Clark, 2000; Costa *et al.,* 2003; Ng and Leung, 2003; Nowacek *et al.,* 2004; Goldbogen *et al.,* 2013a, 2013b, Blair *et al.,* 2016). Variations in dive behavior may reflect interruptions in biologically significant activities (*e.g.,* foraging) or they may be of little biological significance. The impact of an alteration to dive behavior resulting from an acoustic exposure depends on what the animal is doing at the time of the exposure and the type and magnitude of the response.

Disruption of feeding behavior from anthropogenic sound exposure is usually inferred by observed displacement from known foraging areas, the appearance of secondary indicators (*e.g.,* bubble nets or sediment plumes), or changes in dive behavior. Acoustic and movement bio-logging tools also have been used in some cases to infer responses to anthropogenic noise. For example, Blair *et al.* (2016) reported significant effects on humpback whale foraging behavior in Stellwagen Bank in response to ship noise including slower descent rates, and fewer side-rolling events per dive with increasing ship nose. In addition, Wisniewska *et al.* (2018) reported that tagged harbor porpoises demonstrated fewer prey capture attempts when encountering occasional high-noise levels resulting from vessel noise as well as more vigorous fluking, interrupted foraging, and cessation of echolocation signals observed in response to some high-noise vessel passes. As for other types of behavioral response, the frequency, duration, and temporal pattern of signal presentation, as well as differences in species sensitivity, are likely contributing factors to differences in response in any given circumstance (*e.g.,* Croll *et al.,* 2001; Nowacek *et al.,* 2004; Madsen *et al.,* 2006; Yazvenko *et al.,* 2007).

Variations in respiration naturally vary with different behaviors and alterations to breathing rate as a function of acoustic exposure can be expected to co-occur with other behavioral reactions, such as a flight response or an alteration in diving. However, respiration rates in and of themselves may be representative of annoyance or an acute stress response. Various studies have shown that respiration rates may either be unaffected or could increase, depending on the species and signal characteristics, again highlighting the importance in understanding species differences in the tolerance of underwater noise when determining the potential for impacts resulting from anthropogenic sound exposure (*e.g.,* Kastelein *et al.,* 2001, 2005, 2006; Gailey *et al.,* 2007).

Avoidance is the displacement of an individual from an area or migration path as a result of the presence of a sound or other stressors, and is one of the most obvious manifestations of disturbance in marine mammals (Richardson *et al.,* 1995). For example, gray whales are known to change direction—deflecting from customary migratory paths—in order to avoid noise from seismic surveys (Malme *et al.,* 1984). Harbor porpoises, Atlantic white-sided dolphins (*Lagenorhynchus actusus*), and minke whales have demonstrated avoidance in response to vessels during line transect surveys (Palka and Hammond, 2001). In addition, beluga whales in the St. Lawrence Estuary in Canada have been reported to increase levels of avoidance with increased boat presence by way of increased dive durations and swim speeds, decreased surfacing intervals, and by bunching together into groups (Blane and Jaakson, 1994). Avoidance may be short-term, with animals returning to the area once the noise has ceased (*e.g.,* Bowles *et al.,* 1994; Goold, 1996; Stone *et al.,* 2000; Morton and Symonds, 2002; Gailey *et al.,* 2007). Longer-term displacement is possible, however, which may lead to changes in abundance or distribution patterns of the affected species in the affected region if habituation to the presence of the sound does not occur (*e.g.,* Blackwell *et al.,* 2004; Bejder *et al.,* 2006; Teilmann *et al.,* 2006).

A flight response is a dramatic change in normal movement to a directed and rapid movement away from the perceived location of a sound source. The flight response differs from other avoidance responses in the intensity of the response (*e.g.,* directed movement, rate of travel). Relatively little information on flight responses of marine mammals to anthropogenic signals exist, although observations of flight responses to the presence of predators have occurred (Connor and Heithaus, 1996; Bowers *et al.,* 2018). The result of a flight response could range from brief, temporary exertion and displacement from the area where the signal provokes flight to, in extreme cases, marine mammal strandings (England *et al.,* 2001). However, it should be noted that response to a perceived predator does not necessarily invoke flight (Ford and Reeves, 2008), and whether individuals are solitary or in groups may influence the response.

Behavioral disturbance can also impact marine mammals in more subtle ways. Increased vigilance may result in costs related to diversion of focus and attention (*i.e.,* when a response consists of increased vigilance, it may come at the cost of decreased attention to other critical behaviors such as foraging or resting). These effects have generally not been demonstrated for marine mammals, but studies involving fishes and terrestrial animals have shown that increased vigilance may substantially reduce feeding rates (*e.g.,* Beauchamp and Livoreil, 1997; Fritz *et al.,* 2002; Purser and Radford, 2011). In addition, chronic disturbance can cause population declines through reduction of fitness (*e.g.,* decline in body condition) and subsequent reduction in reproductive success, survival, or both (*e.g.,* Harrington and Veitch, 1992; Daan *et al.,* 1996; Bradshaw *et al.,* 1998). However, Ridgway *et al.* (2006) reported that increased vigilance in bottlenose dolphins exposed to sound over a 5-day period did not cause any sleep deprivation or stress effects.

Many animals perform vital functions, such as feeding, resting, traveling, and socializing, on a diel cycle (24-hour cycle). Disruption of such functions resulting from reactions to stressors such as sound exposure are more likely to be significant if they last more than one diel cycle or recur on subsequent days (Southall *et al.,* 2007). Consequently, a behavioral response lasting less than 1 day and not recurring on subsequent days is not considered particularly severe unless it could directly affect reproduction or survival (Southall *et al.,* 2007). Note that there is a difference between multi-day substantive (*i.e.,* meaningful) behavioral reactions and multi-day anthropogenic activities. For example, just because an activity lasts for multiple days does not necessarily mean that individual animals are either exposed to activity-related stressors for multiple days or, further, exposed in a manner resulting in sustained multi-day substantive behavioral responses.

Stress responses. An animal's perception of a threat may be sufficient to trigger stress responses consisting of some combination of behavioral responses, autonomic nervous system responses, neuroendocrine responses, or immune responses (*e.g.,* Selye, 1950; Moberg, 2000). In many cases, an animal's first and sometimes most economical (in terms of energetic costs) response is behavioral avoidance of the potential stressor. Autonomic nervous system responses to stress typically involve changes in heart rate, blood pressure, and gastrointestinal activity. These responses have a relatively short duration and may or may not have a significant long-term effect on an animal's fitness.

Neuroendocrine stress responses often involve the hypothalamus-pituitary-adrenal system. Virtually all neuroendocrine functions that are affected by stress—including immune competence, reproduction, metabolism, and behavior—are regulated by pituitary hormones. Stress-induced changes in the secretion of pituitary hormones have been implicated in failed reproduction, altered metabolism, reduced immune competence, and behavioral disturbance (*e.g.,* Moberg, 1987; Blecha, 2000). Increases in the circulation of glucocorticoids are also equated with stress (Romano *et al.,* 2004).

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

Relationships between these physiological mechanisms, animal behavior, and the costs of stress responses are well-studied through controlled experiments and for both laboratory and free-ranging animals (*e.g.,* Holberton *et al.,* 1996; Hood *et al.,* 1998; Jessop *et al.,* 2003; Krausman *et al.,* 2004; Lankford *et al.,* 2005). Stress responses due to exposure to anthropogenic sounds or other stressors and their effects on marine mammals have also been reviewed (Fair and Becker, 2000; Romano *et al.,* 2002b) and, more rarely, studied in wild populations (*e.g.,* Romano *et al.,* 2002a). For example, Rolland *et al.* (2012) found that noise reduction from reduced ship traffic in the Bay of Fundy was associated with decreased stress in North Atlantic right whales. In addition, Lemos *et al.* (2022) observed a correlation between higher levels of fecal glucocorticoid metabolite concentrations (indicative of a stress response) and vessel traffic in gray whales. These and other studies lead to a reasonable expectation that some marine mammals will experience physiological stress responses upon exposure to acoustic stressors and that it is possible that some of these would be classified as ''distress.'' In addition, any animal experiencing TTS would likely also experience stress responses (NRC, 2005), however distress is an unlikely result of this project based on observations of marine mammals during previous, similar construction projects.

Norman (2011) reviewed environmental and anthropogenic stressors for CIBWs. Lyamin *et al.* (2011) determined that the heart rate of a beluga whale increases in response to noise, depending on the frequency and intensity. Acceleration of heart rate in the beluga whale is the first component of the ''acoustic startle response.'' Romano *et al.* (2004) demonstrated that captive beluga whales exposed to high-level impulsive sounds (*i.e.,* seismic airgun and/or single pure tones up to 201 dB RMS) resembling sonar pings showed increased stress hormone levels of norepinephrine, epinephrine, and dopamine when TTS was reached. Thomas *et al.* (1990) exposed beluga whales to playbacks of an oil-drilling platform in operation (''Sedco 708,'' 40 Hz–20 kHz; source level 153 dB). Ambient SPL at ambient conditions in the pool before playbacks was 106 dB and 134 to 137 dB RMS during playbacks at the monitoring hydrophone across the pool. All cell and platelet counts and 21 different blood chemicals, including epinephrine and norepinephrine, were within normal limits throughout baseline and playback periods, and stress response hormone levels did not increase immediately after playbacks. The difference between the Romano *et al.* (2004) and Thomas *et al.* (1990) studies could be the differences in the type of sound (seismic airgun and/or tone versus oil drilling), the intensity and duration of the sound, the individual's response, and the surrounding circumstances of the individual's environment. The sounds in the Thomas *et al.* (1990) study would be more similar to those anticipated by Hilcorp's tugs under load with a jack-up rig; therefore, no more than short-term, low-hormone stress responses, if any, of CIBWs or other marine mammals are expected as a result of exposure to noise during tugs under load with a jack-up rig during Hilcorp's planned activities.

Auditory Masking. Since many marine mammals rely on sound to find prey, moderate social interactions, and facilitate mating (Tyack, 2008), noise from anthropogenic sound sources can interfere with these functions, but only if the noise spectrum overlaps with the hearing sensitivity of the receiving marine mammal (Southall *et al.,* 2007; Clark *et al.,* 2009; Hatch *et al.,* 2012). Chronic exposure to excessive, though not high-intensity, noise could cause masking at particular frequencies for marine mammals that utilize sound for vital biological functions (Clark *et al.,* 2009). Acoustic masking is when other noises such as from human sources interfere with an animal's ability to detect, recognize, or discriminate between acoustic signals of interest (*e.g.,* those used for intraspecific communication and social interactions, prey detection, predator avoidance, navigation) (Richardson *et al.,* 1995; Erbe *et al.,* 2016). Therefore, under certain circumstances, marine mammals whose acoustical sensors or environment are being severely masked could also be impaired from maximizing their performance fitness for survival and reproduction. The ability of a noise source to mask biologically important sounds depends on the characteristics of both the noise source and the signal of interest (*e.g.,* signal-to-noise ratio, temporal variability, direction), in relation to each other and to an animal's hearing abilities (*e.g.,* sensitivity, frequency range, critical ratios, frequency discrimination, directional discrimination, age or TTS hearing loss), and existing ambient noise and propagation conditions (Hotchkin and Parks, 2013).

Marine mammals vocalize for different purposes and across multiple modes, such as whistling, echolocation click production, calling, and singing. Changes in vocalization behavior in response to anthropogenic noise can occur for any of these modes and may result from a need to compete with an increase in background noise or may reflect increased vigilance or a startle response. For example, in the presence of potentially masking signals, humpback whales and killer whales have been observed to increase the length of their songs (Miller *et al.,* 2000; Fristrup *et al.,* 2003) or vocalizations (Foote *et al.,* 2004), respectively, while North Atlantic right whales (*Eubalaena glacialis*) have been observed to shift the frequency content of their calls upward while reducing the rate of calling in areas of increased anthropogenic noise (Parks *et al.,* 2007). Fin whales have also been documented lowering the bandwidth, peak frequency, and center frequency of their vocalizations under increased levels of background noise from large vessels (Castellote *et al.* 2012). Other alterations to communication signals have also been observed. For example, gray whales, in response to playback experiments exposing them to vessel noise, have been observed increasing their vocalization rate and producing louder signals at times of increased outboard engine noise (Dahlheim and Castellote, 2016). Alternatively, in some cases, animals may cease sound production during production of aversive signals (Bowles *et al.,* 1994; Wisniewska *et al.,* 2018).

Under certain circumstances, marine mammals experiencing significant masking could also be impaired from maximizing their performance fitness in survival and reproduction. Therefore, when the coincident (masking) sound is human-made, it may be considered harassment when disrupting or altering critical behaviors. It is important to distinguish TTS and PTS, which persist after the sound exposure, from masking, which occurs during the sound exposure. Because masking (without resulting in TS) is not associated with abnormal physiological function, it is not considered a physiological effect, but rather a potential behavioral effect (though not necessarily one that would be associated with harassment).

The frequency range of the potentially masking sound is important in determining any potential behavioral impacts. For example, low-frequency signals may have less effect on high-frequency echolocation sounds produced by odontocetes but are more likely to affect detection of mysticete communication calls and other potentially important natural sounds such as those produced by surf and some prey species. The masking of communication signals by anthropogenic noise may be considered as a reduction in the communication space of animals (*e.g.,* Clark *et al.,* 2009) and may result in energetic or other costs as animals change their vocalization behavior (*e.g.,* Miller *et al.,* 2000; Foote *et al.,* 2004; Parks *et al.,* 2007; Di Iorio and Clark, 2010; Holt *et al.,* 2009). Masking can be reduced in situations where the signal and noise come from different directions (Richardson *et al.,* 1995), through amplitude modulation of the signal, or through other compensatory behaviors (Hotchkin and Parks, 2013).

Marine mammals at or near the proposed project site may be exposed to anthropogenic noise which may be a source of masking. Vocalization changes may result from a need to compete with an increase in background noise and include increasing the source level, modifying the frequency, increasing the call repetition rate of vocalizations, or ceasing to vocalize in the presence of increased noise (Hotchkin and Parks, 2013). For example, in response to vessel noise, CIBWs may shift the frequency of their echolocation clicks and communication signals, reduce their overall calling rates, and or increase the emission of certain call signals to prevent masking by anthropogenic noise (Lesage *et al.* 1999; Tyack, 2000; Eickmeier and Vallarta, 2022).

Masking occurs in the frequency band that the animals utilize, and is more likely to occur in the presence of broadband, relatively continuous noise sources such as tugging. Since noises generated from tugs towing and positioning are mostly concentrated at low frequency ranges, with a small concentration in high frequencies as well, these activities likely have less effect on mid-frequency echolocation sounds by odontocetes (toothed whales) such as CIBWs. However, lower frequency noises are more likely to affect detection of communication calls and other potentially important natural sounds such as surf and prey noise. Low-frequency noise may also affect communication signals when they occur near the frequency band for noise and thus reduce the communication space of animals (*e.g.,* Clark *et al.,* 2009) and cause increased stress levels (*e.g.,* Holt *et al.,* 2009). Unlike TS, masking, which can occur over large temporal and spatial scales, can potentially affect the species at population, community, or even ecosystem levels, in addition to individual levels. Masking affects both senders and receivers of the signals, and at higher levels for longer durations, could have long-term chronic effects on marine mammal species and populations. However, the noise generated by the tugs will not be concentrated in one location or for more than 5 hours per positioning attempt, and up to two positioning attempts at the same site. Thus, while Hilcorp's activities may mask some acoustic signals that are relevant to the daily behavior of marine mammals, the short-term duration and limited areas affected make it very unlikely that the fitness of individual marine mammals would be impacted.

In consideration of the range of potential effects (PTS to behavioral disturbance), we consider the potential exposure scenarios and context in which species would be exposed to tugs under load with a jack-up rig during Hilcorp's planned activities. CIBWs may be present in low numbers during the work; therefore, some individuals may be reasonably expected to be exposed to elevated sound levels However, CIBWs are expected to be transiting through the area, given this work is proposed primarily in middle Cook Inlet (as described in the Description of Marine Mammals in the Area of Specified Activities section), thereby limiting exposure duration, as CIBWs in the area are expected to be headed to or from the concentrated foraging areas farther north near the Beluga River, Susitna Delta, and Knik and Turnigan Arms. Similarly, humpback whales, fin whales, minke whales, gray whales, killer whales, California sea lion, and Steller sea lions are not expected to remain in the area of the tugs. Dall's porpoise, harbor porpoise, and harbor seal have been sighted with more regularity than many other species during oil and gas activities in Cook Inlet but due to the transitory nature of these species, they are unlikely to remain close to a tug under load for the full duration of the noise-producing activity. In fact, during Hilcorp's jack-up rig-based monitoring efforts in 2023, only one Dall's porpoise, two harbor seals, and one harbor porpoise were observed across four different sightings, and observations only lasted 1 to 5 minutes (Horsley and Larson, 2023). Because of this and the relatively low-level sources, the likelihood of PTS and TTS over the course of the tug activities is discountable. Harbor seals may linger or haul-out in the area but they are not known to do so in any large number or for extended periods of time (there are no known major haul-outs or rookeries coinciding with the anticipated transit routes). Here we find there is small potential for TTS over the course of tug activities but again, PTS is not likely due to the nature of tugging. Potential for PTS and TTS due to pile driving is discussed further in the Estimated Take section.

Given most marine mammals are likely transiting through the area, exposure is expected to be brief but the actual presence of the tug and jack-up rig may result in animals shifting pathways around the work site (*e.g.,* avoidance), increasing speed or dive times, changing their group formations, or altering their acoustic signals. The likelihood of no more than a short-term, localized disturbance response is supported by data from Hilcorp's previous jack-up rig-based monitoring efforts in 2023, which reported no observable reactions to the towing activities outside of two harbor seals diving. Further other data indicate CIBWs and other marine mammals regularly pass by industrialized areas such as the POA (61N Environmental, 2021, 2022a, 2022b, 2022c; Easley-Appleyard and Leonard, 2022); therefore, we do not expect abandonment of their transiting route or other disruptions of their behavioral patterns. We also anticipate some animals may respond with such mild reactions to the project that the response would not be detectable. For example, during low levels of tug power output (*e.g.,* while tugs may be operating at low power because of favorable conditions), the animals may be able to hear the work but any resulting reactions, if any, are not expected to rise to the level of take.

While in some cases marine mammals have exhibited little to no obviously detectable response to certain common or routine industrialized activity (Cornick *et al.,* 2011; Horley and Larson, 2023), it is possible some animals may at times be exposed to received levels of sound above the Level B harassment threshold. This potential exposure in combination with the nature of the tug and jack-up rig configuration (*e.g.,* difficult to maneuver, potential need to operate at night) means it is possible that take by Level B harassment could occur over the total estimated period of activities; therefore, NMFS in response to Hilcorp's IHA application proposes to authorize take by Level B harassment from Hilcorp's use of tugs towing a jack-up rig for both positioning and straight-line tug activities.

Potential Effects on Marine Mammal Habitat

Hilcorp's proposed activities could have localized, temporary impacts on marine mammal habitat, including prey, by increasing in-water sound pressure levels. Increased noise levels may affect acoustic habitat and adversely affect marine mammal prey in the vicinity of the project areas (see discussion below). Elevated levels of underwater noise would ensonify the project areas where both fishes and mammals occur and could affect foraging success. Additionally, marine mammals may avoid the area during rig towing, holding, and or positioning; however, displacement due to noise is expected to be temporary and is not expected to result in long-term effects to the individuals or populations.

The total area likely impacted by Hilcorp's activities is relatively small compared to the available habitat in Cook Inlet. Avoidance by potential prey (*i.e.,* fish) of the immediate area due to increased noise is possible. The duration of fish and marine mammal avoidance of this area after tugging stops is unknown, but a rapid return to normal recruitment, distribution, and behavior is anticipated. Any behavioral avoidance by fish or marine mammals of the disturbed area would still leave significantly large areas of fish and marine mammal foraging habitat in the nearby vicinity. Increased turbidity near the seafloor is not anticipated

Potential Effects on Prey. Sound may affect marine mammals through impacts on the abundance, behavior, or distribution of prey species (*e.g.,* crustaceans, cephalopods, fishes, zooplankton). Marine mammal prey varies by species, season, and location and, for some, is not well documented. Studies regarding the effects of noise on known marine mammal prey are described here.

Fishes utilize the soundscape and components of sound in their environment to perform important functions such as foraging, predator avoidance, mating, and spawning (*e.g.,* Zelick *et al.,* 1999; Fay, 2009). Depending on their hearing anatomy and peripheral sensory structures, which vary among species, fishes hear sounds using pressure and particle motion sensitivity capabilities and detect the motion of surrounding water (Fay *et al.,* 2008). The potential effects of noise on fishes depends on the overlapping frequency range, distance from the sound source, water depth of exposure, and species-specific hearing sensitivity, anatomy, and physiology. Reactions also depend on the physiological state of the fish, past exposures, motivation (*e.g.,* feeding, spawning, migration), and other environmental factors.

Fish react to sounds that are especially strong and/or intermittent low-frequency sounds, and behavioral responses such as flight or avoidance are the most likely effects. Short duration, sharp sounds can cause overt or subtle changes in fish behavior and local distribution. SPLs of sufficient strength have been known to cause injury to fishes and fish mortality (summarized in Popper *et al.,* 2014). However, in most fish species, hair cells in the ear continuously regenerate and loss of auditory function likely is restored when damaged cells are replaced with new cells. Halvorsen *et al.* (2012) showed that a TTS of 4 to 6 dB was recoverable within 24 hours for one species. Impacts would be most severe when the individual fish is close to the source and when the duration of exposure is long. Injury caused by barotrauma can range from slight to severe and can cause death, and is most likely for fish with swim bladders.

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). The tugs used during the specified activity could be expected to produce levels in this range when in transit. Based upon the reports in the literature and the predicted sound levels from these vessels, 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 the specified activity.

Zooplankton is a food source for several marine mammal species, as well as a food source for fish that are then preyed upon by marine mammals. Population effects on zooplankton could have indirect effects on marine mammals. Data are limited on the effects of underwater sound on zooplankton species, particularly sound from ship traffic and construction (Erbe *et al.,* 2019). Popper and Hastings (2009) reviewed information on the effects of human-generated sound and concluded that no substantive data are available on whether the sound levels from pile driving, seismic activity, or any human-made sound would have physiological effects on invertebrates. Any such effects would be limited to the area very near (1 to 5 m) the sound source and would result in no population effects because of the relatively small area affected at any one time and the reproductive strategy of most zooplankton species (short generation, high fecundity, and very high natural mortality). No adverse impact on zooplankton populations is expected to occur from the specified activity due in part to large reproductive capacities and naturally high levels of predation and mortality of these populations. Any mortalities or impacts that might occur would be negligible.

In summary, given the relatively small areas being affected, as well as the temporary and mostly transitory nature of the tugging, any adverse effects from Hilcorp's activities on any prey habitat or prey populations are expected to be minor and temporary. The most likely impact to fishes at the project site would be temporary avoidance of the area. Any behavioral avoidance by fish of the disturbed area would still leave significantly large areas of fish and marine mammal foraging habitat in the nearby vicinity. Thus, we preliminarily conclude that impacts of the specified activities are not likely to have more than short-term adverse effects on any prey habitat or populations of prey species. Further, any impacts to marine mammal habitat are not expected to result in significant or long-term consequences for individual marine mammals, or to contribute to adverse impacts on their populations.

Estimated Take of Marine Mammals

This section provides an estimate of the number of incidental takes proposed for authorization through the IHA, which will inform NMFS' consideration of ''small numbers,'' the negligible impact determinations, and impacts on subsistence uses.

Harassment is the only type of take expected to result from these activities. Except with respect to certain activities not pertinent here, section 3(18) of the MMPA defines ''harassment'' as any act of pursuit, torment, or annoyance, which (i) has the potential to injure a marine mammal or marine mammal stock in the wild (Level A harassment); or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering (Level B harassment).

Authorized takes would be by Level B harassment only, in the form of behavioral reactions and or TTS for individual marine mammals resulting from exposure to Hilcorp's acoustic sources (*i.e.,* tugs towing, holding, and positioning). Based on the nature of the activity, Level A harassment is neither anticipated nor proposed to be authorized.

As described previously, no serious injury or mortality is anticipated or proposed to be authorized for this activity. Below we describe how the proposed take numbers are estimated.

For acoustic impacts, generally speaking, we estimate take by considering: (1) acoustic thresholds above which NMFS believes the best available science indicates marine mammals will be behaviorally harassed or incur some degree of permanent hearing impairment; (2) the area or volume of water that will be ensonified above these levels in a day; (3) the density or occurrence of marine mammals within these ensonified areas; and, (4) the number of days of activities. We note that while these factors can contribute to a basic calculation to provide an initial prediction of potential takes, additional information that can qualitatively inform take estimates is also sometimes available (*e.g.,* previous monitoring results or average group size). Below, we describe the factors considered here in more detail and present the proposed take estimates.

Acoustic Thresholds

NMFS recommends the use of acoustic thresholds that identify the received level of underwater sound above which exposed marine mammals would be reasonably expected to be behaviorally harassed (equated to Level B harassment) or to incur PTS of some degree (equated to Level A harassment).

Level B Harassment—Though significantly driven by received level, the onset of behavioral disturbance from anthropogenic noise exposure is also informed to varying degrees by other factors related to the source or exposure context (*e.g.,* frequency, predictability, duty cycle, duration of the exposure, signal-to-noise ratio, distance to the source), the environment (*e.g.,* bathymetry, other noises in the area, predators in the area), and the receiving animals (hearing, motivation, experience, demography, life stage, depth) and can be difficult to predict (*e.g.,* Richardson *et al.,* 1995; Southall *et al.* 2007, 2021, Ellison *et al.* 2012). Based on what the available science indicates and the practical need to use a threshold based on a metric that is both predictable and measurable for most activities, NMFS typically uses a generalized acoustic threshold based on received level to estimate the onset of behavioral harassment (*i.e.,* Level B harassment). NMFS generally predicts that marine mammals are likely to be behaviorally disturbed in a manner considered to be Level B harassment when exposed to underwater anthropogenic noise above root-mean-squared pressure received levels (RMS SPL) of 120 dB (referenced to 1 micropascal (re 1 μPa)) for continuous (*e.g.,* tugging, vibratory pile driving, drilling) and above RMS SPL 160 dB re 1 μPa for non-explosive impulsive (*e.g.,* seismic airguns) or intermittent (*e.g.,* scientific sonar) sources. Generally speaking, Level B harassment take estimates based on these thresholds are expected to include any likely takes by TTS as, in most cases, the likelihood of TTS occurs at distances from the source smaller than those at which behavioral harassment is likely. TTS of a sufficient degree can manifest as behavioral harassment, as reduced hearing sensitivity and the potential reduced opportunities to detect important signals (conspecific communication, predators, prey) may result in changes in behavior patterns that would not otherwise occur.

Hilcorp's proposed activity includes the use of continuous sources (tugs towing, holding, and positioning a jack-up rig), and therefore the RMS SPL threshold of 120 is applicable.

Level A harassment—NMFS' Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0) (Technical Guidance, 2018) identifies dual criteria to assess auditory injury (Level A harassment) to five different marine mammal groups (based on hearing sensitivity) as a result of exposure to noise from two different types of sources (impulsive or non-impulsive). Hilcorp's proposed activity includes the use of non-impulsive sources (*i.e.,* tugs towing, holding, and positioning a jack-up rig).

These thresholds are provided in table 4 below. The references, analysis, and methodology used in the development of the thresholds are described in NMFS' 2018 Technical Guidance, which may be accessed at: *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-acoustic-technical-guidance.*

TABLE 4—THRESHOLDS IDENTIFYING THE ONSET OF PERMANENT THRESHOLD SHIFT

Hearing group	PTS onset acoustic thresholds * (received level)	
	Impulsive	Non-impulsive
Low-Frequency (LF) Cetaceans	*Cell 1:* $L_{pk,flat}$: 219 dB; $L_{E,LF,24h}$: 183 dB	*Cell 2:* $L_{E,LF,24h}$: 199 dB.

TABLE 4—THRESHOLDS IDENTIFYING THE ONSET OF PERMANENT THRESHOLD SHIFT—Continued

Hearing group	PTS onset acoustic thresholds * (received level)	
	Impulsive	Non-impulsive
Mid-Frequency (MF) Cetaceans	*Cell 3:* $L_{pk,flat}$: 230 dB; $L_{E,MF,24h}$: 185 dB	*Cell 4:* $L_{E,MF,24h}$: 198 dB.
High-Frequency (HF) Cetaceans	*Cell 5:* $L_{pk,flat}$: 202 dB; $L_{E,HF,24h}$: 155 dB	*Cell 6:* $L_{E,HF,24h}$: 173 dB.
Phocid Pinnipeds (PW) (Underwater)	*Cell 7:* $L_{pk,flat}$: 218 dB; $L_{E,PW,24h}$: 185 dB	*Cell 8:* $L_{E,PW,24h}$: 201 dB.
Otariid Pinnipeds (OW) (Underwater)	*Cell 9:* $L_{pk,flat}$: 232 dB; $L_{E,OW,24h}$: 203 dB	*Cell 10:* $L_{E,OW,24h}$: 219 dB.

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

Note: Peak sound pressure (L_{pk}) has a reference value of 1 µPa, and cumulative sound exposure level (L_E) has a reference value of 1µPa²s. In this table, thresholds are abbreviated to reflect American National Standards Institute standards (ANSI, 2013). However, peak sound pressure is defined by ANSI as incorporating frequency weighting, which is not the intent for this Technical Guidance. Hence, the subscript "flat" is being included to indicate peak sound pressure should be flat weighted or unweighted within the generalized hearing range. The subscript associated with cumulative sound exposure level thresholds indicates the designated marine mammal auditory weighting function (LF, MF, and HF cetaceans, and PW and OW pinnipeds) and that the recommended accumulation period is 24 hours. The cumulative sound exposure level thresholds could be exceeded in a multitude of ways (*i.e.,* varying exposure levels and durations, duty cycle). When possible, it is valuable for action proponents to indicate the conditions under which these acoustic thresholds will be exceeded.

Ensonified Area

Here, we describe operational and environmental parameters of the activity that are used in estimating the area ensonified above the acoustic thresholds, including source levels and transmission loss coefficient.

The sound field in the project area is the existing background noise plus additional noise resulting from tugs under load with a jack-up rig. Marine mammals are expected to be affected via sound generated by the primary components of the project (*i.e.,* tugs towing, holding, and positioning a jack-up rig). Calculation of the area ensonified by the proposed action is dependent on the background sound levels at the project site, the source levels of the proposed activities, and the estimated transmission loss coefficients for the proposed activities at the site. These factors are addressed below.

Sound Source Levels of Proposed Activities. The project includes 3 to 4 tugs under load with a jack-up rig. Hilcorp conducted a literature review of underwater sound emissions of tugs under various loading efforts. The sound source levels for tugs of various horsepower (2,000 to 8,200) under load can range from approximately 164 dB RMS to 202 dB RMS. This range largely relates to the level of operational effort, with full power output and higher speeds generating more propeller cavitation and hence greater sound source levels than lower power output and lower speeds. Tugs under tow produce higher source levels than tugs transiting with no load because of the higher power output necessary to pull the load. The amount of power the tugs expend while operating is the best predictor of relative sound source level. Several factors would determine the duration that the tugboats are towing the jack-up rig, including the origin and destination of the towing route (*e.g.,* Rig Tenders Dock, an existing platform) and the tidal conditions. The power output would be variable and influenced by the prevailing wind direction and velocity, the current velocity, and the tidal stage. To the extent feasible, transport would be timed with the tide to minimize towing duration and power output.

Hilcorp's literature review identified no existing data on sound source levels of tugs towing jack-up rigs. Accordingly, for this analysis, Hilcorp considered data from tug-under-load activities, including berthing and towing activities. Austin and Warner (2013) measured 167 dB RMS for tug towing barge activity in Cook Inlet. Blackwell and Greene (2002) reported berthing activities in the POA with a source level of 179 dB RMS. Laurinolli *et al.* (2005) measured a source level of 200 dB RMS for anchor towing activities by a tugboat in the Strait of Juan de Fuca, WA. The Roberts Bank Terminal 2 study (2014) repeated measurements of the same tug operating under different speeds and loading conditions. Broadband measurements from this study ranged from approximately 162 dB RMS up to 200 dB RMS.

The rig manager for Hilcorp, 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 (pers. Comm., Durham, 2021). Transits with the tide (lower power output) are preferred for safety reasons, and effort is made to reduce or eliminate traveling against the tide (higher power output). The Roberts Bank Terminal 2 study (2014) allowed for a comparison of source levels from the same vessel (Seaspan Resolution tug) at half power versus full power. Seaspan Resolution's half-power (*i.e.,* 50 percent) berthing scenario had a sound source level of 180 dB RMS. In addition, the Roberts Bank Terminal 2 Study (2014) reported a mean tug source level of 179.3 dB RMS from 650 tug transits under varying load and speed conditions.

The 50 percent (or less) power output scenario occurs during the vast majority of tug towing jack-up rig activity, as described in the *Detailed Description of the Specific Activity* section. Therefore, based on Hilcorp's literature review, a source level of 180 dB RMS was found to be an appropriate proxy source level for a single tug under load based on the Roberts Bank Terminal 2 study. If all three tugs were operating simultaneously at 180 dB RMS, the overall source emission levels would be expected to increase by approximately 5 dB when logarithmically adding the sources (*i.e.,* to 185 dB RMS). To further support this level as an appropriate proxy, a sound source verification (SSV) study performed by JASCO Applied Sciences (JASCO) in Cook Inlet in October 2021 (Lawrence *et al.,* 2022) measured the sound source level from three tugs pulling a jack-up rig in Cook Inlet at various power outputs. Lawrence *et al.* (2022) reported a source level of 167.3 dB RMS for the 20 percent-power scenario and a source level of 205.9 dB RMS for the 85 percent-power scenario. Assuming a linear scaling of tug power, a source level of 185 dB RMS was calculated as a single point source level for three tugs operating at 50 percent power output. 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 RMS to calculate the Level B harassment estimates for three tugs operating at 50 percent power output. In practice, the load condition of the three tugs is unlikely to be identical at all times, so sound emissions would be dominated by the single tug in the group that is working hardest at any point in time.

Further modeling was done to account for one additional tug working for one hour at 50 percent power during jack-up rig positioning, a stationary activity. This is equivalent in terms of acoustic energy to three tugs operating at 180.0 dB RMS (each of them) for 4 hours, joined by a fourth tug for 1 hour, increasing the source level to 186.0 dB RMS only during the 1-hour period (the logarithmic sum of four tugs working together at 180.0 dB RMS). An SEL of 185.1 dB was used to account for the cumulative sound exposure when calculating Level A harassment by adding a 4th tug operating at 50 percent power for 20 percent of the 5-hour period. This is equivalent in terms of acoustic energy to 3 tugs operating at 185.0 dB for 4 hours, joined by a fourth tug for 1 hour, increasing the source level to 186.0 dB only during the 1-hour period. The use of the 20 percent duty cycle was a computational requirement and, although equal in terms of overall energy and determination of impacts, should not be confused with the actual instantaneous SPL (see section 6.2.1.1 of Hilcorp's application for additional computational details).

In summary, Hilcorp has proposed to use a source level of 185.0 dB RMS to calculate the stationary Level B harassment isopleth where three tugs were under load for 4 hours with a 50 percent power output and a source level of 186.0 dB RMS to calculate the stationary Level B harassment isopleth where four tugs were under load for 1 hour with a 50 percent power output. Further, Hilcorp has proposed to use a source level of 185.1 dB SEL to calculate the stationary Level A harassment isopleths where three tugs were underload for 4 hours and then one tug joined for 1 additional hour. Lastly, Hilcorp proposed to use the 185.0 dB RMS level to model the mobile Level A harassment isopleths for three tugs under load with a 50 percent power output. NMFS concurs that Hilcorp's proposed source levels are appropriate.

Underwater Sound Propagation Modeling. Hilcorp contracted SLR Consulting to model the extent of the Level A and Level B harassment isopleths for tugs under load with a jack-up rig during their proposed activities. Cook Inlet is a particularly complex acoustic environment with strong currents, large tides, variable sea floor and generally changing conditions. Accordingly, Hilcorp applied a more detailed propagation model than the ''practical spreading loss'' approach that uses a factor of 15. The objective of a more detailed propagation calculation 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 was conducted using the dBSea software package. The fluid parabolic equation modeling algorithm was used with 5 Padé terms to calculate the TL between the source and the receiver at low frequencies (⅓-octave bands, 31.5 Hz up to 1 kHz). For higher frequencies (1 kHz up to 8 kHz) the ray tracing model was used with 1,000 reflections for each ray. Sound sources were assumed to be omnidirectional and modeled as points. The received sound levels for the project were calculated as follows: (1) One-third octave source spectral levels were obtained via reference spectral curves with subsequent corrections based on their corresponding overall source levels; (2) 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 modeling path was obtained via interpolation of the bathymetry dataset which has 83 m grid resolution; (4) The one-third octave source levels and transmission loss were combined to obtain the received levels as a function of range, depth, and frequency; and (5) The overall received levels were calculated at a 1-m depth resolution along each propagation path by summing all frequency band spectral levels.

Model Inputs. Bathymetry data used in the model was collected from the NOAA National Centers for Environmental Information (AFSC, 2019). Using NOAA's temperature and salinity data, sound speed profiles were computed for depths from 0 to 100 m for May, July, and October to capture the range of possible sound speed depending on the time of year Hilcorp's work could be conducted. These sound speed profiles were compiled using the Mackenzie Equation (1981) and are presented in table 8 of Hilcorp's application (available at *https://www.fisheries.noaa.gov/action/incidental-take-authorization-hilcorp-alaska-llc-oil-and-gas-activities-cook-inlet-alaska-0*). Geoacoustic parameters were also incorporated into the model. The parameters were based on substrate type and their relation to depth. These parameters are presented in table 9 of Hilcorp's application (available at *https://www.fisheries.noaa.gov/action/incidental-take-authorization-hilcorp-alaska-llc-oil-and-gas-activities-cook-inlet-alaska-0*).

Detailed broadband sound transmission loss modeling in dBSea used the source level of 185 dB RMS calculated in one-third octave band levels (31.5 Hz to 64,000 Hz) for frequency dependent solutions. The frequencies associated with tug sound sources occur within the hearing range of marine mammals in Cook Inlet. Received levels for each hearing marine mammal group based on one-third octave auditory weighting functions were also calculated and integrated into the modeling scenarios of dBSea. For modeling the distances to relevant PTS thresholds, a weighting factor adjustment was not used; instead, the data on the spectrum associated with their source was used and incorporated the full auditory weighting function for each marine mammal hearing group.

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

For acoustic modeling purposes of the stationary Level A harassment 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 Levels A and Level B harassment distances 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 platform in lower Trading Bay, then from the Dolly Varden 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 harassment exposure estimates from mobile tugs towing a jack-up rig. The Level B harassment results were also used to calculate Level B harassment exposure estimates from stationary tugs holding or positioning a jack-up rig, as the mobile route encompassed the stationary modeling points. The locations represent a range of water depths from 18 to 77 m found throughout the project area.

For mobile Level B harassment and stationary Level B harassment with three tugs, 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 (table 5). The result is a mobile and stationary Level B harassment zone of 3,850 m when three tugs are used (table 5). For stationary Level B harassment with four tugs, the average distance to the 120 dB RMS threshold was based on 100 radials at two locations, one in Trading Bay and one in middle Cook Inlet, across seasons (May, July, and October) and represents the average Level B harassment zone for each season and location. The result is a stationary Level B harassment zone of 4,453 m when four tugs are in use (table 6). NMFS concurs that 3,850 m and 4,453 m are appropriate estimates for the extent of the Level B harassment zones for Hilcorp's towing, holding, and positioning activities when using three and four tugs, respectively.

TABLE 5—AVERAGE DISTANCES TO THE LEVEL B HARASSMENT THRESHOLD (120 dB) FOR THREE TUGS TOWING (MOBILE) AND HOLDING AND POSITIONING FOR 4 HOURS (STATIONARY)

Location	Average distance to 120 dB threshold (m)			Season average distance to threshold (m)
	May	July	October	
M1	4,215	3,911	4,352	4,159
M2	3,946	3,841	4,350	4,046
M3	4,156	3,971	4,458	4,195
M4	4,040	3,844	4,364	4,083
M5	4,053	3,676	4,304	4,011
M6	3,716	3,445	3,554	3,572
M7	2,947	2,753	2,898	2,866
M8	3,270	3,008	3,247	3,175
M9	3,567	3,359	3,727	3,551
M10	3,600	3,487	3,691	3,593
M11	3,746	3,579	4,214	3,846
M12	3,815	3,600	3,995	3,803
M13	4,010	3,831	4,338	4,060
M14	3,837	3,647	4,217	3,900
M15	3,966	3,798	4,455	4,073
M16	3,873	3,676	4,504	4,018
M18	5,562	3,893	4,626	4,694
M20	5,044	3,692	4,320	4,352
M22	4,717	3,553	4,067	4,112
M24	4,456	3,384	4,182	4,007
M25	3,842	3,686	4,218	3,915
M26	3,690	3,400	3,801	3,630
M27	3,707	3,497	3,711	3,638
M28	3,546	3,271	3,480	3,432
M29	3,618	3,279	3,646	3,514
Average	3,958	3,563	4,029	3,850

TABLE 6—AVERAGE DISTANCES TO THE LEVEL B HARASSMENT THRESHOLD (120 dB) FOR FOUR TUGS POSITIONING (STATIONARY) FOR 1 HOUR

Location	Average distance to Level B harassment threshold (m)			Season average distance to threshold (m)
	May	July	October	
Trading Bay	4,610	3,850	4,810	4,423
Middle CI	4,820	4,130	4,500	4,483
Average	4,715	3,990	4,655	4,453

The average Level A harassment distances for the stationary, four tug scenario were calculated assuming a SEL of 185.1 dB for a 5-hour exposure duration (table 7). For the mobile, three tug scenario, the average Level A harassment distances were calculated assuming a SEL of 185.0 dB with an 18-second exposure period (table 8). This 18-second exposure was derived using the standard TL equation (Source Level − TL = Received Level) for determining threshold distance (R [m]), where TL = 15Log10. In this case, the equation was 185.0 dB − 15Log10 = 173 dB. Solving for threshold distance (R) yields a distance of approximately 6 m, which was then used as the preliminary ensonified radius to determine the duration of time it would take for the ensonified area of the sound source traveling at a speed of 2.06 m/s (4 knots) to pass a marine mammal. The duration (twice the radius divided by speed of the source) that the ensonified area of a single tug would take to pass a marine mammal under these conditions is 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 7—AVERAGE DISTANCES TO THE LEVEL A HARASSMENT THRESHOLDS FOR FOUR STATIONARY TUGS UNDER LOAD WITH A JACK-UP RIG FOR 5 HOURS

Location	Season	Average distance (m) to Level A harassment threshold by functional hearing group				
		LF	MF	HF	PW	OW [1]
Trading Bay	May	107	77	792	64	
Trading Bay	July	132	80	758	66	
Trading Bay	October	105	75	784	79	
Middle Cook Inlet	May	86	85	712	78	
Middle Cook Inlet	July	95	89	718	80	
Middle Cook Inlet	October	82	86	730	80	
Average		102	82	749	75	0

[1] The Level A harassment distances are smaller than the footprint of the tugs.

TABLE 8—AVERAGE DISTANCES TO THE LEVEL A HARASSMENT THRESHOLDS FOR THREE MOBILE TUGS UNDER LOAD WITH A JACK-UP RIG ASSUMING A 18-SECOND EXPOSURE DURATION

Location	Season	Average distance (m) to Level A threshold by functional hearing group				
		LF [1]	MF [1]	HF	PW [1]	OW [1]
M2	May			10		
M2	July			5		
M2	October			10		
M11	May			10		
M11	July			5		
M11	October			10		
M22	May			10		
M22	July			5		
M22	October			10		
Average		0	0	8	0	0

[1] The Level A harassment distances are smaller than the footprint of the tugs.

Tugs are anticipated to be towing the jack-up rig between platforms and considered a mobile sound source for 6 hours in a single day per jack-up rig move. Tugs are anticipated to be towing the jack-up rig and considered a mobile source during demobilization and mobilization to/from Rig Tenders Dock in Nikiski for 9 hours. One jack-up rig move between platforms is planned during the IHA period. Tugs are anticipated to be holding or positioning the jack-up rig at the platforms or Rig Tenders Dock during demobilization and mobilization and are considered a stationary sound source for 5 hours in the first day and 5 hours 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; three total pinning events are anticipated during the IHA period for production drilling.

The ensonified area for a location-to-location transport for production drilling represents a rig move between two production platforms in middle Cook Inlet and/or Trading Bay and includes 6 mobile hours over an average distance of 16.77 km in a single day and 5 stationary hours on the first day and 5 stationary hours on a second day. The 5 stationary hours are further broken into 4 hours with three tugs under load and 1 hour with four tugs under load. One location-to-location jack-up rig move is planned for the IHA period.

The ensonified area for production drilling demobilization and mobilization represents a rig move from a production platform in middle Cook Inlet to Rig Tenders Dock in Nikiski and reverse for mobilization and includes 9 mobile hours over a distance of up to 64.34 km in a single day and 5 stationary hours on the first day and 5 stationary hours on a second day, which are further broken into the same three tugs working for 4 hours and four tugs working for 1 hour as mentioned above. A summary of the estimated Level A and Level B harassment distances and areas for the various tugging scenarios if provided in table 9.

TABLE 9—AVERAGE DISTANCES AND AREAS TO THE ESTIMATED LEVEL A AND BEVEL B HARASSMENT THRESHOLDS FOR THE VARIOUS TUGGING SCENARIOS

Activity	Level A harassment distance (m)/area (km²)					Level B harassment distance (m)/area (km²)
	LF	MF	HF	PW	OW	
Demobilization/Mobilization						
3 Tugs Towing a Jack-Up Rig—Mobile	[1]	[1]	8/1.07	[1]	[1]	3,850/541.96
3 Tugs Towing a Jack-Up Rig—Stationary for up to 4 hours	102/0.03	82/0.02	749/1.76	75/0.02	[1]	3,850/46.56
4 Tugs Towing a Jack-Up Rig—Stationary for up to 1 hour	102/0.03	82/0.02	749/1.76	75/0.02	[1]	4,453/62.30
Location-to-Location						
3 Tugs Towing a Jack-Up Rig—Mobile	[1]	[1]	8/0.28	[1]	[1]	3,850/175.6
3 Tugs Towing a Jack-Up Rig—Stationary for up to 4 hours	102/0.03	82/0.02	749/1.76	75/0.02	[1]	3,850/46.56
4 Tugs Towing a Jack-Up Rig—Stationary for up to 1 hour	102/0.03	82/0.02	749/1.76	75/0.02	[1]	4,453/62.30

[1] The Level A harassment distances are smaller than the footprint of the tugs.

Marine Mammal Occurrence

In this section we provide information about the occurrence of marine mammals, including density or other relevant information which will inform the take calculations.

Densities for marine mammals in Cook Inlet were derived from NMFS' Marine Mammal Laboratory (MML) aerial surveys, typically flown in June, from 2000 to 2022 (Rugh *et al.,* 2005; Shelden *et al.,* 2013, 2015b, 2017, 2019, 2022; Goetz, *et al.* 2023). While the surveys are concentrated for a few days in summer annually, which may skew densities for seasonally present species, they represent the best available long-term dataset of marine mammal sightings available in Cook Inlet. Density was calculated by summing the total number of animals observed and dividing the number sighted by the area surveyed. The total number of animals observed accounts for both lower and upper Cook Inlet. There are no density estimates available for California sea lions and Pacific white-sided dolphins in Cook Inlet, as they were so infrequently sighted. Average densities across survey years are presented in table 10.

TABLE 10—AVERAGE DENSITIES OF MARINE MAMMAL SPECIES IN COOK INLET

Species	Density (individuals per km²)
Humpback whale	0.00185
Minke whale	0.00004
Gray whale	0.00007
Fin whale	0.00028
Killer whale	0.00061
Beluga whale (MML—Entire Cook Inlet)	0.07166
Beluga whale (MML—Middle Cook Inlet)	0.00658
Beluga whale (MML—Lower Cook Inlet)	0.00003
Beluga whale (Goetz—North Cook Inlet)	0.00166
Beluga whale (Goetz—Lower Cook Inlet)	0.00000
Beluga whale (Goetz—Trading Bay)	0.01505
Dall's porpoise	0.00014
Harbor porpoise	0.00380
Pacific white-sided dolphin	N/A[1]
Harbor seal	0.26819
Steller sea lion	0.00669
California sea lion	N/A [1]

[1] Density estimates are not available in Cook Inlet for this species.

For CIBWs, two densities were considered as a comparison of available data. The first source considered was directly from the MML aerial surveys, as described above. Sighting data collected during aerial surveys was collected and then several correction factors were applied to address perception, availability, and proximity bias. These corrected sightings totals were then divided by the total area covered during the survey to arrive at a density value. Densities were derived for the entirety of Cook Inlet as well as for middle and lower Cook Inlet. Densities across all three regions are low and there is a known effect of seasonality on the distribution of the whales. Thus, densities derived directly from surveys flown in the summer might underestimate the density of CIBWs in lower Cook Inlet at other ice-free times of the year.

The other mechanism for arriving at CIBW density considered here is the Goetz *et al.* (2012a) habitat-based model. This model is derived from sightings and incorporates depth soundings, coastal substrate type, environmental sensitivity index, anthropogenic disturbance, and anadromous fish streams to predict densities throughout Cook Inlet. The output of this model is a density map of Cook Inlet, which predicts spatially explicit density estimates for CIBW. Using the resulting grid densities, average densities were calculated for two regions applicable to Hilcorp's operations (table 10). The densities 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 provided in table 10 above and were carried forward to the exposure estimates as they were deemed to likely be the most representative estimates available. Likewise, when a range is given, the higher end of the range was used out of caution to calculate exposure estimates (*i.e.,* Trading Bay in the Goetz model has a range of 0.004453 to 0.015053; 0.015053 was used for the exposure estimates).

Take Estimation

Here we describe how the information provided above is synthesized to produce a quantitative estimate of the take that is reasonably likely to occur and proposed for authorization.

As described above, Hilcorp's tug towing rig activity considers a total of three rig moves across 6 days (one 2-day location-to-location jack-up rig move, one 2-day demobilization effort, and one 2-day mobilization effort). For the location-to-location move, Hilcorp assumed 6 hours of mobile (towing) and 5 hours of stationary (holding and positioning) activities on the first day, and 5 hours of the stationary activity (4 hours with three tugs and 1 hour with four tugs) on the second day to account for two positioning attempts (across 2 days). For the demobilization and mobilization efforts, Hilcorp assumed 9 hours of mobile and 5 hours of stationary (4 hours with three tugs and 1 hour with four tugs) activities on the first day, and 5 hours of stationary (4 hours with three tugs and 1 hour with four tugs) activities on the second day (across 2 days for each effort, for a total of 4 days of tugs under load with a jack-up rigs).

Take by Level A harassment was estimated by multiplying the ensonified Level A harassment areas per tugging activity scenario for each functional hearing group (table 9) by the estimated marine mammal densities (table 10) to get an estimate of exposures per day. This value was then multiplied by the number of days per move and the number of moves of that type of activity scenario. The estimated exposures by activity scenario were then summed to result in a number of exposures for all tug towing rig activity. Based on this analysis, only Dall's porpoise, harbor porpoise, and harbor seals had estimated take by Level A harassment that were greater than zero: 0.001, 0.018, and 0.006, respectively. Given these small estimates, NMFS does not propose to authorize take by Level A harassment related to Hilcorp's tugging activity. For mobile tugging, the distances to the PTS thresholds for HF cetaceans and phocids are smaller than the overall size of the tug and rig configuration (*i.e.,* 8 m and 0 m, respectively), making it unlikely an animal would remain close enough to the tug engines to incur PTS. For stationary positioning of the jack up rig, the PTS isopleths for both the 3-tug and 4-tug scenarios are up to 749 m for HF cetaceans and up to 102 m for all other species, but calculated on the assumption that an animal would remain within several hundred meters of the jack-up rig for the full 5 hours of noise-producing activity. Given the location of the activity is not in an area known to be essential habitat for any marine mammal species with extreme site fidelity over the course of 2 days, in addition to the mobile nature of marine mammals, the occurrence of PTS is unlikely and thus not proposed to be authorized for any species.

The ensonified Level B harassment areas calculated per activity scenario (three tug stationary, four tug stationary, and three tug mobile for the location-to-location move and the demobilization and mobilization efforts) for a single day (see table 9) were multiplied by marine mammal densities to get an estimate of exposures per day. This was then multiplied by the number of days per move and the number of moves of that type of activity scenario to arrive at the number of estimated exposures per activity type. These exposures by activity scenario were then summed to result in a number of exposures per year for all Hilcorp's proposed tug under load activities (table 11). As exposure estimates were calculated based on specific potential rig moves or well locations, the density value for CIBWs that was carried through the estimate was the higher density value for that particular location (table 10). There are no estimated exposures based on this method of calculation for California sea lions and pacific white-sided dolphins because the assumed density of these species in the project area is 0.00 animals per km². Table 11 also indicates the number of takes, by Level B harassment, proposed to be authorized. For species where the total calculated take by Level B harassment is less than the estimated group size for that species, NMFS adjusted the take proposed for authorization to the anticipated group size. Explanations for species for which take proposed for authorization is greater than the calculated take are included below.

TABLE 11—AMOUNT OF ESTIMATED AND PROPOSED TAKE BY LEVEL B HARASSMENT, BY SPECIES AND STOCK FOR HILCORP'S TUG TOWING, HOLDING, AND POSITIONING OF A JACK-UP RIG ACTIVITIES

Scenario	Location-to-location			Demobilization/mobilization			Total estimated take by level B harassment	Proposed Take by Level B Harassment
	3 Mobile Tugs	3 Stationary Tugs	4 Stationary Tugs	3 Mobile Tugs	3 Stationary Tugs	4 Stationary Tugs		
Level B Harassment Area (km²)	175.67	46.56	62.30	541.96	46.56	62.30		
Species	Estimated Take by Level B Harassment							
Humpback whale	0.324	0.029	0.010	2.001	0.057	0.019	2.440	3
Minke whale	0.005	0.000	0.000	0.031	0.001	0.000	0.037	3
Gray whale	0.012	0.001	0.000	0.072	0.002	0.001	0.088	3
Fin whale	0.048	0.004	0.001	0.299	0.009	0.003	0.364	2
Killer whale	0.108	0.009	0.003	0.663	0.019	0.006	0.808	10
Beluga whale	1.900	0.168	0.056	7.133	0.204	0.068	9.529	15
Dall's porpoise	0.024	0.002	0.001	0.148	0.004	0.001	0.180	6
Harbor porpoise	0.667	0.059	0.020	4.117	0.118	0.039	5.020	12
Pacific white-sided dolphin	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3
Harbor seal	47.112	4.163	1.392	290.699	8.325	2.785	354.476	355
Steller sea lion	1.175	0.104	0.035	7.253	0.208	0.069	8.844	9
California sea lion	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2

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 1 to 3 individuals (Shelden *et al.,* 2013). Three humpback whales were observed in Cook Inlet during SAExploration's seismic study in 2015: two near the Forelands and one in Kachemak Bay (Kendall and Cornick, 2015). In total, 14 sightings of 38 humpback whales (ranging in group size from 1 to 14) were recorded in the 2019 Hilcorp lower Cook Inlet seismic survey in the fall (Fairweather Science, 2020). Two sightings totaling three individual humpback whales were recorded near Ladd Landing north of the Forelands on the recent Harvest Alaska CIPL Extension Project (Sitkiewicz *et al.,* 2018). Based on documented observations from the CIPL Extension Project, which is the data closest to the specific geographic region, NMFS is proposing to authorize, three takes by Level B harassment for humpback whales, which is slightly greater than the take estimated using the methods described above (0.2440 takes by Level B harassment, table 11).

Minke whales usually travel in groups of two to three individuals (NMFS, 2023b). During Cook Inlet-wide aerial surveys conducted from 1993 to 2004, minke whales were encountered three times (1998, 1999, and 2006), all were observed off Anchor Point (Shelden *et al.,* 2013, 2015b, 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 occurred southeast of Kalgin Island while the other sighting occurred near Homer (Lomac-MacNair *et al.,* 2014). SAExploration noted one minke whale near Tuxedni Bay in 2015 (Kendall and Cornick, 2015). Eight sightings of eight minke whales were recorded in the 2019 Hilcorp lower Cook Inlet seismic survey (Fairweather Science, 2020). Based on these observations of group size and consistency of sightings in Cook Inlet, NMFS is proposing to authorize three takes by Level B harassment for minke whales (table 11). This is higher than the exposure estimate (*i.e.,* 0.037, table 11) to allow for the potential occurrence of a group, or several individuals, during the project period.

During Apache's 2012 seismic program, nine sightings of a total of nine gray whales were observed in June and July (Lomac-MacNair *et al.,* 2013). In 2014, one gray whale was observed during Apache's seismic program (Lomac-MacNair *et al.,* 2014) and in 2015, no gray whales were observed during SAExploration's seismic survey (Kendall and Cornick, 2015). No gray whales were observed during the 2018 CIPL Extension Project (Sitkiewicz *et al.,* 2018) or during the 2019 Hilcorp seismic survey in lower Cook Inlet (Fairweather Science, 2020). The greatest densities of gray whales in Cook Inlet occur from November through January and March through May; the former are southbound, the latter are northbound (Ferguson *et al.,* 2015). Based on this information, NMFS is proposing to authorize three takes by Level B harassment for gray whales. This is higher than the exposure estimate (*i.e.,* 0.088, table 11) to allow for the potential occurrence of a group, or several individuals, particularly during the fall shoulder season during the higher density periods mentioned above.

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 to 300 individuals (NMFS, 2010). During the NMFS aerial surveys in Cook Inlet from 2000 to 2018, 10 sightings of 26 estimated individual fin whales were recorded in lower Cook Inlet (Shelden *et al.,* 2013, 2015b, and 2017; Shelden and Wade, 2019). Wild *et al.* (2023) identified areas south of the mouth of Cook Inlet as a fin whale feeding BIA from June to September with an importance score of 1 and an intensity score of 1 (see Harrison *et al.* 2023 for more details regarding BIA scoring). As such, the potential for fin whales to occupy waters adjacent to the BIA during that time period and near the specified area may be higher. Acoustic detections of fin whales were recorded during passive acoustic monitoring in the fall of 2019 (Castellote *et al.,* 2020) Additionally, during seismic surveys conducted in 2019 by Hilcorp in lower Cook Inlet, 8 sightings of 23 fin whales were recorded in groups ranging in size from 1 to 15 individuals (Fairweather Science, 2020). The higher number of sightings in a single year relative to the multi-year NMFS aerial surveys flown earlier in season each year suggests fin whales may be present in greater numbers in the fall. Given the possible presence of fin whales in the project area, NMFS proposes to authorize two takes by Level B harassment for fin whales during tugs Hilcorp's planned activities.

Killer whale pods typically consist of a few to 20 or more animals (NMFS, 2023c). 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 SAExploration seismic program near the North Foreland (Kendall and Cornick, 2015). Based on recent documented sightings, observed group sizes, and the established presence of killer whales in Cook Inlet, NMFS is proposing to authorize 10 takes by Level B harassment for killer whales. This would facilitate two sightings with a group size of five individuals, which represents the upper end of recorded group size in recent surveys conducted in Cook Inlet.

The total estimated take for CIWB was calculated to be 9.529 individuals based on recorded densities and estimated durations that tugs would be under load with a jack-up rig (table 11). The 2018 MML aerial survey (Shelden and Wade, 2019) reported a median beluga group size estimate of approximately 11 whales, although estimated group sizes were highly variable (ranging from 2 to 147 whales) as was the case in previous survey years (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). Additionally, vessel-based surveys in 2019 found CIBW groups in the Susitna River Delta (roughly 24 km north of the Tyonek Platform) that ranged from 5 to 200 animals (McGuire *et al.,* 2022). Based on these observations, NMFS proposes to increase the estimated take calculated above and authorize 15 takes by Level B harassment for CIBWs to account for 1 group of 15 individuals, the lower end of the 2022 median group size, or 2 observations of smaller-sized groups. While large groups of CIBWs have been seen in the Susitna River Delta region, they are not expected near Hilcorp's specified activity because groups of this size have not been observed or documented outside river deltas in upper Cook Inlet; however, smaller groups (*i.e.,* around the 2022 median group size) could be traveling through to access the Susitna River Delta and other nearby coastal locations.

Dall's porpoises are usually found in groups averaging between 2 and 12 individuals (NMFS, 2023d). During seismic surveys conducted in 2019 by Hilcorp in lower Cook Inlet, Dall's porpoises were recorded in groups ranging from two to seven individuals (Fairweather Science, 2020). The 2012

Apache survey recorded two groups of three individual Dall's porpoises (Lomac-MacNair *et al.,* 2014). NMFS proposes to authorize six takes by Level B harassment for Dall's porpoises. This is greater than the estimated exposure estimate for this species (0.180, table 11), but would allow for at least one group at the higher end of documented group size or a combination of small groups plus individuals.

Harbor porpoises are most often seen in groups of two to three (NMFS, 2023e); however, based on observations during project-based marine mammal monitoring, they can also occur in larger group sizes. 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. The 2018 CIPL Extension Project that occurred in middle Cook Inlet reported 29 sightings of 44 individuals (Sitkiewicz *et al.,* 2018). NMFS proposes to authorize 12 takes by Level B harassment for harbor porpoises to allow for multiple group sightings during the specified activity. This authorization is greater than the exposure estimate calculated (5.020, table 11) but would account for the possibility of a couple sightings of small groups of harbor porpoises during Hilcorp's 6 days of tugging activity.

Recent data specific to Pacific white-sided dolphins within Cook Inlet is lacking, and the calculated exposure estimate is zero based on the paucity of sightings of this species in this region (table 11). However, Pacific-white sided dolphins have been observed in Cook Inlet. During an aerial survey in May 2014, Apache observed three Pacific white-sided dolphins near Kenai. No large groups of Pacific white-sided dolphins have been reported within Cook Inlet, although acoustic detections of several Pacific white-sided dolphins were recorded near Iniskin Bay during Hilcorp's 3D seismic survey in 2020. Prior to this, only one other survey in the last 20 years noted the presence of Pacific white-sided dolphins (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 has not been generated. However, based on the possibility of this species in the project area, NMFS proposes to authorize three takes by Level B harassment for Pacific white-sided dolphins, the maximum number of Pacific white-sided dolphins that have been recorded in the somewhat recent past are present in Cook Inlet. This is consistent with NMFS' IHA for Hilcorp's previous tugging activities (87 FR 62364, October 14, 2022).

Harbor seals are often solitary in water but can haul out in groups of a few to thousands (Alaska Department of Fish and Game (ADF&G), 2022). Given their presence in the study region, NMFS proposes to authorize 355 takes by Level B harassment for harbor seals, which is commensurate with the calculated exposure estimate based on harbor seal densities and Hilcorp's estimated durations for tugs under load with a jack-up rig (table 11).

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. In 2012, during Apache's 3D Seismic survey, three sightings of approximately four individuals in upper Cook Inlet were reported (Lomac-MacNair *et al.,* 2013). Marine mammal observers associated with Buccaneer's drilling project off Cape Starichkof observed seven Steller sea lions during the summer of 2013 (Owl Ridge, 2014). During SAExploration's 3D Seismic Program in 2015, four Steller sea lions were observed in Cook Inlet. 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). During NMFS Cook Inlet beluga whale aerial surveys from 2000 to 2016, 39 sightings of 769 estimated individual Steller sea lions in lower Cook Inlet were reported (Shelden *et al.,* 2017). During a waterfowl survey in upper Cook Inlet, an observer documented an estimated 25 Steller sea lions hauled-out at low tide in the Lewis River on the west side of Cook Inlet (K. Lindberg, pers. comm., August 15, 2022). Hilcorp reported one sighting of two Steller sea lions while conducting pipeline work in upper Cook Inlet (Sitkiewicz *et al.,* 2018). Commensurate with exposure estimates shown in table 11, NMFS is proposing to authorize nine takes by Level B harassment for Steller sea lions.

While 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 haul outs and rookeries (Maniscalco *et al.,* 2004). Despite the estimated exposure estimate being zero due to the lack of sightings during aerial surveys, NMFS proposes to authorize two takes by Level B harassment for California sea lions to account for the potential to see up to two animals over the course of the season. This is consistent with NMFS authorization for Hilcorp's previous tugging activities (87 FR 62364, October 14, 2022).

Proposed Mitigation

In order to issue an IHA under section 101(a)(5)(D) of the MMPA, NMFS must set forth the permissible methods of taking pursuant to the activity, and other means of effecting the least practicable impact on the species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of the species or stock for taking for certain subsistence uses. NMFS regulations require applicants for incidental take authorizations to include information about the availability and feasibility (economic and technological) of equipment, methods, and manner of conducting the activity or other means of effecting the least practicable adverse impact upon the affected species or stocks, and their habitat (50 CFR 216.104(a)(11)).

In evaluating how mitigation may or may not be appropriate to ensure the least practicable adverse impact on species or stocks and their habitat, as well as subsistence uses where applicable, NMFS considers two primary factors:

(1) The manner in which, and the degree to which, the successful implementation of the measure(s) is expected to reduce impacts to marine mammals, marine mammal species or stocks, and their habitat, as well as subsistence uses. This considers the nature of the potential adverse impact being mitigated (likelihood, scope, range). It further considers the likelihood that the measure will be effective if implemented (probability of accomplishing the mitigating result if implemented as planned), the likelihood of effective implementation (probability implemented as planned); and

(2) The practicability of the measures for applicant implementation, which may consider such things as cost and impact on operations.

There is a discountable potential for marine mammals to incur PTS from the project, as source levels are relatively low, non-impulsive, and animals would have to remain at very close distances for multiple hours to accumulate acoustic energy at levels that could damage hearing. Therefore, we do not believe there is reasonable potential for Level A harassment and we are not proposing to authorize it. However, Hilcorp will implement a number of mitigation measures designed to reduce the potential for and severity of Level B harassment and minimize the impacts of the project.

The tugs towing a jack-up rig are not able to shut down while transiting, holding, or positioning the rig. Hilcorp would maneuver the tugs towing the jack-up rig such that they maintain a consistent speed (approximately 4 knots [7 km/hr]) and avoid multiple changes of speed and direction to make the course of the vessels as predictable as possible to marine mammals in the surrounding environment, characteristics that are expected to be associated with a lower likelihood of disturbance.

During activities involving tugs under load with a jack-up rig, Hilcorp would implement a clearance zone of 1,500 m centered around the jack-up rig for non-CIBW species and a clearance zone that extends as far as PSOs can feasibly observe for CIBWs. The 1,500 m proposed clearance zone is consistent with previous authorizations for tugging activities (87 FR 62364, October 14, 2022), and was determined to be appropriate as it is approximately twice as large as largest Level A harassment zone (table 10) and is a reasonable distance within which cryptic species (*e.g.,* porpoises, pinnipeds) could be observed. The larger clearance zone for CIBWs is a new measure aimed to further minimize any potential impacts from tugs under load with a jack-up rig on this species.

Hilcorp would employ two NMFS-approved PSOs to conduct marine mammal monitoring to a distance out to the greatest extent possible for all mobile and stationary tugging activity. Prior to new commencing activities during daylight hours or if there is a 30-minute lapse in operational activities, the PSOs would observe the clearance zones described above for 30 minutes (*i.e.,* pre-clearance monitoring) (transitioning from towing to positioning without shutting down would not be considered commencing a new operational activity). If no marine mammals are observed within the relevant clearance zone during this pre-clearance monitoring period, tugs may commence their towing, positioning, or holding of a jack-up rig. If a non-CIBW marine mammal(s) is observed within the relevant clearance zone during the pre-clearance monitoring period towing, positioning, or holding of a jack-up rig would be delayed, unless the delay interferes with the safety of working conditions. Operations would not commence until the PSO(s) observe that the non-CIBW animal(s) is outside of and on a path away from the clearance zone, or 30 minutes have elapsed without observing the non-CIBW marine mammal. If a CIBW(s) is observed within the relevant clearance zone during those 30 minutes, operations may not commence until the CIBW(s) is no longer detected at any range and 30 minutes have elapsed without any observations of CIBWs. Once the PSOs have determined one of those conditions are met, operations may commence. PSOs would also conduct monitoring for marine mammals through 30 minutes post-completion of any tugging activity each day, and after each stoppage of 30 minutes or greater.

During nighttime hours or low/no-light conditions, night-vision devices (NVDs) shown to be effective at detecting marine mammals in low-light conditions (*e.g.,* Portable Visual Search-7 model, or similar) would be provided to PSOs to aid in their monitoring of marine mammals. Every effort would be made to observe that the relevant clearance zone is free of marine mammals by using night-vision devices and or the naked eye, however it may not always be possible to see and clear the entire clearance zones prior to nighttime transport. Prior to commencing new operational activities during nighttime hours or if there is a 30-minute lapse in operational activities in low/no-light conditions, the PSOs would observe out to the greatest extent feasible while using NVDs for 30 minutes (*i.e.,* pre-clearance monitoring); if no marine mammals are observed during this pre-clearance monitoring period, tugs may commence towing, positioning, or holding a jack-up rig. If a marine mammal(s) is observed during the pre-clearance monitoring period, tugs towing, positioning, or holding a jack-up rig would be delayed, unless the delay interferes with the safety of working conditions. Operations would not commence until the PSO(s) observe that: (1) the animal(s) is outside of the observable area; or (2) 30 minutes have elapsed. Once the PSOs have determined one of those conditions are met, operations may commence.

Hilcorp would operate with the tide, resulting in a low power output from the tugs towing the jack-up rig, unless human safety or equipment integrity are at risk. Due to the nature of tidal cycles in Cook Inlet, it is possible that the most favorable tide for the towing operation would occur during nighttime hours. Hilcorp would operate the tugs towing the jack-up rigs at night if the nighttime operations result in a lower power output from the tugs by operating with a favorable tide.

Out of concern for potential disturbance to CIBWs in sensitive and essential habitat, Hilcorp would maintain a distance of 2.4 km from the MLLW line of the Susitna River Delta (Beluga River to the Little Susitna River) between April 15 and November 15. The dates of applicability of this exclusion area have been expanded based on new available science, including visual surveys and acoustic studies, which indicate that substantial numbers of CIBWs continue to occur in the Susitna Delta area through at least mid-November (M. Castellote, pers. comm., T. McGuire, pers. comm.). In addition, Hilcorp would coordinate with local Tribes as described in its Stakeholder Engagement Plan (see Appendix C in Hilcorp's application), notify the communities of any changes in the operation, and take action to avoid or mitigate impacts to subsistence harvests.

For transportation of a jack-up rig to or from the Tyonek platform, in addition to the two PSOs stationed on the rig during towing, one additional PSO would be stationed on the Tyonek platform to monitor for marine mammals. The PSO would be on-watch for at least 1 hour before tugs are expected to arrive (scheduled to approach the Level B harassment threshold).

Based on our evaluation of Hilcorp's proposed measures, NMFS has preliminarily determined that the proposed mitigation measures provide the means of effecting the least practicable impact on the affected species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of such species or stock for subsistence uses.

Proposed Monitoring and Reporting

In order to issue an IHA for an activity, section 101(a)(5)(D) of the MMPA states that NMFS must set forth requirements pertaining to the monitoring and reporting of such taking. The MMPA implementing regulations at 50 CFR 216.104(a)(13) indicate that requests for authorizations must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that are expected to be present while conducting the activities. Effective reporting is critical both to compliance as well as ensuring that the most value is obtained from the required monitoring.

Monitoring and reporting requirements prescribed by NMFS should contribute to improved understanding of one or more of the following:

• Occurrence of marine mammal species or stocks in the area in which take is anticipated (*e.g.,* presence, abundance, distribution, density);

• Nature, scope, or context of likely marine mammal exposure to potential stressors/impacts (individual or cumulative, acute or chronic), through better understanding of: (1) action or environment (*e.g.,* source characterization, propagation, ambient noise); (2) affected species (*e.g.,* life history, dive patterns); (3) co-occurrence of marine mammal species with the activity; or (4) biological or behavioral context of exposure (*e.g.,* age, calving or feeding areas);

• Individual marine mammal responses (behavioral or physiological) to acoustic stressors (acute, chronic, or cumulative), other stressors, or cumulative impacts from multiple stressors;

• How anticipated responses to stressors impact either: (1) long-term fitness and survival of individual marine mammals; or (2) populations, species, or stocks;

• Effects on marine mammal habitat (*e.g.,* marine mammal prey species, acoustic habitat, or other important physical components of marine mammal habitat); and

• Mitigation and monitoring effectiveness.

Hilcorp would abide by all monitoring and reporting measures contained within the IHA, if issued, and their Marine Mammal Monitoring and Mitigation Plan (see appendix D of Hilcorp's application). A summary of those measures and additional requirements proposed by NMFS is provided below.

A minimum of two NMFS-approved PSOs must be stationed on the tug or jack-up rig for monitoring purposes for the entirety of jack-up rig towing, holding, and positioning operations. PSOs would be independent of the activity contractor (for example, employed by a subcontractor) and have no other assigned tasks during monitoring periods. At least one PSO would have prior experience performing the duties of a PSO during an activity pursuant to a NMFS-issued Incidental Take Authorization or Letter of Concurrence. Other PSOs may substitute other relevant experience (including relevant Alaska Native traditional knowledge), education (degree in biological science or related field), or training for prior experience performing the duties of a PSO.

PSOs would also have the following additional qualifications:

(a) The ability to conduct field observations and collect data according to assigned protocols;

(b) Experience or training in the field identification of marine mammals, including the identification of behaviors;

(c) Sufficient training, orientation, or experience with the tugging operation to provide for personal safety during observations;

(d) Sufficient writing skills to record required information including but not limited to the number and species of marine mammals observed; dates and times when tugs were under load with the jack-up rig; dates, times, and reason for implementation of mitigation (or why mitigation was not implemented when required); and marine mammal behavior; and

(e) The ability to communicate orally, by radio or in person, with project personnel to provide real-time information on marine mammals observed in the area as necessary.

PSOs would be positioned aboard the tug or the jack-up-rig at the best practical vantage points that are determined to be safe, ideally an elevated stable platform from which a single PSO would have an unobstructed 360-degree view of the water or a total 360-degree view between all PSOs on-watch. Generally, one PSO would be on the port side and one PSO would be on the starboard side. Additionally, when towing the jack-up rig to the Tyonek platform, an additional PSO would be stationed on the Tyonek platform 1 hour before tugs are expected to arrive (*i.e.,* scheduled to approach the Level B threshold) to monitor for marine mammals out to the maximum extent possible. PSOs may use a combination of equipment to scan the monitoring area and to verify the required monitoring distance from the project site, including the naked eye, 7 by 50 binoculars, and NMFS approved NVDs for low light and nighttime operations. PSOs would be in communication with all vessel captains via VHF radio and/or cell phones at all times and alert vessel captains to all marine mammal sightings relative to the vessel location.

Hilcorp would submit interim monthly reports for all months in which tug towing, holding, or positioning of the jack-up rig occurs. Monthly reports would be due 14 days after the conclusion of each calendar month, and would include a summary of marine mammal species and behavioral observations, delays, and tugging activities completed (*i.e.,* tugs towing, holding, or positioning the jack-up rig). They also must include an assessment of the amount of tugging remaining to be completed, in addition to the number of CIBWs observed within estimated harassment zones to date.

A draft final summary marine mammal monitoring report would be submitted to NMFS within 90 days after the completion of the tug towing jack-up rig activities for the year or 60 calendar days prior to the requested issuance of any subsequent IHA for similar activity at the same location, whichever comes first. The draft summary report would include an overall description of all work completed, a narrative regarding marine mammal sightings, and associated marine mammal observation data sheets (data must be submitted electronically in a format that can be queried such as a spreadsheet or database). Specifically, the summary report would include:

• Date and time that monitored activity begins or ends;

• Activities occurring during each observation period, including (a) the type of activity (towing, holding, positioning), (b) the total duration of each type of activity, (c) the number of attempts required for positioning, (d) when nighttime operations were required, and (e) whether towing against the tide was required;

• PSO locations during marine mammal monitoring;

• Environmental conditions during monitoring periods (at the beginning and end of the PSO shift and whenever conditions change significantly), including Beaufort sea state, tidal state, and any other relevant weather conditions including cloud cover, fog, sun glare, overall visibility to the horizon, and estimated observable distance;

• Upon observation of a marine mammal, the following information:

○ Name of PSO who sighted the animal(s) and PSO location and activity at time of sighting;

○ Time of sighting;

○ Identification of the animal(s) (*e.g.,* genus/species, lowest possible taxonomic level, or unidentified), PSO confidence in identification, and the composition of the group if there is a mix of species;

○ Distance and location of each observed marine mammal relative to the tug boats for each sighting;

○ Estimated number of animals (min/max/best estimate);

○ Estimated number of animals by cohort (adults, juveniles, neonates, group composition, *etc.*);

○ Animal's closest point of approach and estimated time spent within the harassment zone;

○ Description of any marine mammal behavioral observations (*e.g.,* observed behaviors such as feeding or traveling), including an assessment of behavioral responses thought to have resulted from the activity (*e.g.,* no response or changes in behavioral state such as ceasing feeding, changing direction, flushing, or breaching);

• Number of marine mammals detected within the harassment zones, by species; and

• Detailed information about implementation of any mitigation (*e.g.,* delays), a description of specific actions that ensued, and resulting changes in behavior of the animal(s), if any.

If no comments are received from NMFS within 30 days, the draft summary report would constitute the final report. If comments are received, a final report addressing NMFS comments must be submitted within 30 days after receipt of comments.

In the event that personnel involved in Hilcorp's tugging activities discover an injured or dead marine mammal, Hilcorp would report the incident to the Office of Protected Resources, NMFS (*PR.ITP.MonitoringReports@noaa.gov, itp.tyson.moore@noaa.gov*), and to the Alaska Regional Stranding Coordinator as soon as feasible. If the death or injury was clearly caused by the specified activity, Hilcorp would immediately cease the specified activities until NMFS is able to review the circumstances of the incident and determine what, if any, additional measures are appropriate to ensure compliance with the IHA. Hilcorp would not resume their activities until notified by NMFS. The report would include the following information:

• Time, date, and location (latitude and longitude) of the first discovery (and updated location information if known and applicable);

• Species identification (if known) or description of the animal(s) involved;

• Condition of the animal(s) (including carcass condition if the animal is dead);

• Observed behaviors of the animal(s), if alive;

• If available, photographs or video footage of the animal(s); and

• General circumstances under which the animal was discovered.

Negligible Impact Analysis and Determination

NMFS has defined negligible impact as an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival (50 CFR 216.103). A negligible impact finding is based on the lack of likely adverse effects on annual rates of recruitment or survival (*i.e.,* population-level effects). An estimate of the number of takes alone is not enough information on which to base an impact determination. In addition to considering estimates of the number of marine mammals that might be ''taken'' through harassment, NMFS considers other factors, such as the likely nature of any impacts or responses (*e.g.,* intensity, duration), the context of any impacts or responses (*e.g.,* critical reproductive time or location, foraging impacts affecting energetics), as well as effects on habitat, and the likely effectiveness of the mitigation. We also assess the number, intensity, and context of estimated takes by evaluating this information relative to population status. Consistent with the 1989 preamble for NMFS' implementing regulations (54 FR 40338, September 29, 1989), the impacts from other past and ongoing anthropogenic activities are incorporated into this analysis via their impacts on the baseline (*e.g.,* as reflected in the regulatory status of the species, population size and growth rate where known, ongoing sources of human-caused mortality, or ambient noise levels).

To avoid repetition, the discussion of our analysis applies to all the species listed in table 11, except CIBWs, given that many of the anticipated effects of this project on different marine mammal stocks are expected to be relatively similar in nature. For CIBWs, there are meaningful differences in anticipated individual responses to activities, impact of expected take on the population, or impacts on habitat; therefore, we provide a separate independent detailed analysis for CIBWs following the analysis for other species for which we propose take authorization.

NMFS has identified several key factors which may be employed to assess the level of analysis necessary to conclude whether potential impacts associated with a specified activity should be considered negligible. These include (but are not limited to) the type and magnitude of taking, the amount and importance of the available habitat for the species or stock that is affected, the duration of the anticipated effect on the individuals, and the status of the species or stock. The potential effects of the specified activity on humpback whales, minke whales, gray whales, fin whales, killer whales, Dall's porpoises, harbor porpoises, Pacific white-sided dolphins, Steller sea lions, harbor seals, and California sea lions are discussed below. These factors also apply to CIBWs; however, an additional analysis for CIBWs is provided in a separate sub-section below.

Tugs under load with the jack-up rig, as outlined previously, have the potential to disturb or displace marine mammals. Specifically, the specified activities may result in take, in the form of Level B harassment, from underwater sounds generated by tugs towing, holding, and positioning a jack-up rig. Potential takes could occur if marine mammals are present in zones ensonified above the thresholds for Level B harassment, identified above, while activities are underway.

Hilcorp's planned activities and associated impacts would occur within a limited, confined area of the affected species or stocks' range over a total of 6 days between September 14, 2024, and September 13, 2025. The intensity and duration of take by Level B harassment would be minimized through use of mitigation measures described herein. Further the amount of take proposed to be authorized is small when compared to stock abundance (see tables 2 and 11). In addition, NMFS does not anticipate that serious injury or mortality would occur as a result of Hilcorp's planned activity given the nature of the activity, even in the absence of required mitigation.

Exposures to elevated sound levels produced during tugs under load with the jack-up rig may cause behavioral disturbance of some individuals within the vicinity of the sound source. Behavioral responses of marine mammals to tugs under load with the jack-up rig are expected to be mild, short term, and temporary. Effects on individuals that are taken by Level B harassment, as enumerated in the Estimated Take section, on the basis of reports in the literature as well as monitoring from other similar activities conducted by Hilcorp (Horsley and Larson, 2023), would likely be limited to behavioral response such as increased swimming speeds, changing in directions of travel and diving and surfacing behaviors, increased respiration rates, or decreased foraging (if such activity were occurring) (Ridgway *et al.,* 1997; Nowacek *et al.,* 2007; Thorson and Reyff, 2006; Kendall and Cornick, 2015; Goldbogen *et al.,* 2013b; Blair *et al.,* 2016; Wisniewska *et al.,* 2018; Piwetz *et al.,* 2021). Marine mammals within the Level B harassment zones may not show any visual cues they are disturbed by activities or they could become alert, avoid the area, leave the area, or have other mild responses that are not observable such as increased stress levels (*e.g.,* Rolland *et al.* 2012; Bejder *et al.,* 2006; Rako *et al.,* 2013; Pirotta *et* *al.,* 2015; Pérez-Jorge *et al.,* 2016). They may also exhibit increased vocalization rates (*e.g.,* Dahlheim, 1987; Dahlheim and Castellote, 2016), louder vocalizations (*e.g.,* Frankel and Gabriele, 2017; Fournet *et al.,* 2018), alterations in the spectral features of vocalizations (*e.g.,* Castellote *et al.,* 2012), or a cessation of communication signals (*e.g.,* Tsujii *et al.,* 2018). However, as described in the Potential Effects of Specified Activities on Marine Mammals and Their Habitat section, marine mammals observed near Hilcorp's planned activities have shown little to no observable reactions to tugs under load with a jack-up rig (Horsley and Larson, 2023).

Tugs pulling, holding, and positioning a jack-up rig 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 on the order of minutes in any particular location. The slow, predictable, and generally straight path of this activity is 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 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. While it is possible that animals may swim around the project area, avoiding closer approaches to the boats, we do not expect them to abandon any intended path. Further, most animals present in the region would likely be transiting through the area; therefore, any potential exposure is expected to be brief. Based on the characteristics of the sound source and the other activities regularly encountered in the area, it is unlikely Hilcorp's plannedactivities would be of a duration or intensity expected to result in impacts on reproduction or survival.

Further, most of the species present in the region would only be present temporarily based on seasonal patterns or during transit between other habitats. These temporarily present species would be exposed to even shorter periods of noise-generating activity, further decreasing the impacts. Most likely, individual animals would simply move away from the sound source and be temporarily displaced from the area. Takes may also occur during important feeding times. The project area though represents a small portion of available foraging habitat and impacts on marine mammal feeding for all species should be minimal.

We anticipate that any potential reactions and behavioral changes are expected to subside quickly when the exposures cease and, therefore, we do not expect long-term adverse consequences from Hilcorp's proposed activities for individuals of any species. The intensity of Level B harassment events would be minimized through use of mitigation measures described herein, which were not quantitatively factored into the take estimates. Hilcorp would use PSOs to monitor for marine mammals before commencing any tugging activity, which would minimize the potential for marine mammals to be present within Level B harassment zones when tugs are under load. Further, given the absence of any major rookeries or areas of known biological significance for marine mammals (*e.g.,* foraging hot spots) within the estimated harassment zones (other than critical habitat and a BIA for CIBWs as described below), we assume that potential takes by Level B harassment would have an inconsequential short-term effect on individuals and would not result in population-level impacts.

Theoretically, repeated, sequential exposure to elevated noise from tugs under load with a jack-up rig over a long duration could result in more severe impacts to individuals that could affect a population (via sustained or repeated disruption of important behaviors such as feeding, resting, traveling, and socializing; Southall *et al.,* 2007). Alternatively, marine mammals exposed to repetitious sounds may become habituated, desensitized, or tolerant after initial exposure to these sounds (reviewed by Richardson *et al.,* 1995; Southall *et al.,* 2007). Cook Inlet is a regional hub of marine transportation, and is used by various classes of vessels, including containerships, bulk cargo freighters, tankers, commercial and sport-fishing vessels, and recreational vessels. Off-shore vessels, tug vessels, and tour boats represent 86 percent of the total operating days for vessels in Cook Inlet (BOEM, 2016). Given that marine mammals still frequent and use Cook Inlet despite being exposed to anthropogenic sounds such as those produced by tug boats and other vessels across many years, these severe population level impacts resulting from the additional noise produced by tugs under load with a jack-up rig are not anticipated. The absence of any pinniped haulouts or other known home-ranges in the planned action area further decreases the likelihood of severe population level impacts.

Hilcorp's tugs under load with a jack-up rig are also not expected to have significant adverse effects on any marine mammal habitat as no physical impacts to habitat are anticipated to results from the specified activities and any impacts to marine mammal habitat (*i.e.,* elevated sound levels) would be temporary. In addition to being temporary and short in overall duration, the acoustic footprint of the proposed activity is small relative to the overall distribution of the animals in the area and their use of the area. Additionally, the habitat within the estimated acoustic footprint is not known to be heavily used by marine mammals.

Impacts to marine mammal prey species are also expected to be minor and temporary and to have, at most, short-term effects on foraging of individual marine mammals, and likely no effect on the populations of marine mammals as a whole. Overall, as described above, the area anticipated to be impacted by Hilcorp's planned activities is very small compared to the available surrounding habitat, and does not include habitat of particular importance. The most likely impact to prey would be temporary behavioral avoidance of the immediate area. When tugs are under load with the jack-up rig, it is expected that some fish would temporarily leave the area of disturbance (*e.g.,* Nakken, 1992; Olsen, 1979; Ona and Godo, 1990; Ona and Toresen, 1988), thus impacting marine mammals' foraging opportunities in a limited portion of their foraging range. But, because of the relatively small area of the habitat that may be affected, and lack of any foraging habitat of particular importance, the impacts to marine mammal habitat are not expected to cause significant or long-term negative consequences.

Finally, Hilcorp will minimize potential exposure of marine mammals to elevated noise levels by delaying tugs being under load with the jack-up rig if marine mammals are observed during the pre-clearance monitoring period. Hilcorp would also implement vessel maneuvering measures to reduce the likelihood of disturbing marine mammals during any periods when marine mammals may be present near the vessels. Lastly, Hilcorp would also reduce the impact of their activity by conducting tugging operations with favorable tides whenever feasible.

In summary and as described above, the following factors (with additional analyses for CIBWs included below) primarily support our preliminary determinations that the impacts resulting from the activities described for this proposed IHA are not expected to adversely affect the species or stocks through effects on annual rates of recruitment or survival:

- No takes by mortality, serious injury, or Level A harassment are anticipated or proposed to be authorized;
- Exposure would likely be brief given the short duration of the specified activity and the transiting behavior of marine mammals in the action area;
- Marine mammal densities are low in the project area; therefore, there will not be substantial numbers of marine mammals exposed to the noise from the project compared to the affected population sizes;
- Take would not occur in places and/or times where take would be more likely to accrue to impacts on reproduction or survival, such as within ESA-designated or proposed critical habitat, BIAs (other than for CIBWs as described below), or other habitats critical to recruitment or survival (*e.g.,* rookery);
- The project area represents a very small portion of the available foraging area for all potentially impacted marine mammal species;
- Take would only occur within middle Cook Inlet and Trading Bay—a limited, confined area of any given stock's home range;
- Monitoring reports from previous projects where tugs were under load with a jack-up rig in Cook Inlet have documented little to no observable effect on individuals of the same species impacted by the specified activities;
- The required mitigation measures (*i.e.,* pre-clearance monitoring, vessel maneuver) are expected to be effective in reducing the effects of the specified activity by minimizing the numbers of marine mammals exposed to sound and the intensity of the exposures; and
- The intensity of anticipated takes by Level B harassment is low for all stocks consisting of, at worst, temporary modifications in behavior, and would not be of a duration or intensity expected to result in impacts on reproduction or survival.

Cook Inlet Beluga Whales. For CIBWs, we further discuss our negligible impact findings in addition to the findings discussed above for all species in the context of potential impacts to this endangered stock based on our evaluation of the take proposed to be authorized (table 11).

All tug towing, holding, or positioning would be done in a manner implementing best management practices to preserve water quality, and no work would occur around creek mouths or river systems leading to prey abundance reductions. In addition, no physical structures would restrict passage, though impacts to the acoustic habitat are relevant and discussed here. While the specified activity would occur within CIBW Critical Habitat Area 2, and the CIBW small and resident BIA, monitoring data from Hilcorp's activities suggest that the presence of tugs under load with a jack-up rig do not discourage CIBWs from transiting throughout Cook Inlet and between critical habitat areas and that the whales do not abandon critical habitat areas (Horsley and Larson, 2023). In addition, large numbers of CIBWs have continued to use Cook Inlet and pass through the area, likely traveling to critical foraging grounds found in upper Cook Inlet, while noise-producing anthropogenic activities, including vessel use, have taken place during the past 2 decades (*e.g.,* Shelden *et al.,* 2013, 2015b, 2017, 2022; Shelden and Wade, 2019; Geotz *et al.,* 2023). These findings are not surprising as food is a strong motivation for marine mammals. As described in Forney *et al.* (2017), animals typically favor particular areas because of their importance for survival (*e.g.,* feeding or breeding), and leaving may have significant costs to fitness (reduced foraging success, increased predation risk, increased exposure to other anthropogenic threats). Consequently, animals may be highly motivated to maintain foraging behavior in historical foraging areas despite negative impacts (*e.g.,* Rolland *et al.,* 2012).

Generation of sound may result in avoidance behaviors that would be limited in time and space relative to the larger availability of important habitat areas in Cook Inlet; however, the area ensonified by sound from the specified activity is anticipated to be small compared to the overall available critical habitat for CIBWs to feed and travel. Therefore, the specified activity would not create a barrier to movement through or within important areas. We anticipate that disturbance to CIBWs would manifest in the same manner as other marine mammals described above (*i.e.,* increased swimming speeds, changes in the direction of travel and dive behaviors, increased respiration rates, decreased foraging (if such activity were occurring), or alterations to communication signals). We do not believe exposure to elevated noise levels during transit past tugging activity would have adverse effects on individuals' fitness for reproduction or survival.

Although data demonstrate that CIBWs are not abandoning the planned project area during anthropogenic activities, results of an expert elicitation (EE) at a 2016 workshop, which predicted the impacts of noise on CIBW survival and reproduction given lost foraging opportunities, helped to inform our assessment of impacts on this stock. The 2016 EE workshop used conceptual models of an interim population consequences of disturbance (PCoD) for marine mammals (NRC, 2005; New *et al.,* 2014; Tollit *et al.,* 2016) to help in understanding how noise-related stressors might affect vital rates (survival, birth rate and growth) for CIBW (King *et al.,* 2015). NMFS (2016b) suggests that the main direct effects of noise on CIBWs are likely to be through masking of vocalizations used for communication and prey location and habitat degradation. The 2016 workshop on CIBWs was specifically designed to provide regulators with a tool to help understand whether chronic and acute anthropogenic noise from various sources and projects are likely to be limiting recovery of the CIBW population. The full report can be found at *https://www.smruconsulting.com/publications/* with a summary of the expert elicitation portion of the workshop below.

For each of the noise effect mechanisms chosen for EE, the experts provided a set of parameters and values that determined the forms of a relationship between the number of days of disturbance a female CIBW experiences in a particular period and the effect of that disturbance on her energy reserves. Examples included the number of days of disturbance during the period April, May, and June that would be predicted to reduce the energy reserves of a pregnant CIBW to such a level that she is certain to terminate the pregnancy or abandon the calf soon after birth, the number of days of disturbance in the period April–September required to reduce the energy reserves of a lactating CIBW to a level where she is certain to abandon her calf, and the number of days of disturbance where a female fails to gain sufficient energy by the end of summer to maintain themselves and their calves during the subsequent winter. Overall, median values ranged from 16 to 69 days of disturbance depending on the question. However, for this elicitation, a ''day of disturbance'' was defined as any day on which an animal loses the ability to forage for at least one tidal cycle (*i.e.,* it forgoes 50–100 percent of its energy intake on that day). The day of disturbance considered in the context of the report is notably more severe than the Level B harassment expected to result from these activities, which as described is expected to be comprised predominantly of temporary modifications in the behavior of individual CIBWs (*e.g.,* faster swim speeds, longer dives, decreased sighting durations, alterations in communication). Also, NMFS proposes to authorize 15 instances of takes, with the instances representing disturbance events within a day—this means that either 15 different individual CIBWs are disturbed on no more than 1 day each, or some lesser number of individuals may be disturbed on more than 1 day, but with the product of individuals and days not exceeding 15. Given the overall anticipated take, and the short duration of the specified activities (*i.e.,* 6 days), it is unlikely that any one CIBW will be disturbed on more than a couple days. Lastly, even if a CIBW was exposed every day of Hilcorp's planned activities, these activities are only planned for 6 days, and thus do not fall into the expected range of days of disturbance expected to elicit an effect on energy reserves as determined by the experts as described above (*i.e.,* 16 to 19 days). Further, Hilcorp has proposed mitigation measures specific to CIBWs whereby they would not begin towing, holding, or positioning of the jack-up rig should a CIBW be observed at any distance. While Level B harassment (behavioral disturbance) would be authorized, this measure, along with other mitigation measures described herein, would limit the severity of the effects of that Level B harassment to behavioral changes such as increased swim speeds, changes in diving and surfacing behaviors, and alterations to communication signals, not the loss of foraging capabilities. Finally, take by mortality, serious injury, or Level A harassment of CIBWs is not anticipated or proposed to be authorized.

In summary and as described above, the additional following factors primarily support our preliminary determination that the impacts resulting from this activity are not expected to adversely affect the CIBWs through effects on annual rates of recruitment or survival:

• The area of exposure would be limited to habitat primarily used for transiting, and not areas known to be of particular importance for feeding or reproduction;

• The activities are not expected to result in CIBWs abandoning critical habitat nor are they expected to restrict passage of CIBWs within or between critical habitat areas; and

• Any disturbance to CIBWs is expected to be limited to temporary modifications in behavior, and would not be of a duration or intensity expected to result in impacts on reproduction or survival.

Based on the analysis contained herein of the likely effects of the specified activity on marine mammals and their habitat, and taking into consideration the implementation of the proposed monitoring and mitigation measures, NMFS preliminarily finds that the total marine mammal take from the proposed activity will have a negligible impact on all affected marine mammal species or stocks.

Small Numbers

As noted previously, only take of small numbers of marine mammals may be authorized under sections 101(a)(5)(A) and (D) of the MMPA for specified activities other than military readiness activities. The MMPA does not define small numbers and so, in practice, where estimated numbers are available, NMFS compares the number of individuals taken to the most appropriate estimation of abundance of the relevant species or stock in our determination of whether an authorization is limited to small numbers of marine mammals. When the predicted number of individuals to be taken is fewer than one-third of the species or stock abundance, the take is considered to be of small numbers (86 FR 5322, January 19, 2021). Additionally, other qualitative factors may be considered in the analysis, such as the temporal or spatial scale of the activities.

For all stocks whose abundance estimate is known, the amount of taking is less than one-third of the best available population abundance estimate (in fact it is less than 2 percent for all stocks, except for CIBWs whose proposed take is 5.38 percent of the stock; table 12). The number of animals proposed for authorization to be taken from these stocks therefore, would be considered small relative to the relevant stocks abundances even if each estimated take occurred to a new individual.

TABLE 12—PROPOSED TAKE TO BE AUTHORIZED AS A PERCENTAGE OF STOCK ABUNDANCE

Species	Proposed total amount of take to be authorized	Stock	Abundance (Nbest)	Percent of stock
Humpback whale	3	Hawaii (Hawaii DPS)	11,278	0.03
		Mexico-North Pacific (Mexico DPS)	[1] N/A	N/A
		Western North Pacific	1,084	0.28
Minke whale	3	Alaska	[2] N/A	N/A
Gray whale	3	Eastern Pacific	26,960	0.01
Fin whale	2	Northeast Pacific	[3] UND	N/A
Killer whale	10	Eastern North Pacific Alaska Resident	1,920	0.52
		Eastern North Pacific Gulf of Alaska, Aleutian Islands, and Bering Sea Transient.	587	1.7
Beluga whale	15	Cook Inlet	[4] 279	5.38
Dall's porpoise	6	Alaska	[5] UND	N/A
Harbor porpoise	12	Gulf of Alaska	31,046	0.04
Pacific white-sided dolphin	3	North Pacific	26,880	0.01
Harbor seal	365	Cook Inlet/Shelikof	28,411	1.29
Steller sea lion	9	Western U.S	[6] 49,932	0.02
California sea lion	2	U.S	257,606	<0.01

[1] Abundance estimates are based upon data collected more than 8 years ago and, therefore, current estimates are considered unknown.

[2] Reliable population estimates are not available for this stock. Please see Friday *et al.* (2013) and Zerbini *et al.* (2006) for additional information on numbers of minke whales in Alaska.

[3] The best available abundance estimate for this stock is not considered representative of the entire stock as surveys were limited to a small portion of the stock's range.

[4] On June 15, 2023, NMFS released an updated abundance estimate for endangered CIBWs in Alaska (Goetz *et al.,* 2023). Data collected during NOAA Fisheries' 2022 aerial survey suggest that the whale population is stable or may be increasing slightly. Scientists estimated that the population size is between 290 and 386, with a median best estimate of 331. In accordance with the MMPA, this population estimate will be incorporated into the CIBW SAR, which will be reviewed by an independent panel of experts, the Alaska Scientific Review Group. After this review, the SAR will be made available as a draft for public review before being finalized. When the number of instances of takes is compared to this median abundance, the percent of the stock proposed for authorization is 4.53%.

[5] The best available abundance estimate is likely an underestimate for the entire stock because it is based upon a survey that covered only a small portion of the stock's range.

[6] Nest is best estimate of counts, which have not been corrected for animals at sea during abundance surveys.

Abundance estimates for the Mexico-North Pacific stock of humpback whales are based upon data collected more than 8 years ago and, therefore, current estimates are considered unknown (Young *et al.,* 2023). The most recent minimum population estimates (N_{MIN}) for this population include an estimate of 2,241 individuals between 2003 and 2006 (Martinez-Aguilar, 2011) and 766 individuals between 2004 and 2006 (Wade, 2021). NMFS' Guidelines for Assessing Marine Mammal Stocks suggest that the N_{MIN} estimate of the stock should be adjusted to account for potential abundance changes that may have occurred since the last survey and provide reasonable assurance that the stock size is at least as large as the estimate (NMFS, 2023a). The abundance trend for this stock is unclear; therefore, there is no basis for adjusting these estimates (Young *et al.,* 2023). Assuming the population has been stable, the 4 takes of this stock proposed for authorization represents small numbers of this stock (0.18 percent of the stock assuming a N_{MIN} of 2,241 individuals and 0.52 percent of the stock assuming an N_{MIN} of 766 individuals).

A lack of an accepted stock abundance value for the Alaska stock of minke whale did not allow for the calculation of an expected percentage of the population that would be affected. The most relevant estimate of partial stock abundance is 1,233 minke whales in coastal waters of the Alaska Peninsula and Aleutian Islands (Zerbini *et al.,* 2006). Given three proposed takes by Level B harassment for the stock, comparison to the best estimate of stock abundance shows, at most, less than 1 percent of the stock would be expected to be impacted.

There is no stock-wide abundance estimate for Northeast Pacific fin whales. However, Young *et al.* (2022) estimate the minimum stock size for the areas surveyed is 2,554. Given two proposed takes by Level B harassment for the stock, comparison to the minimum population estimate shows, at most, less than 1 percent of the stock would be expected to be impacted.

The Alaska stock of Dall's porpoise has no official NMFS abundance estimate for this area, as the most recent estimate is greater than 8 years old. As described in the 2022 Alaska SAR (Young *et al.,* 2023) the minimum population estimate is assumed to correspond to the point estimate of the 2015 vessel-based abundance computed by Rone *et al.* (2017) in the Gulf of Alaska (N = 13,110; CV = 0.22). Given six authorized takes by Level B harassment for the stock, comparison to the minimum population estimate shows, at most, less than 1 percent of the stock would be expected to be impacted.

Based on the analysis contained herein of the proposed activity (including the proposed mitigation and monitoring measures) and the anticipated take of marine mammals, NMFS preliminarily finds that small numbers of marine mammals would be taken relative to the population size of the affected species or stocks.

Unmitigable Adverse Impact Analysis and Determination

In order to issue an IHA, NMFS must find that the specified activity will not have an ''unmitigable adverse impact'' on the subsistence uses of the affected marine mammal species or stocks by Alaskan Natives. NMFS has defined ''unmitigable adverse impact'' in 50 CFR 216.103 as an impact resulting from the specified activity: (1) That is likely to reduce the availability of the species to a level insufficient for a harvest to meet subsistence needs by: (i) Causing the marine mammals to abandon or avoid hunting areas; (ii) Directly displacing subsistence users; or (iii) Placing physical barriers between the marine mammals and the subsistence hunters; and (2) That cannot be sufficiently mitigated by other measures to increase the availability of marine mammals to allow subsistence needs to be met.

Hilcorp's towing, holding, and positioning of the jack-up rig would occur offshore and north of Kenai and the Village of Salmatof. The last ADF&G subsistence survey conducted in Kenai was in 1998 (Fall *et al.,* 2000). 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 harvest has 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. ADF&G Community Subsistence Information System harvest data are not available for Salamatof, so Hilcorp assumes the subsistence harvest patterns are similar to other communities along the road system on the southern Kenai Peninsula, namely Kenai.

Tugs towing, holding, or positioning a jack-up rig on the Tyonek platform in the North Cook Inlet Unit in middle Cook Inlet would occur approximately 10 km from the Native Village of Tyonek. Tyonek, on the western side of middle Cook Inlet, has a subsistence harvest area that extends south from the Susitna River to Tuxedni Bay (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 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).

The only non-ESA-listed marine mammal available for subsistence harvest in Cook Inlet is the harbor seal (Wolfe *et al.,* 2009). The listed Steller sea lions are occasionally taken in lower Cook Inlet, but at a low level (Wolfe *et al.* 2009) (*e.g.,* 33 harbor seals were harvested in Tyonek between 1983 and 2013). 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. Hilcorp's tug towing jack-up rig activities may overlap with subsistence hunting of seals. However, these activities typically occur along the shoreline or very close to shore near river mouths, whereas most of Hilcorps's tugging is in the middle of the Inlet and rarely near the shoreline or river mouths.

Any harassment to marine mammal stocks if it were to occur would be limited to minor behavioral changes (*e.g.,* increased swim speeds, changes in dive behaviors and communication signals, temporary avoidance near the tugs) and is anticipated to be short-term, mild, and not result in any abandonment or behaviors that would make the animals unavailable to Alaska Natives.

To further minimize any potential effects of their action on subsistence activities, Hilcorp has outlined their communication plan for engaging with subsistence users in their Stakeholder Engagement Plan (appendix C of Hilcorp's application). This includes using traditional/subsistence knowledge to inform planning for the activity. Hilcorp would be required to abide by this plan and update the plan accordingly.

Based on the description of the specified activity, the measures described to minimize adverse effects on the availability of marine mammals for subsistence purposes, and the proposed mitigation and monitoring measures, NMFS has preliminarily determined that there will not be an unmitigable adverse impact on subsistence uses from the POA's proposed activities.

Endangered Species Act

Section 7(a)(2) of the Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531 *et seq.*) requires that each Federal agency insure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of designated critical habitat. To ensure ESA compliance for the issuance of IHAs, NMFS consults internally whenever we propose to authorize take for endangered or threatened species, in this case with the NMFS Alaska Regional Office (AKRO).

NMFS is proposing to authorize take of fin whale, humpback whale (Mexico DPS and Western North Pacific DPS), fin whale (Northeastern Pacific stock), beluga whale (Cook Inlet), and Steller sea lion (Western DPS), which are listed under the ESA. The Permits and Conservation Division has requested initiation of section 7 consultation with NMFS AKRO for the issuance of this IHA. NMFS will conclude the ESA consultation prior to reaching a determination regarding the proposed issuance of the authorization.

Proposed Authorization

As a result of these preliminary determinations, NMFS proposes to an IHA to Hilcorp for the use of tugs to tow, hold, and position a jack-up rig in support of their oil and gas activities in Cook Inlet, Alaska from September 14, 2024 through September 13, 2025, provided the previously mentioned mitigation, monitoring, and reporting requirements are incorporated. Drafts of the proposed IHA can be found at: *https://www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act.*

Request for Public Comments

We request comment on our analyses, the proposed authorization, and any other aspect of this notice of proposed IHA and the draft EA for the proposed tugging activities. We also request comment on the potential renewal of this proposed IHA as described in the paragraph below. Please include with your comments any supporting data or literature citations to help inform decisions on the proposed IHA or a subsequent renewal IHA.

On a case-by-case basis, NMFS may issue a one-time, 1-year renewal IHA following notice to the public providing an additional 15 days for public comments when (1) up to another year of identical or nearly identical activities as described in the Description of Proposed Activity section of this notice is planned or (2) the activities as described in the Description of Proposed Activity section of this notice would not be completed by the time the IHA expires and a renewal would allow for completion of the activities beyond that described in the *Dates and Duration* section of this notice, provided all of the following conditions are met:

- A request for renewal is received no later than 60 days prior to the needed renewal IHA effective date (recognizing that the renewal IHA expiration date cannot extend beyond 1 year from expiration of the initial IHA).
- The request for renewal must include the following:

(1) An explanation that the activities to be conducted under the requested renewal IHA are identical to the activities analyzed under the initial IHA, are a subset of the activities, or include changes so minor (*e.g.,* reduction in pile size) that the changes do not affect the previous analyses, mitigation and monitoring requirements, or take estimates (with the exception of reducing the type or amount of take).

(2) A preliminary monitoring report showing the results of the required monitoring to date and an explanation showing that the monitoring results do not indicate impacts of a scale or nature not previously analyzed or authorized.

- Upon review of the request for renewal, the status of the affected species or stocks, and any other pertinent information, NMFS determines that there are no more than minor changes in the activities, the mitigation and monitoring measures will remain the same and appropriate, and the findings in the initial IHA remain valid.

Dated: July 17, 2024.

Kimberly Damon-Randall,

Director, Office of Protected Resources, National Marine Fisheries Service.

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