Proposed Rulemaking for Issuance of a Letter of Authorization and an Incidental Harassment Authorization for the Take of Marine Mammals Incidental to the Don Young Port of Alaska's Cargo Terminals Replacement (CTR) Project in Anchorage, Alaska

LEAD AGENCY:	U.S. Department of Commerce National Oceanic and Atmospheric Administration National Marine Fisheries Service
RESPONSIBLE OFFICIAL:	Kimberly Damon-Randall, Director Office of Protected Resources National Marine Fisheries Service
FOR FURTHER INFORMATION:	Cara Hotchkin National Marine Fisheries Service Office of Protected Resources Permits and Conservation 1315 East West Highway Silver Spring, MD 20910 301-427-8460
LOCATION:	Anchorage, Alaska
ABSTRACT:	This Draft Environmental Assessment analyzes the environmental impacts of the National Marine Fisheries Service, Office of Protected Resources' decision regarding a rulemaking and issuance of a Letter of Authorization and Incidental Harassment Authorization, pursuant to section 101(a)(5)(D) of the Marine Mammal Protection Act, to the Don Young Port of Alaska for the take of small numbers of marine mammals incidental to construction of the Cargo Terminals Replacement Project for the Port of Alaska Modernization Program in Anchorage, Alaska.
DATE:	October 2024

This page intentionally left blank.

Contents

Section Page

Chapter 1. Introduction and Purpose and Need ... 1
1.1 Introduction and Background ... 1
1.2 Marine Mammal Protection Act Overview ... 2
1.2.1 Required Mitigation ... 3
1.2.2 Required Monitoring and Reporting ... 4
1.3 Summary of the Applicant's Incidental Take Authorization Request ... 4
1.4 Purpose and Need ... 6
1.4.1 Description of Proposed Action ... 6
1.4.2 Purpose ... 6
1.4.3 Need ... 6
1.5 Environmental Review Process and Background ... 6
1.5.1 Scoping and Public Involvement ... 6
1.5.2 Compliance with Other Environmental Laws or Consultations ... 7
1.6 Document Scope ... 9

Chapter 2. Alternatives ... 11
2.1 Criteria and Considerations for Selecting Alternatives ... 11
2.2 Description of the Applicant's Specified Activities ... 12
2.2.1 Specified Geographic Area ... 12
2.2.2 Applicant's Proposed Project ... 14
2.2.3 Avoidance and Minimization Measures ... 36
2.3 Alternative 1 - No Action Alternative ... 41
2.4 Alternative 2 - Issuance of Requested LOA and IHA (Preferred Alternative) ... 41
2.5 Alternatives Considered but Eliminated from Further Consideration ... 41

Chapter 3. Affected Environment ... 43
3.1 Physical Environment ... 43
3.1.1 Ambient Sound/Acoustical Environment ... 43
3.2 Biological Environment ... 44
3.2.1 History of Incidental Take Authorized at the POA ... 44
3.2.2 Marine Mammal Habitat ... 45
3.2.3 Marine Mammals ... 46
3.3 Socioeconomic Environment ... 61
3.3.1 Subsistence ... 61

Chapter 4. Environmental Consequences ... 63
4.1 Type of Potential Impacts ... 63
4.2 Duration of Potential Impacts ... 63
4.3 Geographic Extent ... 64
4.4 Significance of Potential Impacts ... 64
4.5 Effects of Alternative 1 – No Action ... 65
4.6 Effects of Alternative 2 – Issuance of the Authorization ... 65
4.6.1 Impacts on Marine Mammal Habitat ... 66
4.6.2 Impacts on Marine Mammals ... 68
4.7 Impacts on Subsistence ... 94
4.8 Cumulative Effects ... 95
4.8.1 Subsistence Hunting ... 95

4.8.2 Pollution 95
4.8.3 Fisheries Interaction 96
4.8.4 Vessel Traffic 97
4.8.5 Coastal Zone Development 98
4.8.6 Air Traffic 102
4.8.7 Tidal Energy 103
4.8.8 Joint Base Elmendorf-Richardson 104
4.8.9 Oil and Gas Development 105
4.8.10 Mining 107
4.8.11 Marine Mammal Research 107
4.8.12 Climate Change 108
4.8.13 Conclusion 109

Chapter 5. List of Preparers and Agencies Consulted 111

Chapter 6. Literature Cited 112

TABLES

Table 1-1. Elements of the Environment Not Carried Forward for Analysis 10
Table 2-1. Summary of Cargo Terminals Replacement Project Activities, Locations, and Quantities for 7 Years 15
Table 2-2. Component 3: Pile Installation and Removal 24
Table 2-3. Component 3: Summary of Total Numbers and Types of In-water Piles to be Installed and Removed during All 6 Years of In-water Project Construction 24
Table 2-4. Component 3: Summary of Numbers and Types of In-water Piles to be Installed and Removed during Year 1 of In-water Project Construction 25
Table 2-5. Component 3: Summary of Numbers and Types of In-water Piles to be Installed and Removed during Year 2 of In-water Project Construction 26
Table 2-6. Component 3: Summary of Numbers and Types of In-water Piles to be Installed and Removed during Year 3 of In-water Project Construction 27
Table 2-7. Component 3: Summary of Numbers and Types of In-water Piles to be Installed and Removed during Year 4 of In-water Project Construction 28
Table 2-8. Component 3: Summary of Numbers and Types of In-water Piles to be Installed and Removed during Year 5 of In-water Project Construction 29
Table 2-9. Component 3: Summary of Numbers and Types of In-water Piles to be Installed and Removed during Year 6 of In-water Project Construction 30
Table 2-10. Estimated Annual and Monthly Distribution of In-water Pile Installation and Removal for Component 3 31
Table 2-11. Proposed Shutdown Zones during CTR Project Activities 39
Table 3-1. Marine Mammals in or near the CTR Project Area at the POA 46
Table 3-2. Annual Cook Inlet Beluga Abundance Estimates 48
Table 3-3. Marine Mammal Functional Hearing Groups 61
Table 4-1. Summary of Terms Used to Describe Potential Environmental Impacts 66
Table 4-2. Summary of Auditory Injury Onset Acoustic Thresholds for Assessing Level A Harassment, and Acoustic Criteria for Assessing Level B Harassment, of Marine Mammals from Exposure to Noise from Impulsive (Pulsed) and Non-impulsive (Continuous) Underwater Sound Sources 73
Table 4-3. Estimates of Unweighted Underwater Sound Levels Generated during Pile Installation and Removal 78

Table 4-4. Calculated Distance of Level A and Level B Harassment Isopleths by Pile Type and Pile Driving Method.......... 79
Table 4-5. Estimated Number of Potential Exposures (Takes) of Gray Whales for Each Construction Year.......... 80
Table 4-6. Estimated Number of Potential Exposures (Takes) of Humpback Whales for Each Construction Year.......... 81
Table 4-7. Estimated Number of Potential Exposures (Takes) of Harbor Seals for Each Construction Year.......... 82
Table 4-8. Estimated Number of Potential Exposures (Takes) of Steller Sea Lions for Each Construction Year.......... 84
Table 4-9. Estimated Number of Potential Exposures (Takes) of Harbor Porpoises for Each Construction Year.......... 85
Table 4-10. Estimated Number of Potential Exposures (Takes) of Killer Whales for Each Construction Year.......... 86
Table 4-11. Beluga Monthly Sighting Rates for Different Bin Sizes.......... 87
Table 4-12. Allocation of Each Level B Isopleth to a Sighting Rate Bin and Beluga Monthly Sighting Rates for Different Pile Sizes and Hammer Types.......... 88
Table 4-13. Comparison of Reported and Authorized Takes for Cook Inlet Belugas.......... 89
Table 4-14. Beluga Monthly and Total Estimated Level B Take.......... 89
Table 4-15. Summary Table of Annual Beluga Potential Take Exposures.......... 92
Table 4-16. Summary of Maximum Annual Marine Mammal Exposures Requested by Species.......... 93

FIGURES

Figure 2-1. POA location in Anchorage, Alaska, in Knik Arm in upper Cook Inlet, including the proposed CTR Project area.......... 13
Figure 2-2. Component 1: Ground Improvement Locations and Approximate Areas.......... 18
Figure 2-3. Component 2: Shoreline Expansion and Protection Areas.......... 20
Figure 2-4. Component 3: Overview of the New Terminal 1 (T1) and Terminal 2 (T2).......... 33
Figure 2-5. Component 4: Demolition of Existing Terminals.......... 35
Figure 3-1. Cook Inlet Beluga Critical Habitat and Exclusion Zone at the POA.......... 51
Figure 4-1. Example Development Activities in Cook Inlet.......... 98
Figure 4-2. Phases 1 through 5 of the PAMP.......... 101

Acronyms and Abbreviations

°C	degrees Celsius
ADF&G	Alaska Department of Fish & Game
AKRO	Alaska Regional Office
ANHSC	Alaska Native Harbor Seal Commission
ARRC	Alaska Railroad Corporation
BA	Biological Assessment
BiOp	Biological Opinion
BOEM	Bureau of Ocean Management
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CIBW	Cook Inlet beluga whale
CM	Companion Manual
cm	centimeters
CPOA	closest point of approach
CTR	Cargo Terminals Replacement
dB	decibels
dB re 1 μPa	decibels referenced to 1 micropascal
DIP	demographically independent population
DOR	designer of record
DOT&PF	Alaska Department of Transportation and Public Facilities
DPS	Distinct Population Segment
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EFH	essential fish habitat
EIS	environmental impact statement
ESA	Endangered Species Act
FR	*Federal Register*
FRN	*Federal Register* Notice
ft	foot; feet
G&G	geophysical and geotechnical
H:V	horizontal to vertical ratio
HF	high frequency
Hz	Hertz
I&R	Illingworth & Rodkin
IHA	Incidental Harassment Authorization
in	inches
ITA	Incidental Take Authorization
ITS	Incidental Take Statement
JBER	Joint Base Elmendorf-Richardson

kHz	kilohertz
$L_{pk,flat}$	peak sound pressure level (unweighted)
$L_{E,24h}$	sound exposure level, cumulative 24 hours
LF	low frequency
LOA	Letter of Authorization
LOC	Letter of Concurrence
m	meter
MF	mid-frequency
MHHW	mean higher high water
MMO	Marine Mammal Observer
MMPA	Marine Mammal Protection Act
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
MTRP	Marine Terminal Redevelopment Project
NA	not applicable
NAO	NOAA Administrative Order
NEPA	National Environmental Policy Act
NES	North Extension Stabilization
NES1	North Extension Stabilization Step 1
NES2	North Extension Stabilization Step 2
NMFS	National Marine Fisheries Service
NOAA	National Oceanographic and Atmospheric Administration
OPR	Office of Protected Resources
OSP	Optimum Sustainable Population
OW	otariid in water
PAMP	Port of Alaska Modernization Program
PCT	Petroleum and Cement Terminal
POA	Don Young Port of Alaska
POL1	Petroleum, Oil, and Lubricants Terminal 1
POL2	Petroleum, Oil, and Lubricants Terminal 2
PSO	Protected Species Observers
PW	phocid in water
RMS	root mean square
SAR	Stock Assessment Report
SEL	sound exposure level
SEL_{cum}	cumulative sound exposure levels
SFA	Sustainable Fisheries Act
SFD	South Floating Dock
SPL	sound pressure level
SSL	sound source level
T&E	threatened and endangered
TL	transmission loss

TPP	Test Pile Program
TTS	temporary threshold shift
UME	Unusual Mortality Event
U.S.	United States
USACE	U.S. Army Corps of Engineers
U.S.C.	U.S. Code
USFWS	U.S. Fish and Wildlife Service

Chapter 1. Introduction and Purpose and Need

1.1 Introduction and Background

On 12 January 2023, the National Marine Fisheries Service (NMFS) received an initial application from the Don Young Port of Alaska (POA) requesting authorization to take[1] small numbers of marine mammals, by Level A and Level B harassment. Potential take may occur incidental to construction of the Cargo Terminals Replacement (CTR) Project near the existing port facility in Anchorage, located in Knik Arm in upper Cook Inlet, Alaska. NMFS received revised applications from the POA on 13 October 2023. NMFS deemed the application adequate and complete on 12 February 2024. A minor modification to project schedule was received on 23 May 2024; the changes did not affect NMFS' analysis and determinations.

NMFS is required to review applications and, if appropriate, issue Incidental Take Authorizations (ITAs) pursuant to the Marine Mammal Protection Act of 1972, as amended (MMPA; Title 16 of the United States Code [U.S.C.] 1361 et seq.). An authorization for incidental take of marine mammals shall be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s) and would not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses (where relevant). NMFS evaluated the POA's request, and has proposed Incidental Take Regulations for the first five years of in-water construction for the project. The anticipated total timeline for the project is six years. The remaining work (year 6) may be considered under a separate Incidental Harassment Authorization (IHA) application that would incorporate additional information from the first five years, and would be submitted during year 4 or year 5. NMFS criteria for determining whether to grant or deny an applicant's request are explained in this chapter; and detailed information is available at https://www.fisheries.noaa.gov/topic/laws-policies/marine-mammal-protection-act.

The National Environmental Policy Act (NEPA), 42 U.S.C. 4321 et seq. (2024), the 2020 Council on Environmental Quality (CEQ) Regulations as modified by the Phase I 2022 revisions (40 Code of Federal Regulations [CFR] 1500–1508 [2022], 87 Federal Register 23453),[2] and National Oceanic and Atmospheric and Administration (NOAA) policy and procedures[3] each requires all proposals for major federal actions to be reviewed with respect to environmental consequences on the human environment. NMFS' consideration of whether to promulgate incidental take regulations and issue a Letter of Authorization (LOA) to the POA authorizing take of marine mammals, consistent with provisions under the MMPA and incidental to the applicant's lawful activities, is a major federal action. NMFS determined that an Environmental Assessment (EA) was the appropriate level of NEPA analysis for this action.

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

---

[1] The term "take" under the MMPA means "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal" (16 U.S.C. 1362 (13)).

[2] This EA applies CEQ's Phase 1 NEPA regulations because review of this proposed action began on 12 February 2024, which preceded the effective date of CEQ's Phase 2 NEPA regulations (July 1, 2024)."

[3] NOAA Administrative Order (NAO) 216-6A, "Compliance with the National Environmental Policy Act, Executive Orders 12114, Environmental Effects Abroad of Major Federal Actions; l1988 and 13690, Floodplain Management and 11990, Protection of Wetlands," issued 22 April 2016, and the Companion Manual for NAO 216-6A, "Policy and Procedures for Implementing the National Environmental Policy Act and Related Authorities," issued 13 January 2017.

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

1.2 Marine Mammal Protection Act Overview

Section 101(a) of the MMPA (16 U.S.C. 1361) prohibits persons or vessels subject to the jurisdiction of the United States from taking any marine mammal in waters or on lands under the jurisdiction of the United States or on the high seas (16 U.S.C. 1372(a)(l) and (a)(2)). Sections 101(a)(5)(A) and (D) of the MMPA provide exceptions to the prohibition on take, which give NMFS (and U.S. Fish and Wildlife Service [USFWS], depending on the species) the authority to authorize the incidental but not intentional take of small numbers of marine mammals, provided certain findings are made and statutory and regulatory procedures are met. Incidental take of a marine mammal can be classified as mortality, serious injury, or harassment.[4] ITAs may be issued as either (1) regulations with an associated LOA or (2) an IHA. LOAs may be issued for a maximum period of five years and IHAs may be issued for a maximum period of one year and may only authorize incidental take by harassment. Detailed information about the MMPA is available at https://www.fisheries.noaa.gov/topic/laws-policies/marine-mammal-protection-act.

NMFS promulgated regulations to implement the provisions of the MMPA governing the taking and importing of marine mammals (see 50 CFR Part 216) and published application instructions that prescribe the procedures necessary to apply for ITAs. U.S. citizens and entities such as the POA, seeking to obtain authorization for the incidental take of marine mammals under NMFS jurisdiction[5] must comply with these regulations and application instructions in addition to the provisions of the MMPA. Information on the NMFS implementing regulations and application process is available at https://www.fisheries.noaa.gov/national/marine-mammal-protection/apply-incidental-take-authorization.

Once NMFS determines an application is adequate and complete, it has a corresponding duty to determine whether and how to authorize take of marine mammals incidental to the activities described in the application. To authorize the incidental take of marine mammals, NMFS must determine, using the best available science, that the taking would be of small numbers of a species or stock, would have a negligible impact on the affected marine mammal species or stocks, and would not have an unmitigable impact on the availability of such stocks for subsistence uses. NMFS must also prescribe the "means of effecting the least practicable adverse impact" on the affected species or stocks and their habitat,[6] and on the availability of those species or stocks for subsistence uses, as well as monitoring and reporting requirements.

---

[4] Except with respect to certain activities not pertinent here, 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) per 50 CFR 216.3.

[5] NMFS has jurisdiction over most marine species, (e.g., marine mammals and pinnipeds).

[6] Habitat includes rookeries, mating grounds, and other areas of similar significance.

1.2.1 Required Mitigation

In accordance with the MMPA, NMFS must prescribe, in the final rule, the means of effecting the least practicable adverse impact on the species or stocks of marine mammals and their habitat. To do so, NMFS considers an applicant's proposed mitigation measures and assesses how such measures could benefit the affected species or stocks and their habitat. NMFS' evaluation of potential measures includes consideration of the following factors in relation to one another: (1) the manner in which and the degree to which NMFS expects the successful implementation of the measure to minimize adverse impacts to marine mammals; (2) the proven or likely efficacy of the specific measure to minimize adverse impacts as planned; and (3) the practicability of the measure for applicant implementation.

Though any mitigation must be evaluated in the context of the specific activity and the species or stocks affected, measures with the following types of goals are often applied to reduce the likelihood or severity of adverse species- or stock-level impacts:

- Avoidance or minimization of marine mammal injury, serious injury, or death whenever possible;
- Reduction in the number of marine mammals taken (total number or number at a biologically important time or location);
- Reduction in the number of times the activity takes individual marine mammals (total number or number at a biologically important time or location);
- Reduction in the degree of effect of the anticipated takes (either total number or number at a biologically important time or location);
- Avoidance or minimization of adverse effects to marine mammal habitat, paying special attention to the food base, activities that block or limit passage to or from biologically important areas, permanent destruction of habitat, or temporary destruction/disturbance of habitat during a biologically important time; and
- For monitoring related directly to mitigation, an increase in the probability of detecting marine mammals, thus allowing for more effective implementation of the mitigation.

Mitigating adverse effects to marine mammals is intended to reduce the likelihood that the activity will result in energetic or other types of impacts that are more likely to result in reduced recruitment or survivorship. It is also important to consider the degree of impacts that were expected in the absence of mitigation in order to assess the benefits of any potential measures. Finally, because the least practicable adverse impact standard authorizes NMFS to weigh a variety of factors when evaluating appropriate mitigation measures, it does not compel mitigation for every kind of individual take, even when practicable for implementation by the applicant (16 U.S.C. 1361 § 101(a)(5)(A)(i)(II)(aa); 16 U.S.C. 1361 § 101(a)(5)(D)(ii)(I)) .

In their application, the POA proposed several avoidance, minimization, and mitigation measures, outlined in Section 2.2.3.2 of this EA, which would apply to all marine mammals analyzed for potential take with the proposed POA CTR action. After discussions with the POA, NMFS proposed additional mitigation measures. These measures are discussed in detail in the notice of the proposed rule (89 *Federal Register* [FR] 85686, 28 October 2024) and in Section 2.2.3.2 of this EA. Through the MMPA rulemaking process, NMFS evaluates whether the proposed measures would constitute affecting the least practicable adverse impact. The final rule, if promulgated, would contain mitigation requirements developed through the consultation and authorization processes and summarized in the Final EA; if applicable, these monitoring requirements would also be applied to any subsequent IHA considered for the CTR project.

1.2.2 Required Monitoring and Reporting

In order to issue an LOA or 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 in the proposed action area. Effective reporting is critical to compliance as well as to 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:

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

(2) Nature, scope, or context of likely marine mammal exposure to potential stressors/impacts (individual or cumulative, acute or chronic), through better understanding of:

   a. Action or environment (*e.g.,* source characterization, propagation, ambient noise);

   b. Affected species (*e.g.,* life history, dive patterns);

   c. Co-occurrence of marine mammal species with the action; or

   d. Biological or behavioral context of exposure (*e.g.,* age, calving or feeding areas).

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

(4) How anticipated responses to stressors impact either:

   a. Long-term fitness and survival of individual marine mammals; or

   b. Populations, species, or stocks.

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

(6) Mitigation and monitoring effectiveness.

In their application, the POA proposed several monitoring and reporting measures, outlined in Section 2.2.3.1 of this EA, which would apply to all marine mammals. General monitoring plan criteria are also discussed in Section 13 of the CTR Project LOA and IHA application and the FRN of the proposed rule (89 FR 85686, 28 October 2024). Additional information is found in the Marine Mammal Monitoring and Mitigation Plan in Appendix B of the LOA and IHA application (available at *https://www.fisheries.noaa.gov/action/incidental-take-authorization-port-alaskas-construction-activities-port-alaska-modernization*). The final rule would contain the monitoring and reporting requirements developed through the consultation and authorization processes and summarized in the Final EA.

1.3 Summary of the Applicant's Incidental Take Authorization Request

The POA, located in Anchorage, Alaska, in Knik Arm in upper Cook Inlet, provides critical infrastructure for the citizens of Anchorage and a majority of the residents of Alaska. Marine-side infrastructure and facilities at the POA were constructed largely in the 1960s and are in need of replacement because they are substantially past their design life and in poor and deteriorating structural condition. To address these deficiencies, the POA is modernizing its marine terminals through the Port of Alaska Modernization

Program (PAMP) to enable safe, reliable, and cost-effective port operations. The PAMP would support infrastructure resiliency in the event of a catastrophic natural disaster over a 75-year design life. The projects associated with the PAMP each have independent utility and therefore require separate authorizations from NMFS. PAMP projects include:

- **Phase 1:** Petroleum and Cement Terminal (PCT) and South Floating Dock (SFD) Replacement (completed in 2022)
- **Phase 2A:** North Extension Stabilization Step 1 (NES1) (upland construction began in 2023 and in-water work began in 2024)
- **Phase 2B:** General Cargo Terminals Replacement (this Project; slated to begin construction in 2025)
- **Phase 3:** Replacement of Petroleum, Oil, and Lubricants Terminal 2 (POL2)
- **Phase 4:** North Extension Stabilization Step 2 (NES2)
- **Phase 5:** Demolition of Terminal 3

IHAs were issued by NMFS for both the PCT project (85 FR 19294, 06 April 2020) and SFD project (86 FR 50057, 07 September 2021) associated with Phase 1, completed in 2022 . NMFS issued an IHA for Phase 2A of the project, the NES1 project in January 2024 (89 FR 2382, 16 January 2024). The project discussed herein, CTR, is Phase 2B of the PAMP. This EA has been prepared to support the POA's request for a rulemaking for the CTR, for the LOAs for the first 5 years of construction, and for an anticipated request for an IHA for the potential sixth year of in-water activities for CTR.

The CTR is urgently needed due to severe corrosion of the foundation piles and deteriorating structural conditions at Terminals 1, 2, and 3. The existing terminals are more than 50 years old and suffer from severe damage to the foundation piles caused by corrosion and seismic forces. The piles have exceeded their useful service life, and multiple engineering investigations have highlighted the probability of wharf and trestle structure failure during a future major seismic event. The remaining service life of the cargo terminals is unknown. These facilities must be replaced with new resilient terminals for the POA to continue to meet its critical role serving Anchorage and the state of Alaska's general cargo needs, as well as to support national defense and military readiness capabilities.

The CTR Project would be completed in five distinct steps over the course of seven years, with six years of in-water work and an additional one year of landside work. These steps include: shoreline stabilization, shoreline expansion and protection, general cargo terminals construction, demolition of existing terminals (Petroleum, Oil, and Lubricants Terminal 1 [POL1] and Terminals 1, 2, and 3), and onshore utilities and storm drain outfall replacement. The in-water work for this Project would take place over six years, and therefore the POA requests a rulemaking and LOAs that are valid for 5 years, from 01 April 2026 through 31 March 2031. POA may request an IHA for the sixth year, which NMFS will evaluate and consider at that time. Landside construction work is scheduled to begin in 2025, including ground improvements and shoreline stabilization. This work is not expected to cause disturbance to marine mammals under the MMPA.

Proposed activities included as part of the CTR Project with potential to affect marine mammals in the waterways adjacent to the POA include in-water vibratory installation and removal of 36-inch (in) (91 centimeter (cm)) temporary stability template piles, and vibratory and impact installation of 72- and 144-in (183- and 366-cm) permanent piles.

1.4 Purpose and Need

1.4.1 Description of Proposed Action

NMFS proposes to promulgate take regulations and issue an LOA for five years of CTR in-water activities pursuant to Section 101(a)(5)(D) of the MMPA and 50 CFR 216. POA may apply for an IHA after the initial LOA and NMFS would consider issuing that IHA then . The LOA would be valid for five consecutive years total upon issuance. Any subsequent IHA for the CTR project would be valid for one year upon issuance, but may be renewed for an additional year as long as the applicant satisfies certain conditions and requirements. The LOA and IHA(s), if issued, would authorize potential take of small numbers of seven species of marine mammals by Level B harassment, and five of the seven species by Level A harassment. Potential take may occur incidental to vibratory and impact pile installation and pile removal associated with the construction of the CTR Project. No serious injury or mortality is anticipated or would be authorized. NMFS' proposed action (*i.e.,* issuance of the LOA and or IHA) is a direct outcome of the POA requesting an authorization to take small numbers of marine mammals incidental to CTR construction activities. Additional details about NMFS' proposed action are provided in the notice of the proposed rule (89 FR 85686, 28 October 2024). The proposed rule does not permit or authorize the POA's CTR Project activities, only the potential take of marine mammals incidental to those activities.

1.4.2 Purpose

The purpose of NMFS' proposed action, which is a direct outcome of POA's request for authorization to take marine mammals incidental to specified activities associated with their project (pile driving), is to evaluate POA's request pursuant to specified requirements of the MMPA and its implementing regulations, consider impacts of POA's activities, and, if appropriate, issue the authorization.

The rule, if finalized, would provide an exemption to the POA from the take prohibitions contained in the MMPA. The purpose of NMFS' action is to evaluate the information in the POA's application pursuant to the MMPA and 50 CFR 216 and issue the requested ITA, if appropriate.

1.4.3 Need

Once NMFS determines that an application for incidental take is adequate and complete, NMFS has a corresponding duty to determine whether, and how, to authorize take of marine mammals incidental to the activities described in the application. On February 12, 2024, NMFS determined that the POA submitted an adequate and complete application demonstrating the need and potential eligibility for an LOA under the MMPA.NMFS' responsibilities under Section 101(a)(5)(D) of the MMPA and its implementing regulations, to consider the impacts of authorizing the requested take on marine mammals and their habitat, establish and frame the need for NMFS' proposed action.

1.5 Environmental Review Process and Background

Under NEPA, federal agencies are required to examine the environmental impacts of their proposed actions within the United States. and its territories. Major federal actions include activities that federal agencies fully or partially fund, regulate, conduct, or approve. NMFS' issuance of an LOA and IHA(s) to the POA is considered a major federal action subject to NEPA. Therefore, NMFS is analyzing the potential environmental effects associated with authorizing incidental takes of marine mammals in this EA.

1.5.1 Scoping and Public Involvement

NMFS relies substantially on the public process required by the MMPA for proposed ITAs, to develop and evaluate relevant environmental information and provide a meaningful opportunity for public participation when NMFS prepares NEPA documents. NMFS considers public comments received in response to the publication of the proposed ITA during the NEPA review process.

Concurrent with publication of this Draft EA, NMFS is also publishing a notice of the proposed rule for the ITRs in the *Federal Register* for review and comment. There, NMFS alerts the public that it intends to use the MMPA public review process to solicit relevant environmental information and provide the public an opportunity to submit comments. NMFS alerts the public that the Draft EA is available on the internet within the notice of the proposed rule for the ITR.

The FRN of the proposed rule for the ITR, the Draft EA, and the corresponding public comment period are instrumental in providing the public with information regarding relevant environmental issues and offering the public a meaningful opportunity to provide comments for our consideration in both the MMPA and NEPA processes.

NMFS shall accept public comments during the 30-day period advertised in the FRN. A detailed summary of the comments, and NMFS' responses to those comments, will be included in the Final EA as well as the FRN for the final rule.

1.5.2 Compliance with Other Environmental Laws or Consultations

NMFS must comply with all applicable federal environmental laws and regulations necessary to implement a proposed action. NMFS' evaluation of and compliance with environmental laws and regulations is based on the nature and location of the applicant's proposed activities and NMFS' Proposed Action. Therefore, this section summarizes only environmental laws and consultations applicable to NMFS' proposed issuance of an LOA and possible subsequent IHA to the POA.

1.5.2.1 The Endangered Species Act

The Endangered Species Act (ESA) (16 U.S.C. 1531 et seq.) establishes a national policy for conserving threatened and endangered (T&E) species of fish, wildlife, plants, and the habitat they depend on. NMFS and USFWS administer the ESA and are responsible for listing a species as T&E, designating critical habitat,[7] developing and implementing protective regulations and recovery plans,[8] and undertaking several other management and conservation efforts pursuant to the ESA. Other management and conservation efforts include monitoring and evaluating the status of listed species, candidate species[9] or species proposed for listing,[10] and recently delisted species as well as consulting on federal actions that may affect a listed species or its designated critical habitat. The ESA generally prohibits the "take"[11] of an

[7] Critical habitat is a specific area within a geographical area occupied by the species at the time of listing that has physical or biological features essential to conservation of the species and that may require special management considerations or protection and specific areas outside the geographical area occupied by the species if the agency determines that the area itself is essential for conservation.

[8] Section 4(f) of the ESA directs NMFS to develop and implement recovery plans for T&E species. Each species has different needs and requires different conservation strategies to achieve recovery. Recovery is the process of restoring listed species and their ecosystems to the point that they no longer require ESA protections. A key role of NMFS in recovering species is to set goals for each species' recovery comeback through the development of recovery plans.

[9] Candidate species are species in the listing petition and for which NMFS determined the listing is warranted pursuant to Section 4(b)(3)(a) of the ESA. Per 71 FR 61022, candidate species also include species that are not the subject of a petition but for which NMFS announced initiation of a status review of the species.

[10] Species proposed for listing are those candidate species found to warrant listing as threatened or endangered and officially proposed for listing in the *Federal Register* after completion of a status review. A public comment period is associated with NMFS' proposal to list a species as threatened or endangered, and NMFS generally has 1 year after a species is proposed for listing to make a final determination whether to list a species as threatened or endangered.

[11] Take, as defined in Section 3 of the ESA, means to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct."

ESA species listed as endangered unless an exception or exemption applies. NMFS extended the “take” prohibition to ESA-listed threatened species under its jurisdiction through promulgation of protective rules. However, as discussed below, federal agencies and applicants for federal permits may receive exemption from incidental take through the Section 7 consultation process. Section 7(a)(2) of the ESA requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of T&E species, or adversely modify or destroy their designated critical habitat. Formal consultation with NMFS and USFWS is required unless exceptions per 50 CFR 402.14(b) apply.

When a federal action agency determines, through a Biological Assessment (BA) or other review, that an action is likely to adversely affect a listed species or result in the destruction or adverse modification of critical habitat, the federal action agency initiates the formal consultation process by submitting a request for formal consultation to the consulting agency (see 50 CFR 402.14). Section 7(b)(3) of the ESA requires that at the conclusion of formal consultation, the consulting agency provides an opinion stating whether the federal action agency’s action is likely to jeopardize ESA-listed species or destroy or adversely modify designated critical habitat. A similar opinion is included for proposed species or proposed critical habitat if either or both were part of the consultation. If the consulting agency determines the action is likely to jeopardize ESA-listed species or destroy or adversely modify critical habitat, they then provide a reasonable and prudent alternative that may allow the action to proceed in compliance with Section 7(a)(2) of the ESA. If a federal action will cause incidental take and is reasonably certain to occur and certain conditions are met, Section 7(b)(4) of the ESA requires the consulting agency to provide an Incidental Take Statement (ITS) that specifies the impact of any incidental taking and includes mandatory reasonable and prudent measures to avoid, minimize, and mitigate such impacts and terms and conditions to implement the reasonable and prudent measures. An agency or applicant’s compliance with these measures exempts the incidental take from the ESA take prohibition.

Marine mammals under NMFS’ jurisdiction that are listed as T&E under the ESA with confirmed or possible occurrence in the proposed Project area (*i.e.,* upper Cook Inlet) are the Cook Inlet Distinct Population Segment (DPS) of beluga whales (*Delphinapterus leucas*); the Western DPS of Steller sea lions (*Eumetopias jubatus*); and the Mexico DPS and Western North Pacific DPS of humpback whales (*Megaptera novaeangliae*). Although critical habitat for the Cook Inlet beluga exists in Cook Inlet, the area around the CTR Project site is within the Beluga Critical Habitat Exclusion Area (see Figure 3-1 in Section 3.2.1) (76 FR 20180).

NMFS Office of Protected Resources’ (OPR’s) issuance of an LOA or IHA is a federal action subject to the requirements of Section 7 of the ESA. As a result, NMFS OPR is required to consult and ensure the issuance of the LOA and IHA to the POA is not likely to jeopardize the continued existence of any T&E species or result in the destruction or adverse modification of designated critical habitat for these species. On 22 October 2024, the NMFS OPR requested a Section 7 consultation with the NMFS Alaska Regional Office (AKRO) on the proposed issuance of an ITR to the POA. Formal consultation between NMFS OPR and AKRO will conclude with the issuance of a Biological Opinion (BiOp) regarding the potential for NMFS’ Proposed Action to jeopardize the continued existence or recovery of the Cook Inlet beluga, the Mexico DPS and Western North Pacific DPS of humpback whales, and the Western DPS of Steller sea lions. This determination will be made based on review of the status of the ESA-listed species, the environmental baseline within the action area, and the effects of the Proposed Action as well as effects of interrelated and interdependent actions and cumulative effects.

1.5.2.2 Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) was enacted to address impacts to fisheries on the U.S. continental shelf. It established U.S. fishery management over fishes within the Fishery Conservation Zone from the seaward boundary of the coastal states out to 200 nautical miles (*i.e.,* the boundary of the U.S. Exclusive Economic Zone [EEZ]). In 1996, Congress enacted amendments to the MSFCMA, known as the Sustainable Fisheries Act (SFA) of 1996 (Public Law 104-297), to address substantially reduced fish stocks resulting from direct and indirect habitat loss. Under the MSFCMA, federal agencies are required to consult with the Secretary of Commerce with respect to any action authorized, funded, or undertaken or proposed to be authorized, funded, or undertaken, by such agency that may adversely affect essential fish habitat (EFH) identified under the MSFCMA. EFH is defined as the waters and substrate necessary to fishes or invertebrates for spawning, breeding, feeding, and growth to maturity. Areas designated as EFH contain habitat essential to the long-term survival and health of U.S. fisheries. This typically includes aquatic areas and their associated physical, chemical, and biological properties used by fish, and may include areas historically used by fish. Substrate types include sediment, hard bottom, structures underlying the waters, and associated biological communities. NMFS recommends consolidated EFH consultations with interagency coordination procedures required by other statutes such as NEPA or the ESA (50 CFR 600.920(e)(1)) to reduce duplication and improve efficiency. If an action may adversely affect EFH, the applicant must consult with NMFS to identify conservation measures to minimize or avoid adverse impacts. If NMFS identifies conservation measures, the applicant must determine whether it will implement them and provide a formal response if it fails to do so.

The North Pacific Fishery Management Council has identified estuarine and marine waters in the vicinity of the POA as EFH for Chinook (*Oncorhynchus tshawytscha*), chum (*O. keta*), coho (*O. kisutch*), sockeye (*O. nerka*), and pink (*O. gorbuscha*) salmon (NPFMC 2021). Marine EFH for Pacific salmon (*Oncorhynchus* spp.) in Alaska includes all estuarine and marine areas used by Pacific salmon of Alaska origin, extending from the influence of tidewater and tidally submerged habitats to the limits of the U.S. EEZ (NPFMC 2016).

Eulachon (*Thaleichthys pacificus*), longfin smelt (*Spirinchus thaleichthys*), and low numbers of Pacific cod (*Gadus macrocephalus*), walleye pollock (*Theragra chalcogramma*), Pacific herring (*Clupea pallasii*), and Pacific staghorn sculpin (*Leptocottus armatusspecies*) have also been captured in upper Cook Inlet (Houghton *et al.* 2005; NMFS 2016a). Based on available general distribution data, estuarine and marine waters in the POA's vicinity are designated as EFH for Pacific cod, walleye pollock, sablefish (*Anoplopoma fimbria*), yellowfin sole (*Limanda aspera*), northern rock sole (*Lepidopsetta polyxystra*), southern rock sole (*L. billineta*), Alaska plaice (*Pleuronectes quadrituberculatus*), rex sole (*Glyptocephalus zachirus*), and flathead sole (*Hippoglossoides elassodon*) larvae and Alaska plaice and dover sole (*Microstomus pacificus*) eggs, all of which may occur in summer; and adult Kamchatka flounder (*Atheresthes evermanni*), which may occur in spring (NPFMC 2020; NMFS 2022b). Available data are insufficient to identify EFH for species in the forage fish complex (*e.g.,* eulachon) (Matt Eagleton, personal communication, 01 September 2016; NPFMC 2020). In addition, streams, lakes, ponds, wetlands, and other water bodies that support Pacific salmon, as identified by the Alaska Department of Fish and Game (ADF&G) *Anadromous Waters Catalog* (Giefer and Blossom 2020), are considered freshwater EFH for Pacific salmon.

Under the 2017 Office of Habitat Conservation guidance on EFH and ITAs, NMFS has determined that the issuance of the ITR will not result in adverse impacts to EFH and, further, that it will not require separate consultation per Section 305(B)(2) of the MSFCMA as amended by the SFA (Public Law 104-267). While an EFH consultation is not being carried out specifically for the ITA issuance, POA and the USACOE are coordinating with NMFS to conduct an EFH consultation for the construction actions.

1.6 Document Scope

This EA addresses potential impacts on marine mammals and their habitat resulting from NMFS' proposed action to authorize incidental take associated with the vibratory pile installation and vibratory and impact pile removal activities proposed by the POA for the CTR Project. Under the 2022 revised

CEQ NEPA regulations, effects or impacts are considered synonymous(40 CFR 1508.1(g))[12] . Section 4.1 of this EA describes how impacts are assessed. Any effect evaluated in this analysis has been determined to be reasonably foreseeable. However, the scope of this analysis is limited to the decision for which NMFS is responsible (*i.e.,* whether to issue the LOA and IHA). This EA is intended to provide focused information on the primary issues and impacts of environmental concern, which include NMFS' issuance of the LOA and IHA authorizing the take of marine mammals incidental to the POA's pile installation and removal activities (including vibratory and impact installation and removal), and the mitigation and monitoring measures to minimize the effects of that take. For these reasons, this EA does not provide a detailed evaluation of the effects on the elements of the human environment listed in Table 1-1.

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

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

[12] The regulatory definition of effects or impacts are defined as: changes to the human environment from the proposed action or alternatives that are reasonably foreseeable and include (1) direct effects, which are caused by the action and occur at the same time and place; (2) indirect effects, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable; (3) cumulative effects, which are effects on the environment that result from the incremental effects of the action when added to the effects of other past, present, and reasonably foreseeable actions regardless of what agency (federal or non-federal) or person undertakes such other actions; and also reads, "Effects include ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative. Effects may also include those resulting from actions which may have both beneficial and detrimental effects, even if on balance the agency believes that the effects will be beneficial."

Chapter 2. Alternatives

As described in Chapter 1, the NMFS Proposed Action is to issue incidental take regulations and an associated LOA to the POA to authorize the take of small numbers of marine mammals incidental to the POA proposal to construct the CTR Project in Anchorage Alaska, located in Knik Arm in upper Cook Inlet. NMFS' Proposed Action is triggered by the POA's request for the LOA per the MMPA (16 U.S.C. 1361 et seq.). In accordance with NEPA, NMFS is required to consider a reasonable range of alternatives to a proposed action as well as a No Action Alternative. Reasonable alternatives means a reasonable range of alternatives that are technically and economically feasible and meet the purpose and need for the proposed action (40 CFR 1508.1(z)). The evaluation of alternatives under NEPA assists NMFS with understanding and, as appropriate, minimizing impacts through an assessment of alternative ways to achieve the purpose and need for its proposed action. Reasonable alternatives are carried forward for detailed evaluation under NEPA, while alternatives considered but determined not to meet the purpose and need are not carried forward. For the purposes of this EA, an alternative will meet the purpose and need only if it satisfies the requirements of Section 101(a)(5)(D) of the MMPA. Therefore, NMFS applied the screening criteria and considerations outlined in Section 2.1 to the alternatives to identify which alternatives to carry forward for analysis. Accordingly, an alternative must meet these criteria to be considered "reasonable."

2.1 Criteria and Considerations for Selecting Alternatives

Per Section 101(a)(5)(D) of the MMPA, NMFS must set forth the permissible methods of taking pursuant to such activity, and other means of effecting the least practicable adverse impact on such species or stock and its habitat. While NMFS does not have a regulatory definition for the least practicable adverse impact, it is considered to satisfy paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of such species or stock for taking for certain subsistence uses (50 CFR 216.102(b)).

NMFS' implementing regulations require applicants to include information about the "availability and feasibility (economic and technological) of equipment, methods, and manner of conducting such activity or other means of effecting the least practicable adverse impact upon the affected species or stocks and their habitat" (50 CFR 216.104(a)(11)). In evaluating how mitigation may or may not be appropriate to ensure the least practicable adverse impact on species or stocks and their habitat, NMFS carefully considered two primary factors of practicability and reducing impacts to marine mammal species or stocks, as described above.

While the language of the least practicable adverse impact standard calls for minimizing impacts to affected species and stocks, NMFS recognizes that the reduction of impacts to those species or stocks accrues through the application of mitigation measures that limit impacts on individual animals. Accordingly, our analysis focuses on measures designed to avoid or minimize impacts to marine mammals from activities that are likely to increase the probability or severity of population-level effects, including auditory injury or disruption of important behaviors, such as foraging, breeding, or mother/calf interactions. To satisfy the MMPA's least practicable adverse impact standard, NMFS proposes a suite of basic mitigation protocols that are required regardless of the status of a stock. Additional or enhanced protections are proposed for species whose stocks are in poor health and/or are subject to some significant additional stressor that lessens that stock's ability to weather the effects of the specified activity without worsening its status.

2.2 Description of the Applicant's Specified Activities

2.2.1 Specified Geographic Area

The POA is located in the industrial waterfront of Anchorage, Alaska, in Knik Arm in upper Cook Inlet (Figure 2-1). The Project site is located in Township 13 North, Range 3 West, Seward Meridian; U.S. Geological Survey Quadrangle Map Anchorage A-8; Latitude 61° 15' North, Longitude 149° 52' West. The POA's boundaries currently occupy an area of approximately 129 acres. The perpendicular distance to the western bank directly across Knik Arm from the POA is approximately 4.2 kilometers (km) (2.6 miles).

Figure 2-1. POA location in Anchorage, Alaska, in Knik Arm in upper Cook Inlet, including the proposed CTR Project area

2.2.2 Applicant's Proposed Project

The purpose of the CTR Project is to replace the existing general cargo docks. The Project would address deteriorating conditions of the existing cargo facilities; improve operational safety and efficiency; accommodate modern (existing and future) shipping operations; and improve the resiliency of the POA to extreme seismic events, all while sustaining ongoing cargo operations.

This Project is urgently needed due to severe corrosion of the foundation piles and deteriorating structural conditions at Terminals 1, 2, and 3. The existing terminals are more than 50 years old and suffer from severe damage to the foundation piles caused by corrosion and seismic forces. The piles have exceeded their useful service life, and multiple engineering investigations have highlighted the probability of wharf and trestle structure failure during a future major seismic event. The remaining service life of the cargo terminals is unknown. These facilities must be replaced with new, resilient terminals for the Port to continue to meet its critical role serving Anchorage and the state of Alaska's general cargo needs as well as supporting national defense and military readiness capabilities.

The geographical isolation of Alaska and the POA's role as the containerized logistic hub and distribution center for much of the state make the cargo terminals a critical lifeline for the Southcentral region of Alaska, as well as the rest of the state. There are no other ports with the cargo capacity, proximity to Alaska's population centers, and intermodal transportation capabilities that can support the logistic missions sustained by the POA, which include commerce, national defense, and earthquake resilience/disaster response and recovery.

2.2.2.1 CTR Project Activities

The POA's boundaries currently occupy an area of approximately 129 acres. Other commercial and industrial activities related to secured maritime operations are located near the POA on Alaska Railroad Corporation (ARRC) property immediately south of the POA, on approximately 111 acres. The new T1 and T2 southernmost ends would be approximately 1.4 km (0.9 mi) north of Ship Creek, a location of heightened marine mammal activity during seasonal runs of several salmon species.
Construction of the Project would include completion of the following components:

- Component 1. Ground improvement shoreline stabilization
- Component 2. Shoreline expansion and protection
- Component 3. General cargo terminals (new Terminals 1 and 2) construction
- Component 4. Demolition of existing terminals (POL1 and general cargo terminals [existing Terminals 1, 2, and 3])
- Component 5. Onshore utilities and storm drain outfall replacement

Of these activities, only Components 3 and 4 include construction work that would occur in the water and therefore these would be the only components of the project expected to potentially impact marine mammals.

New terminals T1 and T2 would be constructed as seismically resilient adjoining terminals on a continuous berthline with mooring features and appurtenances as required to support safe ship mooring for lift-on/lift-off and roll-on/roll-off cargo handling operations. The new T1 wharf would be 870 ft x 120 ft (265- x 37-m) with two 36-ft-wide (11-m) trestles of varying length. The new T2 wharf would be 932 ft x 120 ft (284- x 37-m) with two 259-ft-long x 54-ft-wide (79- x 16.5-m) trestles and one 259-ft-long x 76-ft-wide (79- x 23-m) trestle. Both T1 and T2 would be constructed using 48- and 72-in-diameter (121- and 183-centimeter (cm), respectively) steel piles. The 48-in-diameter piles would be installed in the dry.

The total number of piles to be installed are included in Table 2-1, below. Two 144-in-diameter (366 cm) steel monopile mooring dolphins with associated mooring systems and access catwalks would be constructed: one on the south end of T1 and one on the north end of T2. Mooring dolphins, as their name implies, are used for mooring only and provide a place for a vessel to be secured by lines (ropes). Use of mooring dolphins helps control transverse and longitudinal movements of berthed vessels.

Both new terminals would be designed to accommodate lift-on/lift-off container operations serviced by rail-mounted ship-to-shore cranes. Structural, in-deck, and surface features to support operational interface for three 100-gauge rail mounted gantry cranes, and associated appurtenances along with an on-terminal combination stevedore-operations building would be included on the wharf. Additionally, T2 would be designed to support roll-on/roll-off container operations and other multi-purpose cargo functions. The reinforced concrete deck structure for both new terminals and all new access trestles would be designed to 1,000 pounds per square foot load capacity. Construction would also include installation of power, lighting, communications, and signal infrastructure to terminal and onshore electrically powered features; potable water service including ship's water; and fire-flow water for terminal-related operations. The on-terminal stevedore-operations building would also be constructed with a connection to the onshore, existing public utility infrastructure.

In addition to these permanent structures, temporary work including temporary pile installation and removal would be required to support construction. Temporary piles would likely be 36-in-diameter steel, and marine mammal take calculations are based on that pile size; however, 24-insteel piles may be used in place of some of the larger temporary piles. Various work boats and barges would be utilized and would be moored at or in the immediate vicinity of the Project.

During pile installation, it may become necessary to remove relic anode sleds. Old anode sleds are currently buried in the sediment behind the existing terminals. If an old sled is encountered in the footprint of a new pile to be installed, the anode sled would be excavated and removed. The excavated anode sled(s) would be hauled to an appropriate disposal location in an upland area. All other relic anode sleds would be abandoned in place.

Project component activities, locations, and approximate estimated quantities for 7 years (6 years of in-water construction) are summarized in Table 2-1, and each component is described in more detail below. For this Project, "in the dry" indicates a location that is above the high tide line or is in the intertidal zone but de-watered.

Table 2-1. Summary of Cargo Terminals Replacement Project Activities, Locations, and Quantities for 7 Years

Component Number	Type of Activity	Location	Size and Type	Total Amount or Number
1. Shoreline Stabilization				
	Placement of temporary construction work pads	In the dry In water	Granular fill and rock	61,100 cubic yards below HTL (3.6 acres)
	Ground Improvements	In the dry	Cementitious materials	Unknown
2. Shoreline Expansion and Protection				
	Excavation/dredging of silt	In the dry In water	Silt, granular fill, and rock	50,000 cubic yards
	Protect shoreline	In the dry	Granular fill and armor rock	60,000 cubic yards
3. General Cargo Terminals Construction				
	Installation of permanent piles	In water; in the dry	48-, 72-, and 144-in steel pipe piles	363 piles

Component Number	Type of Activity	Location	Size and Type	Total Amount or Number
	Installation of temporary piles	In water; in the dry	36-in steel pipe piles	674 piles
	Removal of temporary piles	In water; in the dry	36-in steel pipe piles	236 piles
	Install concrete pile caps, deck, and utilities	Above water	Concrete, steel	281,535 square ft
4. Demolition of Existing Terminals (POL1 and Terminals 1, 2, and 3)				
	Demolish and remove concrete pile caps, deck, and utilities	POL1 and T1	Concrete, steel	173,798 square ft
	Cut piles at mudline or leave in place	Above water	16- to 42-in steel pipe	1,508 piles
	Demolish and remove concrete pile caps, deck, and utilities	POL1 and T1	Concrete, steel	159,677 square ft
	Cut piles at mudline or leave in place	In water, in the dry	16- to 42-in steel pipe	1,525 piles
5. Onshore Utilities and Storm Drain Outfall Replacement				
	Addition of electrical, water, and gas pipes and conduit	Above water, on land	Concrete, steel pipes	Unknown
	Addition of drain pipes and manholes	Above water, on land	Concrete, steel pipes	Unknown
	Addition of outflow pipe through armor rock	In water	Concrete, steel pipes	4 outfalls

Notes: HTL = high tide line; POL1 = Petroleum, Oil, and Lubricants Terminal 1; T1 = Terminal 1; T2 = Terminal 2; T3 = Terminal 3.

Component 1. Ground Improvement Stabilization of the Shoreline

A ground improvement technique such as deep soil mixing or a similar technique would be used to stabilize the shoreline. Deep soil mixing and similar techniques mechanically mix weak soils with a cement binder, causing the soils to behave more like soft rock. This process is used to create foundations for buildings and roads and is used in earthquake-prone areas to prevent soil liquefaction. Liquefaction is a phenomenon that occurs when loosely packed water-logged sediments at or near the ground surface lose their strength in response to strong ground-shaking. Soil composition of the tidal flats adjacent to T1 and T2 exhibit potential for liquefaction and likelihood of large ground deformations during seismic events. Soil improvements at trestle abutments, and potentially between the abutments, would mitigate the potential for seismic-induced slope failure that could result in structural failure.

Construction would include installation of soil improvements in the five locations where the access trestles meet the beach to provide geotechnical stability to the embankment. Centered at each of the five trestle abutments, the ground improvement technique would create approximately 200- by 96-foot (61- by 29-m) blocks of treated soil extending from the surface to the top of the clay layer approximately 85 ft (25.9-m) deep (Figure 2-2). The size of the block is designed to create enough contact area with the clay layer to restrain and significantly reduce the overall ground movements of the liquefiable soils surrounding the trestle abutment. If deemed necessary for geotechnical stability, ground improvements would extend along the embankment in areas between the abutments.

The drilling process to conduct ground improvement would likely require containment and collection of the cement/soil slurry and spoils during construction. Drying beds would be constructed beyond the shoreline to contain the excess slurry until it can be disposed of off-site or incorporated into other portions of the Project. The drying beds would be removed once construction is completed.

During construction, a temporary soil work pad would be constructed at each of the five trestles to provide a level temporary work surface. The ground improvement panels/columns would extend approximately 100 ft (30.5 m) seaward and shoreward of the crest of the slope and approximately 30 ft (9 m) to either side of the trestle structure (Figure 2-2). Temporary armoring would protect the work pad from water forces while in use. After completion of the ground improvement work, the temporary construction work pads would be removed and the foreshore graded and armored. Placement of temporary work pads would take place on land or in the dry.

Ground improvement work would take place "in the dry," either above the high tide line or in the intertidal zone but de-watered. No impacts on marine mammals are anticipated from ground improvement work. Take of marine mammals from ground improvement work and placement of temporary work pads was not requested by POA in the incidental take application.

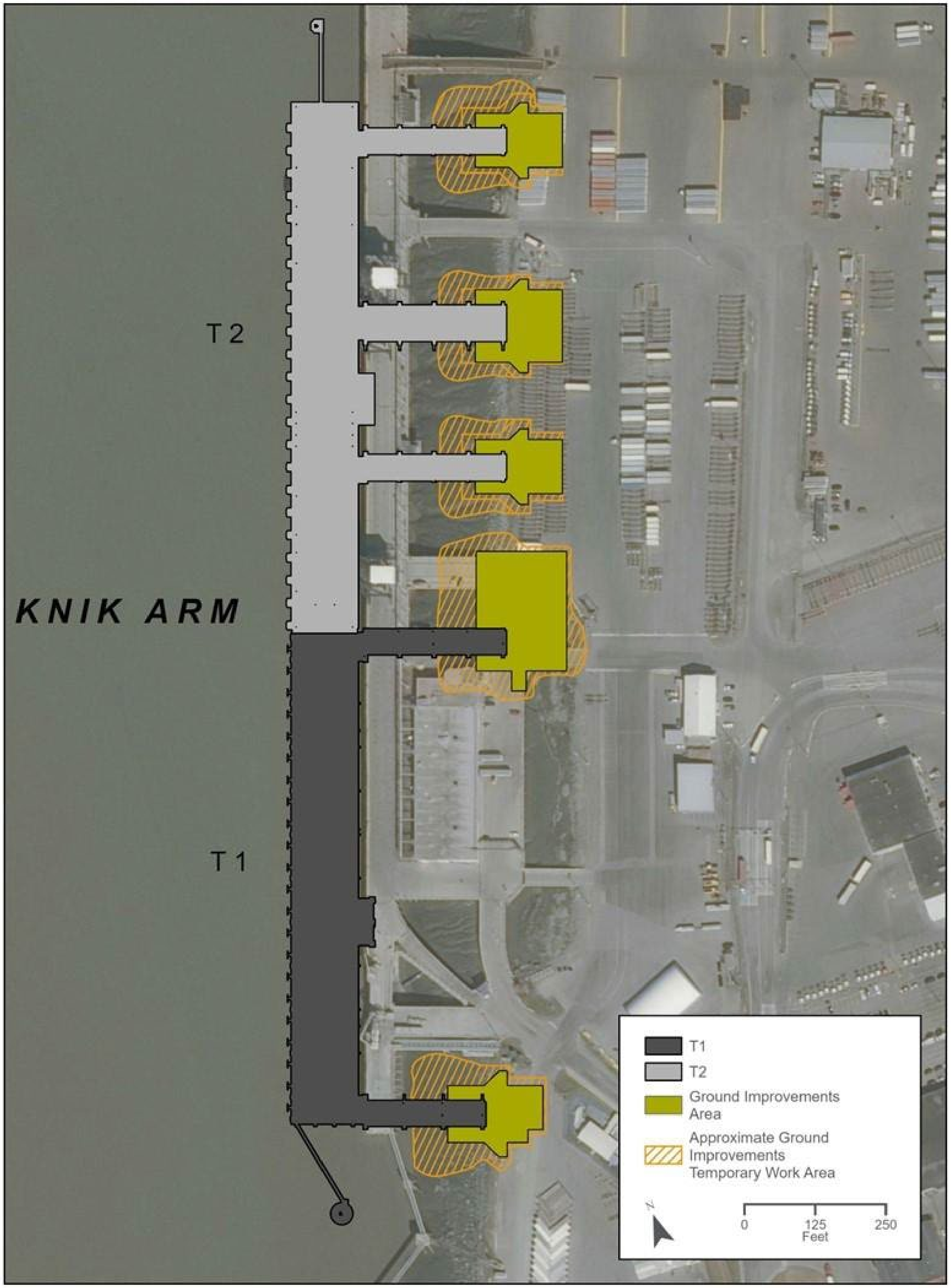

Figure 2-2. Component 1: Ground Improvement Locations and Approximate Areas

Component 2. Shoreline Expansion and Protection

The shoreline behind the existing Terminals 1, 2, and 3 is irregular, with two areas where the shoreline is located about 30 m to the east of the typical shoreline (Figure 2-3). Areas that are above the high-water line or below the tide line in a dewatered state would be excavated from the landward side to remove deposited silts before the areas are then filled with more dense, stable materials such as clean granular fill and rock. If the material is unable to be excavated in the dry, it would be dredged. The filled area would provide a consistent shoreline and additional container storage area. See Table 2-1 for estimated quantities.

After ground improvement work and shoreline expansion have been completed, the slope along the shore would be secured with armor stone placed over the clean granular and rock fill. Placement of armor rock requires good visibility of the shore, as each rock is placed carefully to interlock with surrounding armor rock. It is therefore anticipated that placement of most armor rock, filter rock, and granular fill would occur in the dry at low tide levels; however, some placement of armor rock, filter rock, and granular fill may occur in shallow water. After placement of armor rock, the top of the fill would be paved to match the existing backland pavements.

No impacts on marine mammals from expansion and protection of the shoreline, including excavation or dredging of silts and placement of granular fill, filter rock, and armor rock, are anticipated. Take of marine mammals from expansion and protection of the shoreline was therefore not requested by POA in the incidental take application.

Any project activities associated with fill would undergo a separate U.S. Army Corps of Engineers (USACE) permitting process and is not included in this evaluation or potential authorization of take.

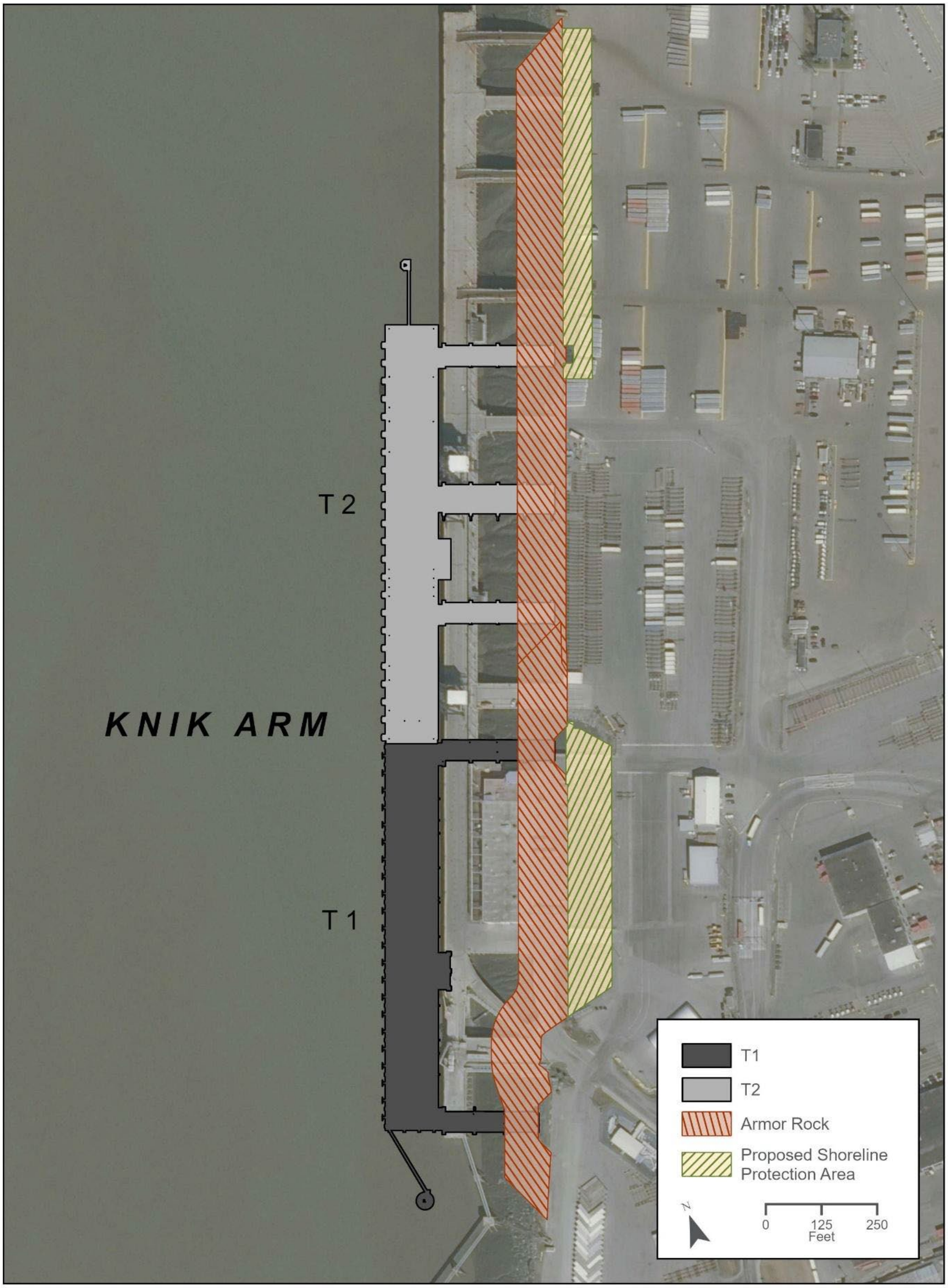

Figure 2-3. Component 2: Shoreline Expansion and Protection Areas

Component 3. General Cargo Terminals Construction

Two new cargo terminals would be constructed, T1 and T2, which include new wharves and access trestles (Figure 2-4). Pile installation and removal is anticipated to take place for over a six construction seasons, over a six-year period starting in 2026. A typical in-water construction season at the POA extends from approximately mid-April to mid-October (6 months) and may include November. Construction dates may change because of unexpected project delays, ongoing construction activities in other areas of the POA, timing of ice-out and spring breakup, and other factors.

Project design and construction methods have been modified to achieve the least practicable adverse impact on marine mammals (see Section 1.3, Avoidance and Minimization of Project Impacts). For example, the use of a bubble curtain during impact and vibratory installation of all permanent 72- and 144-in piles, and during vibratory installation and removal of temporary piles during months with historically higher beluga abundance (August through October), would likely reduce propagation of sound in the water (see Noise Mitigation for Pile Installation and Removal below). The POA is aware that August through October are months with high beluga abundance and plans to complete in-water work as early in the construction season as possible. The POA also recognizes that more work shutdowns for belugas are likely to take place in high abundance months, which provides incentive to complete work earlier in the season. This schedule is an estimate based on best available information and is not intended to be a limitation on the number of pile installation or removal hours that may occur in any given month or year. Table 2-10 has been used to estimate potential take by Level A and Level B harassment of beluga. If there are significant changes to the construction schedule, the POA would confer with NMFS to determine if modifications to the LOA and/or IHA or re-initiation of Section 7 consultation are necessary or required.

The two new terminals would be located 140 ft (47 m) seaward of existing Terminals 1, 2, and 3. Construction of each terminal would require installation and removal of temporary steel pipe piles, including template piles, and installation of permanent steel pipe piles. Pile installation would occur in water depths that range from a few ft or in dry (dewatered) conditions nearest the shore to approximately 20 m (70 ft) at the outer face of the wharves, depending on tidal stage; the mean diurnal tide range at the POA is approximately 8.0 m (26 ft; NOAA 2015).

In-water construction activities would occur at multiple locations across the project site simultaneously; the POA anticipates that two "spreads" (a construction crew with crane and pile driving hammer) would be on site and working throughout the construction season, with a third "spread" present on some days. Of the two regular spreads, one would be designated for permanent (72-in) piles and one for temporary (24-in or 36-in) piles. Each spread would operate a single hammer at a time (impact or vibratory), with no more than two vibratory hammers simultaneously active in-water at any given time. It is not expected that three piles would be driven concurrently, and this scenario is not addressed further in this analysis. The only combinations of vibratory hammers that could be used simultaneously would be for installation of an attenuated (through use of a bubble curtain) 72-in pile and an attenuated temporary pile, an attenuated 72-in pile and an unattenuated temporary pile, or two temporary piles. There would be no simultaneous driving of unattenuated 72-in piles in water. Simultaneous use of two hammers would increase production rates.

Duration of active hammer use is anticipated to be brief each day (see Pile Installation and Removal below), and it is therefore anticipated that overlap in use of hammers would be uncommon. Pile installation and removal would occur intermittently over the work period for durations of minutes to hours at a time. Use of two hammers would serve to reduce the overall duration of in-water pile installation and removal during each construction season, minimizing potential impacts on marine mammals, although this decrease cannot be quantified. One construction crane would likely be based on a floating work barge, and one would likely be based on land or on an access trestle.

It is important to note that T1 and T2 construction activities and components may change as the design is revised, construction contracts are awarded, and construction details are further refined. The Project description included in this application represents the planned approach for construction of T1 and T2. Actual field conditions may require minor adjustments to this construction approach to address issues that may arise due to constructability, construction phasing, safety, or encountering an erratic in the soil profile.

Pile Installation and Removal

Vibratory and impact hammers will be used for installation of 48-, 72-, and 144-in permanent piles, totaling approximately 699.5 hours of anticipated in-water pile installation and removal over the course of years 1 through 5 of the project. Vibratory hammers will be used for installation and removal of 24- and/or 36-in temporary piles, unless an obstruction during installation requires the use of an impact hammer. Some temporary and permanent steel pipe piles will be installed or removed in the dry, depending on construction sequencing and tide heights. To avoid potential impacts on marine mammals from in-water pile installation and removal, conducting these activities in the dry would be maximized as feasible. It is anticipated that the permanent and temporary piles in the three bents nearest the shore for all five trestles will be installed in the dry at low tide levels. An additional bent would be installed in the dry for the northernmost trestle of T1 and for the three trestles of T2. Estimated numbers of piles of each size that will be installed and/or removed in the dry are presented in Table 2-2. These numbers may be subject to change according to the Construction Contractor and designer of record (DOR); but are not expected to vary beyond a number that would change the potential impacts associated with the proposed action.

When a pile is installed or removed in the dry, it is assumed that no exposure of marine mammals occurs to elevated sound levels that are defined as Level B harassment and no take of marine mammals occurs. Take of marine mammals from pile installation and removal in the dry is therefore not requested, and marine mammal monitoring would not be conducted during pile installation and removal in the dry.

Although some piles would be installed or removed in the dry, it is anticipated that most piles will be installed or removed in water. The estimated total and annual numbers of in-water pile installations and removals are presented in Table 2-3 through Table 2-9. Table 2-10 presents the estimated monthly and annual distribution of in-water pile installation and removals. Installation and removal of piles in water with a vibratory or impact hammer will impart sound energy into the water that could rise to the level of harassment to marine mammals. Estimated potential take of marine mammals associated with pile installation and removal with an impact or vibratory hammer is described in Chapter 4 of this EA. To avoid and minimize potential impacts of pile installation and removal on marine mammals, a minimum 100-meter shutdown zone would be implemented during all in-water pile installation and removal.

Estimates of installation and removal durations were calculated based on Wave Equation Analyses of Pile Driving specific to the Project as well as existing data from both PCT and SFD construction.

Pile Cutting

To avoid potential impacts on marine mammals from removal of temporary piles with a vibratory hammer, a majority of in-water temporary piles (approximately 90 percent) would be cut off at the mudline and remain in place or will remain in place intact (without cutting). Temporary piles would be removed that conflict with construction or operations or that can be removed in the dry. Leaving piles in place below the mudline supports stability of the soil. Also, many piles are corroded and may break during removal, with the lower part remaining in place. The existing structure is closer to shore than new construction would be, and many piles can be cut or removed in the dry when their location is dewatered during low tides.

The number of piles that would be cut or remain in place would be maximized as feasible; however, the exact number of piles that may be cut or can remain in place is unknown (see table 2-2 for best estimates of piles to be removed). While the exact method of pile cutting is at the discretion of the construction contractor, any methodology considered for cutting and removing the piles would account for worker safety, constructability, and minimization of potential acoustic impacts that the operation may have on marine mammals. Potential methods of underwater include hydraulic shears, underwater ultrathermic cutting, pile clippers or wire-saws. Hydraulic shears are unlikely to be feasible for cutting pipe piles, but the remaining methods are viable options.

Underwater ultrathermic cutting is performed by commercial divers using hand-held equipment to cut or melt through ferrous and non-ferrous metals. These systems operate through a torch-like process, initiated by applying a melting amperage to a steel tube packed with alloy steel rods, sometimes mixed with aluminum rods to increase the heat output. In the hands of skilled commercial divers, underwater ultrathermic cutting is reputed to be relatively fast and efficient, cutting through approximately 2 to 4 inches (5 to 10 cm) per minute, depending upon the number of divers deployed. This efficacy may be constrained by the requirement to secure the severed piles from falling into the inlet to prevent an extreme hazard to the diver cutting the piles. Tidally driven currents in Cook Inlet may limit dive times to approximately 2 to 3 hours per high- and low-tide event, depending upon the tide cycle and the ability of divers to efficiently perform the cutting task while holding position during high current periods. This activity is not considered to produce sound at levels that would rise to the level of take.

Pile clipping and underwater sawing generate noise that is typically non-impulsive, low-level, and short duration (typically less than 15 seconds per pile) (NAVFAC SW, 2020). Potential pile cutting methodologies are not anticipated to have the potential to result in incidental take of marine mammals because they are either above water, do not last for sufficient duration to present the reasonable potential for disruption of behavioral patterns, do not produce sound levels with likely potential to result in marine mammal harassment, or some combination of the above. Impacts on marine mammals from pile cutting are therefore not anticipated, and take of marine mammals from pile cutting is not anticipated or proposed for authorization.

Table 2-2. Component 3: Pile Installation and Removal

Pile Diameter and Type	Number of Piles		
	In-water	In the Dry	Total Piling Events
Permanent Pile Installation			
48" Trestle	0	16	16
72" Wharf	284	0	284
72" Trestle	48	13	61
144" Monopile Mooring Dolphin	2	0	2
Total Number of Permanent Installations	334	29	363
Temporary Pile Installation and Removal			
36" Installation	513	161	674
36" Removal	75	161	236
Total Number of Temporary Installations and Removals	588	322	910
Project Total	922	351	1,273

Table 2-3. Component 3: Summary of Total Numbers and Types of In-water Piles to be Installed and Removed during All 6 Years of In-water Project Construction

Pile Diameter and Type	Number of Piles	Impact Duration per Pile (minutes)	Impact Strikes per Pile	Vibratory Duration per Pile (minutes)	Total Duration of Activity per Pile (impact minutes + vibratory minutes)	Total Days of Installation and Removal For All Years	Typical Production Rate in Piles per Day (range)
Total							
Permanent Pile Installation							
72" Wharf	284	86	5,743	10	96	169	1.7 (0.5–3)
72" Trestle	48	86	5,743	10	96	15	1.7 (0.5–3)
144" Monopile Mooring Dolphin	2	120	5,000	15	135	4	0.5 (0.2–1)
Total Number of Permanent Installations	334	-	-	-	-	-	-
Temporary Pile Installation and Removal							
36" Installation	513	0	0	30	30	177	3 (2–4)
36" Removal	75	0	0	45	45	18	3 (2–4)
Total Number of Temporary Installations and Removals	588	-	-	-	-	-	-

Total	**922**	**28,792 (479.9 hours)**	**1,916,676**	**22,115 (368.6 hours)**	**50,907 (848.5 hours)**	**-**	**-**

Note: For all years, pile sizes, and hammer types, the durations of hammer use and numbers of strikes are estimated averages and may be higher or lower based on the Contractor's means and methods.

Table 2-4. Component 3: Summary of Numbers and Types of In-water Piles to be Installed and Removed during Year 1 of In-water Project Construction

Pile Diameter and Type	Number of Piles	Impact Duration per Pile (minutes)	Impact Strikes per Pile	Vibratory Duration per Pile (minutes)	Total Duration of Activity per Pile (impact minutes + vibratory minutes)	Total Days of Installation and Removal For All Years	Typical Production Rate in Piles per Day (range)
Year 1 (2026)							
Permanent Pile Installation							
72" Wharf	60	86	5,743	10	96	36	1.7 (0.5–3)
72" Trestle	9	86	5,743	10	96	4	1.7 (0.5–3)
Total Number of Permanent Installations	69	-	-	-	-	-	-
Temporary Pile Installation and Removal							
36" Installation	75	0	0	30	30	25	3 (2–4)
36" Removal	8	0	0	45	45	3	3 (2–4)
Total Number of Temporary Installations and Removals	83	-	-	-	-	-	-
Total	**152**	**5,934 (98.9 hours)**	**396,267**	**3,300 (55.0 hours)**	**9,234 (153.9 hours)**	**-**	**-**

Note: For all years, pile sizes, and hammer types, the durations of hammer use and numbers of strikes are estimated averages and may be higher or lower based on the Contractor's means and methods.

Table 2-5. Component 3: Summary of Numbers and Types of In-water Piles to be Installed and Removed during Year 2 of In-water Project Construction

Pile Diameter and Type	Number of Piles	Impact Duration per Pile (minutes)	Impact Strikes per Pile	Vibratory Duration per Pile (minutes)	Total Duration of Activity per Pile (impact minutes + vibratory minutes)	Total Days of Installation and Removal For All Years	Typical Production Rate in Piles per Day (range)
Year 2 (2027)							
Permanent Pile Installation							
72" Wharf	61	86	5,743	10	96	36	1.7 (0.5–3)
Total Number of Permanent Installations	61	-	-	-	-	-	-
Temporary Pile Installation and Removal							
36" Installation	65	0	0	30	30	22	3 (2–4)
36" Removal	7	0	0	45	45	3	3 (2–4)
Total Number of Temporary Installations and Removals	72	-	-	-	-	-	-
Total	**133**	**5,246 (87.4 hours)**	**350,323**	**2,875 (47.9 hours)**	**8,121 (135.4 hours)**	**-**	**-**

Note: For all years, pile sizes, and hammer types, the durations of hammer use and numbers of strikes are estimated averages and may be higher or lower based on the Contractor's means and methods.

Table 2-6. Component 3: Summary of Numbers and Types of In-water Piles to be Installed and Removed during Year 3 of In-water Project Construction

Pile Diameter and Type	Number of Piles	Impact Duration per Pile (minutes)	Impact Strikes per Pile	Vibratory Duration per Pile (minutes)	Total Duration of Activity per Pile (impact minutes + vibratory minutes)	Total Days of Installation and Removal For All Years	Typical Production Rate in Piles per Day (range)
Year 3 (2028)							
Permanent Pile Installation							
72" Wharf	18	86	5,743	10	96	11	1.7 (0.5–3)
72" Trestle	9	86	5,743	10	96	4	1.7 (0.5–3)
Total Number of Permanent Installations	27	-	-	-	-	-	-
Temporary Pile Installation and Removal							
36" Installation	160	0	0	30	30	54	3 (2–4)
36" Removal	16	0	0	45	45	6	3 (2–4)
Total Number of Temporary Installations and Removals	**176**	-	-	-	-	-	-
Total	**203**	**2,322 (38.7 hours)**	**155,061**	**5,790 (96.5 hours)**	**8,112 (135.2 hours)**	**-**	**-**

Note: For all years, pile sizes, and hammer types, the durations of hammer use and numbers of strikes are estimated averages and may be higher or lower based on the Contractor's means and methods.

Table 2-7. Component 3: Summary of Numbers and Types of In-water Piles to be Installed and Removed during Year 4 of In-water Project Construction

Pile Diameter and Type	Number of Piles	Impact Duration per Pile (minutes)	Impact Strikes per Pile	Vibratory Duration per Pile (minutes)	Total Duration of Activity per Pile (impact minutes + vibratory minutes)	Total Days of Installation and Removal For All Years	Typical Production Rate in Piles per Day (range)
Year 4 (2029)							
Permanent Pile Installation							
72" Wharf	52	86	5,743	10	96	36	1.7 (0.5–3)
72" Trestle	9	86	5,743	10	96	3	1.7 (0.5–3)
Total Number of Permanent Installations	61	-	-	-	-	-	-
Temporary Pile Installation and Removal							
36" Installation	70	0	0	30	30	24	3 (2–4)
36" Removal	7	0	0	45	45	3	3 (2–4)
Total Number of Temporary Installations and Removals	77	-	-	-	-	-	-
Total	**138**	**5,246 (87.4 hours)**	**350,323**	**3,025 (50.4 hours)**	**8,271 (137.9 hours)**	**-**	**-**

Note: For all years, pile sizes, and hammer types, the durations of hammer use and numbers of strikes are estimated averages and may be higher or lower based on the Contractor's means and methods.

Table 2-8. Component 3: Summary of Numbers and Types of In-water Piles to be Installed and Removed during Year 5 of In-water Project Construction

Pile Diameter and Type	Number of Piles	Impact Duration per Pile (minutes)	Impact Strikes per Pile	Vibratory Duration per Pile (minutes)	Total Duration of Activity per Pile (impact minutes + vibratory minutes)	Total Days of Installation and Removal For All Years	Typical Production Rate in Piles per Day (range)
Year 5 (2030)							
Permanent Pile Installation							
72" Wharf	45	86	5,743	10	96	25	1.7 (0.5–3)
72" Trestle	12	86	5,743	10	96	4	1.7 (0.5–3)
Total Number of Permanent Installations	57	-	-	-	-	-	-
Temporary Pile Installation and Removal							
36" Installation	80	0	0	30	30	34	3 (2–4)
36" Removal	8	0	0	45	45	4	3 (2–4)
Total Number of Temporary Installations and Removals	88	-	-	-	-	-	-
Total	**145**	**4,902 (81.7 hours)**	**327,351**	**3,330 (55.5 hours)**	**8,232 (137.2 hours)**	**-**	**-**

Note: For all years, pile sizes, and hammer types, the durations of hammer use and numbers of strikes are estimated averages and may be higher or lower based on the Contractor's means and methods.

Table 2-9. Component 3: Summary of Numbers and Types of In-water Piles to be Installed and Removed during Year 6 of In-water Project Construction

Pile Diameter and Type	Number of Piles	Impact Duration per Pile (minutes)	Impact Strikes per Pile	Vibratory Duration per Pile (minutes)	Total Duration of Activity per Pile (impact minutes + vibratory minutes)	Total Days of Installation and Removal For All Years	Typical Production Rate in Piles per Day (range)
Year 6 (2031)							
Permanent Pile Installation							
72" Wharf	48	86	5,743	10	96	29	1.7 (0.5–3)
72" Trestle	9	86	5,743	10	96	2	1.7 (0.5–3)
144" Monopile Mooring Dolphin	2	120	5,000	15	135	4	0.5 (0.2–1)
Total Number of Permanent Installations	59	-	-	-	-	-	-
Temporary Pile Installation and Removal							
36" Installation	63	0	0	30	30	20	3 (2–4)
36" Removal	29	0	0	45	45	2	3 (2–4)
Total Number of Temporary Installations and Removals	92	-	-	-	-	-	-
Total	**151**	**5,142 (85.7 hours)**	**337,351**	**3,795 (63.3 hours)**	**8,937 (149.0 hours)**	**-**	**-**

Note: For all years, pile sizes, and hammer types, the durations of hammer use and numbers of strikes are estimated averages and may be higher or lower based on the Contractor's means and methods.

Table 2-10. Estimated Annual and Monthly Distribution of In-water Pile Installation and Removal for Component 3

Number of Piles									
Year 1	**April**	**May**	**June**	**July**	**Aug.**	**Sept.**	**Oct.**	**Nov.**	**Total**
24- or 36-in Temporary Pile Installation	5	12	12	12	12	12	6	4	75
24- or 36-in Temporary Pile Removal	1	1	1	1	1	1	1	1	8
72-in Permanent Pile Installation	5	11	11	11	9	9	9	4	69
Year 2	**April**	**May**	**June**	**July**	**Aug.**	**Sept.**	**Oct.**	**Nov.**	**Total**
24- or 36-in Temporary Pile Installation	6	10	10	10	10	10	5	4	65
24- or 36-in Temporary Pile Removal	1	1	1	1	1	1	1	0	7
72-in Permanent Pile Installation	5	9	9	9	9	8	8	4	61
Year 3	**April**	**May**	**June**	**July**	**Aug.**	**Sept.**	**Oct.**	**Nov.**	**Total**
24- or 36-in Temporary Pile Installation	13	26	26	26	26	26	13	4	160
24- or 36-in Temporary Pile Removal	1	3	3	3	2	2	1	1	16
72-in Permanent Pile Installation	4	4	4	3	3	3	3	3	27
Year 4	**April**	**May**	**June**	**July**	**Aug.**	**Sept.**	**Oct.**	**Nov.**	**Total**
24- or 36-in Temporary Pile Installation	5	11	11	12	11	11	5	4	70
24- or 36-in Temporary Pile Removal	1	1	1	1	1	1	1	0	7
72-in Permanent Pile Installation	5	9	9	9	9	8	8	4	61
Year 5	**April**	**May**	**June**	**July**	**Aug.**	**Sept.**	**Oct.**	**Nov.**	**Total**
24- or 36-in Temporary Pile Installation	5	12	12	12	12	11	11	5	80
24- or 36-in Temporary Pile Removal	1	1	1	1	1	1	1	1	8
72-in Permanent Pile Installation	3	9	9	9	8	8	8	3	57
Year 6	**April**	**May**	**June**	**July**	**Aug.**	**Sept.**	**Oct.**	**Nov.**	**Total**
24- or 36-in Temporary Pile Installation	5	10	10	10	10	10	4	4	63
24- or 36-in Temporary Pile Removal	1	1	1	1	1	4	10	10	29
72-in Permanent Pile Installation	3	9	9	9	8	8	8	3	57

Number of Piles							
144-in Permanent Pile Installation	0	2	0	0	0	0	2

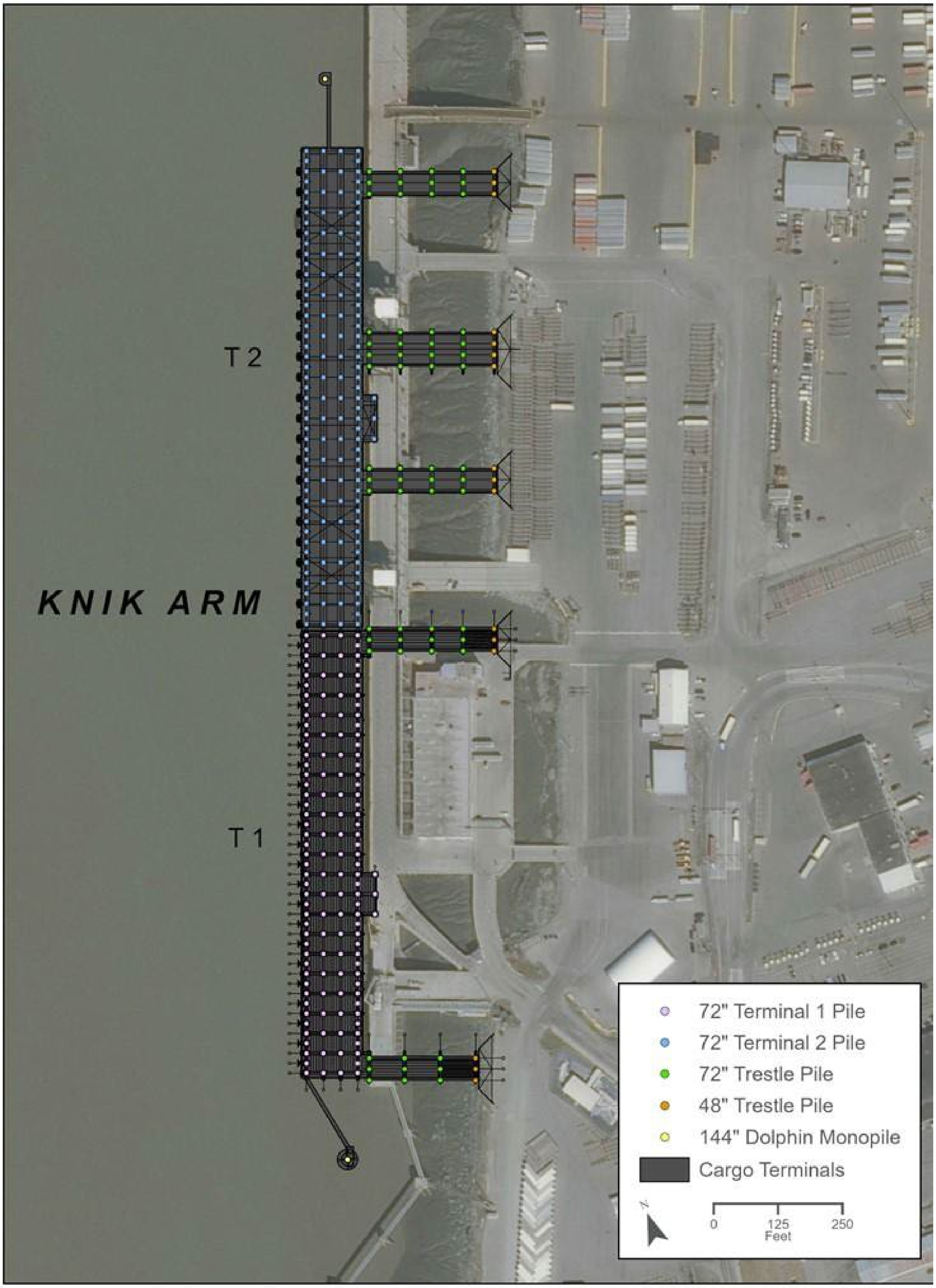

Figure 2-4. Component 3: Overview of the New Terminal 1 (T1) and Terminal 2 (T2)

Component 4. Demolition of Existing Terminals

Once the new T1, T2, and petroleum products transfer system are complete and operational, any remaining existing Terminal 1, Terminal 2, and POL1 platforms, wharves, and trestles would be dismantled (Figure 2-5). All temporary work structures will be removed. Existing permanent piles and most temporary piles will be cut and removed or left in place to avoid potential impacts on marine mammals in lieu of removal with a vibratory hammer.

Terminal 3 may be partially demolished during Phase 2B construction of T1 and T2, especially where the existing infrastructure may interfere with new construction. Elements of T3 that persist after Phase 2B is complete would remain in place until Phase 5, when they would be removed under a separate permitting process.

The selection of construction equipment by the Contractor, including cranes and barges, would determine the plans and sequencing for demolition. Portions of the existing terminals may be used for construction phasing and as support platforms for ongoing new construction, as feasible.

Demolition would take place above the water, and demolished decking, pipes, and other superstructure materials would be contained before they fall into the water, following best management practices. Demolished materials will be removed by barge or truck. Work associated with fill and/or water quality impacts would be analyzed under a separate permitting process and are not included in this proposed action to authorize potential take incidental to noise

Figure 2-5. Component 4: Demolition of Existing Terminals

Component 5. Onshore and Storm Drain Outfall Replacement

The replacement of onshore utilities would involve construction on land and replacement of utilities above the high tide line. No in-water work is anticipated as part of this component. Impacts on marine mammals from replacement of utilities are not anticipated. Take of marine mammals from replacement of utilities was therefore not requested in the POA incidental take application.

The storm drain outfall replacement would involve construction on land and replacement of four outfall pipes above the high tide line, on land. No in-water work is anticipated as part of this component. Impacts on marine mammals from storm drain outfall replacement are not anticipated. Take of marine mammals from storm drain outfall replacement was therefore not requested in the POA incidental take application.

2.2.2.2 Construction and Schedule Considerations

The CTR Project would require a full construction season each year for successful completion. A typical construction season at the POA extends from approximately mid-April to mid-October (6 months) and may include November. Exact dates of ice-out in spring and formation of new ice in fall vary from year to year and cannot be predicted with accuracy. In-water pile installation and removal generally cannot occur during the winter months when ice is present because of the hazards associated with moving ice floes that change directions four times per day, preventing the use of tugs, barges, workboats, and other vessels. Ice movement also prevents accurate placement of piles.

Restricting the POA from completing in-water pile installation and removal in months with historically higher beluga abundance (August through October) is impracticable and would force the CTR Project into one or more additional seasons of in-water construction. This would have severe negative repercussions on Project and program funding in addition to potential impacts on marine mammals over a greater number of construction seasons.

Additional in-water construction seasons would require additional mobilization and demobilization of the Contractor's equipment spreads. Extending the CTR Project into one or more additional construction seasons would also potentially have severe negative impacts on the overall PAMP schedule and funding. The replacement of T1 is scheduled to begin in 2025, with in-water work beginning in 2026. The fiscal and logistical (*i.e.,* port operations) impacts on the POA of extending the in-water CTR work into additional seasons would prevent the POA from being able to complete the T1 replacement project on schedule and would delay the start of construction on T2, which would delay funding and/or completion of both T1 and T2. Potential consequences of delay include de-rating of the structural capacity of the existing cargo terminals, a shutdown of dock operations due to deteriorated conditions, or an actual collapse of one or more dock structures. Any of these scenarios could have dire consequences for the populations of Anchorage and Alaska who are served by the POA. The potential for collapse increases with schedule delays due to both worsening deterioration and the higher probability of a significant seismic event occurring before T1 and T2 replacement.

2.2.3 Avoidance and Minimization Measures

In their 23 May 2024 LOA and IHA application, the POA identified several avoidance and minimization measures as components of the Proposed Action and requirements of contractors during CTR construction to eliminate the potential for injury and to minimize disturbance harassment of marine mammals. NMFS has also proposed additional measures in the proposed rule. The avoidance, minimization, and mitigation measures proposed by the POA and NMFS, all proposed to be required for the CTR Project, are identified below.

2.2.3.1 Monitoring and Reporting

Marine mammal monitoring by qualified, NMFS approved, protected species observers (PSOs; also called Marine Mammal Observers or MMOs) would be conducted at the POA at all times when in-water pile installation or removal is taking place (POA 2024a). PSOs would search for, monitor, document, and track marine mammals around and within the Level A and Level B harassment zones and the 100-meter minimum shutdown zone during pile installation and vibratory extraction.

The POA, through its Construction Contractor and PSOs, would collect electronic data on marine mammal sightings and any behavioral responses to in-water pile installation and removal associated with the CTR Project. Four PSO teams at four locations would work concurrently to provide full coverage for marine mammal monitoring in rotating shifts during in-water pile installation and removal. All PSOs would be trained in marine mammal identification and behaviors. The PSOs would monitor for marine mammals in applicable harassment zones (see Table 4-4) during in-water pile installation and removal, and collaborate to communicate the presence of marine mammals to the POA.

The marine mammal monitoring and mitigation program that is planned for CTR would be similar to that used for construction of the POA's PCT and SFD, which are recently completed pile driving construction projects that required NMFS authorization (06 April 2020, 85 FR 19294; 07 September 2021, 86 FR 50057). PSOs would be positioned at the best practical vantage points that are determined to be safe.

PSOs would monitor for marine mammals from a minimum of four PSO stations. It is anticipated that PSO stations would be located where the Level B harassment shutdown zones for belugas can be effectively monitored. At least one of the MMO stations would be able to observe the Level A zones. Eleven total MMOs for the CTR Project typically would be stationed between the Anchorage Downtown viewpoint near Point Woronzof, the Anchorage Public Boat Dock at Ship Creek, the CTR Project site, and the north end of POA property near Cairn Point or at Port MacKenzie, across Knik Arm. See the Marine Mammal Monitoring and Mitigation Plan 2024 (POA 2024b) for additional details.

The POA would receive a daily monitoring summary from its Construction Contractor that would include a summary of marine mammal sightings and potential exposures (takes). The POA would provide weekly monitoring reports to NMFS during the CTR Project construction season. These reports would include raw electronic data sheets as well as a summary of marine mammal species and behavioral observations, pile driving shutdowns or delays, and pile driving work completed. The reports also must include an assessment of the amount of construction remaining to be completed (*i.e.,* the number of estimated hours of work remaining), in addition to the number of belugas observed within estimated harassment zones to date.

The POA to submit interim weekly monitoring reports within 14 calendar days after the conclusion of each calendar week (that include raw electronic data sheets) during the CTR construction seasons, including for weeks during which no in-water work occurred (an email notification for weeks with no in-water work would be sufficient). These reports will include a summary of marine mammal species observed and behavioral observations, mitigation actions implemented, construction delays, and construction work completed. They will also include an assessment of the amount of construction remaining to be completed (*i.e.,* the number of estimated hours of work remaining), in addition to the number of Cook Inlet beluga whales (CIBWs) observed within estimated harassment zones to date for the current construction year.

The POA would also submit annual reports after the end of each construction season, and a comprehensive final report following the conclusion of Year 5 of construction activities. Draft annual marine mammal monitoring reports would be submitted to NMFS within 90 days after the completion of each construction season, or 60 days prior to a requested date of issuance of any future incidental take authorization for projects at the same location (*i.e.,* an IHA application for year 6 of CTR construction activities), whichever comes first. Annual reports would detail the monitoring protocol and summarize the data recorded during monitoring, and associated PSO data sheets in electronic tabular format.

2.2.3.2 Mitigation Measures

Mitigation measures proposed by the POA include the following, modeled after the successful mitigation and monitoring program outlined in the Final IHAs for PCT Phase 1 and Phase 2 construction (85 FR 19294), SFD construction (86 FR 50057), NES1 construction (89 FR 2832), and Section 11 of the Project LOA and IHA application:

- The POA would ensure that construction supervisors and crews, the monitoring team, and relevant POA staff are trained prior to the start of all pile driving, so that responsibilities, communication procedures, monitoring protocols, and operational procedures are clearly understood. New personnel joining during the project must be trained prior to commencing work;
- Employ PSOs and establish monitoring locations as described in the POA's Marine Mammal Monitoring and Mitigation Plan (POA 2024b). The POA must monitor the project area to the maximum extent possible based on the required number of PSOs, required monitoring locations, and environmental conditions;
- Marine mammal monitoring would take place from 30 minutes prior to initiation of in-water pile installation and removal through 30 minutes post-completion of pile installation and removal;
- Pre-start clearance monitoring must be conducted during periods of visibility sufficient for the lead PSO to determine that the shutdown zones indicated in Table 2-11 are clear of marine mammals. Pile driving may commence following 30 minutes of observation when the determination is made that the shutdown zones are clear of marine mammals or when the mitigation measures proposed specifically for belugas (below) are satisfied;
- For all construction activities, shutdown zones must be established following Table 2-11. The purpose of a shutdown zone is generally to define an area within which shutdown of activity would occur upon sighting of a marine mammal (or in anticipation of an animal entering the defined area). In addition to the shutdown zones specified in Table 2-11, the POA plans to implement a minimum 100-meter shutdown zone around in-water pile installation and removal. Shutdown zones for in-water pile installation and removal would vary based on the type of construction activity and by marine mammal hearing group. Here, shutdown zones are larger than or equivalent to the estimated Level A harassment isopleths shown in Table 2-11 for species other than belugas and are equal to the estimated Level B harassment isopleths for belugas;
- Marine mammals observed anywhere within visual range of the PSO must be tracked relative to construction activities. If a marine mammal is observed entering or within the shutdown zones indicated in Table 2-11, pile driving must be delayed or halted. If pile driving is delayed or halted due to the presence of a marine mammal, the activity may not commence or resume until either the animal has voluntarily exited and been visually confirmed beyond the shutdown zone (Table 2-11), or 15 minutes (non-belugas) or 30 minutes (belugas) have passed without re-detection of the animal;
- The POA must use bubble curtains for all piles during both vibratory and impact pile driving in water depths greater than 3 m during the months of August through October. No bubble curtain is required for vibratory pile driving of temporary (24-in or 36-in) piles in the months of April – July. Bubble curtains must be used for all permanent (72- and 144-in) piles during both vibratory and impact pile driving in waters deeper than 3 m in the months of April – November. The bubble curtain must be operated as necessary to achieve optimal performance. At a minimum, the bubble curtain must distribute air bubbles around 100 percent of the piling circumference for the full depth of the water column; the lowest bubble ring must be in contact with the substrate for the full circumference of the

ring; and air flow to the bubblers must be balanced around the circumference of the pile. The POA must use soft start techniques when impact pile driving. Soft start requires contractors to provide an initial set of three strikes at reduced energy, followed by a 30-second waiting period, then two subsequent reduced energy strike sets. A soft start must be implemented at the start of each day's impact pile driving and at any time following cessation of impact pile driving for a period of 30 minutes or longer. PSOs shall begin observing for marine mammals 30 minutes before “soft start” or in-water pile installation or removal begins;

- Pile-driving activity must be halted upon observation of either a species for which incidental take is not authorized or a species for which incidental take has been authorized but the authorized number of takes has been met, entering or within the harassment zone;
- The POA must avoid direct physical interaction with marine mammals during construction activities, including barge positioning and pile cutting. If a marine mammal comes within 10 m of such activity, operations shall cease. Should a marine mammal come within 10 m of a vessel in transit, the boat operator would reduce vessel speed to the minimum level required to maintain steerage and safe working conditions. If human safety is at risk, the in-water activity would be allowed to continue until it is safe to stop; and

The following additional mitigation measures are proposed by NMFS for belugas:

- The POA must make all practicable efforts to complete in-water pile installation and removal between April and July, when Cook Inlet belugas are typically found in lower numbers near the proposed site;
- Prior to the onset of in-water pile driving, should a beluga be observed approaching the estimated Level B harassment zone, pile driving would be delayed. Pile driving may commence once the whale(s) moves at least 100 m past the Level B harassment zone and on a path away from the zone, or the whale has not been re-sighted within 30 minutes;
- If in-water pile installation or removal has commenced, and a beluga(s) is observed within or likely to enter the Level B harassment zone, pile installation or removal would shut down and not re-commence until the whale has traveled at least 100 m beyond the Level B harassment zone and is on a path away from such zone or until no beluga has been observed in the Level B harassment zone for 30 minutes; and
- If during installation and removal of piles, PSOs can no longer effectively monitor the entirety of the beluga Level B harassment zone due to environmental conditions (*e.g.,* fog, rain, wind), pile driving may continue only until the current segment of the pile is driven; no additional sections of pile or additional piles may be driven until conditions improve such that the Level B harassment zone can be effectively monitored. If the Level B harassment zone cannot be monitored for more than 15 minutes, the entire Level B harassment zone would be cleared again for 30 minutes prior to pile driving.

Table 2-11. Proposed Shutdown Zones during CTR Project Activities

Activity	Pile Type / Size	Attenuated or Unattenuated	Shutdown Zone (m)					
			LF cetaceans	Non-CIBW MF[1] cetaceans	CIBWs	HF[1] cetaceans	PW	OW
Vibratory Installation	24-in	Unattenuated	100	100	2,250	100	100	100
	36-in				4,520			
	72-in				9,100			

	24-in	Attenuated			2,630			
	36-in				3,580			
	72-in				6,120			
Vibratory Removal	24-in	Unattenuated			5,970			
	36-in				1,700			
	24-in	Attenuated			2,100			
	36-in				1,320			
Impact Installation – 1 pile per day	24-in	Unattenuated	500	500	1,600	500	100	100
	36-in							
	24-in	Attenuated	100	100	550	100	100	100
	36-in							
Impact Installation – 1 pile per day	72-in	Unattenuated	500	500	7,360	500	100	100
Impact Installation – 2 piles per day		Attenuated			2,520			
Impact Installation – 3 piles per day								
Concurrent – 2 Vibratory sources	36-in AND 36-in	Attenuated / Attenuated	100	100	5,670	100	100	100
		Attenuated / Unattenuated			9,370			
		Unattenuated / Unattenuated			9,070			
	36-in AND 72-in	Attenuated / Attenuated			8,320			
		Unattenuated / Attenuated			9,370			
Concurrent Vibratory / Impact	36-in AND 72-in	Attenuated / Attenuated (1 pile per day)	500	500	3,580	500	100	100
		Attenuated / Attenuated (2 piles per day)						
		Attenuated / Attenuated (3 piles per day)						
		Unattenuated / Attenuated (1 pile per day)			4,520			

		Unattenuated / Attenuated (2 piles per day)						
		Unattenuated / Attenuated (3 piles per day)						

Notes: cm = centimeter(s), m = meter(s); POA may elect to use either 36-in or 24-in temporary piles; as 36-in piles are more likely and estimated to have larger ensonified areas, we have used these piles in our analyses of concurrent activities.

[1] In the Updated Technical Guidance (NMFS, 2024), the MF Cetacean hearing group has been re-named the HF Cetacean group; HF Cetaceans from the 2018 Technical Guidance have been re-named VHF Cetaceans.

In addition to these mitigation measures, the POA and NMFS considered practicable work restrictions. Given the nature of this Project and the required sequencing structure of the construction schedule, the POA cannot commit to restricting pile driving to April to July, when belugas are typically found in lower numbers. NMFS is requiring as a mitigation measure that the POA would complete as much work as possible in April to July to reduce the number of piles that need to be installed in August and September. However, the POA cannot commit to effort restrictions during those months.

2.3 Alternative 1 - No Action Alternative

In accordance with NOAA's implementing regulations, the Companion Manual (CM) for NAO 216-6A, Section 6.B.i, NMFS is defining the No Action Alternative as not issuing the requested LOA and IHA under Section 101(a)(5)(D) of the MMPA. This is consistent with the NMFS statutory obligation under the MMPA to either (1) deny the requested authorization, or (2) grant the requested authorization and prescribe mitigation, monitoring, and reporting requirements. Thus, under the No Action Alternative, NMFS assumes that the POA would not proceed with their proposed CTR Project construction as described in the application. Although the No Action Alternative would not meet the purpose and need to allow incidental takes of small numbers of marine mammals under certain conditions (*i.e.,* when the statutory requirements are satisfied), the CEQ regulations require consideration and analysis of a No Action Alternative for the purposes of presenting a comparative analysis to the action alternatives. The No Action Alternative, consistent with CEQ regulations and the CM, serves as a baseline against which the impacts of the Preferred Alternative are compared and contrasted.

2.4 Alternative 2 - Issuance of Requested LOA and IHA (Preferred Alternative)

Under Alternative 2, the Preferred Alternative, NMFS would issue the requested LOA and IHA to the POA allowing the take by Level B harassment of seven species of marine mammals and by Level A harassment of five of those seven species, incidental to in-water pile installation and removal associated with the construction of the CTR Project (see Section 2.2, subject to the mitigation measures, monitoring, and reporting requirements set forth in the LOA and IHA, if issued. This alternative also includes mandatory requirements for the POA to achieve the MMPA standard of effecting the least practicable adverse impact on the species or stocks of marine mammals and their habitat, paying particular attention to rookeries, mating grounds, and other areas of similar significance and not having an unmitigable adverse impact on the availability of marine mammals for subsistence use.

2.5 Alternatives Considered but Eliminated from Further Consideration

In coordination with the POA, NMFS considered whether other alternatives could meet the purpose of and need for the Project while supporting the POA's proposal to construct the CTR Project. In addition to the proposed action, the POA prepared an engineering alternative design report entitled, "Cargo Terminals – Terminal 1 and Terminal 2: Report on Analyses of Marine Construction Alternatives" that discussed numerous alternative designs, means and methods for construction of the proposed replacement cargo terminals (Jacobs 2022). The alternatives analyzed in this report were used to determine the design elements of the proposed action based on the types of pilings to be installed, estimated impacts to CIBW, constructability with respect to project site, and cost.

No other action alternatives met the purpose and need for this Project; therefore other alternatives were not considered.

Chapter 3. Affected Environment

NMFS considered all relevant environmental, cultural, historical, social, and economic resources based on the geographic location associated with NMFS' Proposed Action, alternatives, and the POA's request for an LOA and IHA. Based on this review, this chapter describes the affected environment, existing (baseline) conditions for select resource categories (*e.g.,* marine environment), and reasonably foreseeable environmental trends. As explained in Section 1.6, certain resource categories were not carried forward for further consideration or evaluation in this EA (see Table 1-1 in Section 1.6).

3.1 Physical Environment

Cook Inlet is a large tidal estuary that exchanges waters at its mouth with the Gulf of Alaska. Cook Inlet is roughly 20,000 square km (7,700 square miles) in area, with approximately 1,350 linear km (840 miles) of coastline (Rugh *et al.* 2000) and an average depth of approximately 100 m (330 ft). Cook Inlet is generally divided into upper and lower regions by the East and West Forelands. Northern Cook Inlet bifurcates into Knik Arm to the north and Turnagain Arm to the east. The POA is located in Anchorage, Alaska, along the southeastern shoreline of Knik Arm in upper Cook Inlet.

The POA currently occupies an area of approximately 129 acres. Other commercial and industrial activities related to secure maritime operations are located near the POA on ARRC property immediately south of the POA, on approximately 111 acres.

3.1.1 Ambient Sound/Acoustical Environment

In Knik Arm, marine mammals are exposed to natural and anthropogenic sounds under baseline conditions. Though much of upper Cook Inlet is a poor environment for acoustic propagation, characterized by shallow depth, sand/mud bottoms, and high background noise from currents and glacial silt (Blackwell and Greene 2002), vessel use and in-water construction have affected baseline acoustic conditions for marine mammals.

Background noise in Knik Arm results from many sources including from dredging operations, boats, ships, oil and gas operations, construction noise, and aircraft overflights from Joint Base Elmendorf-Richardson (JBER) and Ted Stevens International Airport (see Section 4.8.6 for additional sources of noise in Knik Arm). The lower range of broadband (10 to 10,000 Hz) background sound levels obtained during underwater measurements at Port MacKenzie, located across Knik Arm from the POA, ranged from 115 to 133 dB RMS referenced to 1 microPascal (dB re 1 µPa; Blackwell 2005). All underwater sound levels in this EA are referenced to dB re 1 µPa. Background sound levels measured during the 2007 test pile study for the POA's Marine Terminal Redevelopment Project (MTRP) site ranged from 105 to 135 dB (URS 2007). The background sound pressure levels (SPLs) obtained during that study were highly variable, with most SPL recordings exceeding 120 dB RMS. Background sound levels measured in 2008 at the MTRP site ranged from 120 to 150 dB RMS (Scientific Fishery Systems, Inc. 2009). These measurements included industrial sounds from maritime operations; ongoing USACE maintenance dredging and pile driving from construction were not underway at the time of the study.

The most recent measurements of background sound levels at the POA are from the 2016 TPP (Austin *et al.* 2016), in which background sound recordings were measured at two locations during a 3-day break in pile installation activities. Median background noise levels, measured at a location just offshore of the POA and at a second location approximately 1 km (0.6 mile) offshore, were 117 and 122.2 dB RMS re 1 µPa, respectively. NMFS accepted 122.2 dB RMS as the background noise level for Phases 1 and 2 of the POA PCT Project (85 FR 19294) and for the POA SFD Project (86 FR 50057). Based on these measurements, the noise level of 122.2 dB RMS will be used for the CTR Project. Ambient noise levels were not measured as part of the acoustic monitoring program during June 2020 or 2021 (I&R 2021a, 2021b).

3.2 Biological Environment

The primary component of the biological environment that would be affected by the proposed action and alternatives is marine mammals, which would be directly affected by the authorization of incidental take.

3.2.1 History of Incidental Take Authorized at the POA

The environmental baseline for the biological environment for the proposed action includes the effects of previously authorized take of marine mammals, including recent authorizations for POA construction that began in 2008. For more background on the POA's development history and analysis of cumulative impact for future activities, see Section 4.8.5.2. The POA (*i.e.,* Port of Anchorage at that time) Expansion Project included pile installation (including sheet and 36-in round piles) and dredging between 2008 and 2011. The Cook Inlet beluga was listed under the ESA in October 2008; therefore, ESA Section 7 consultation covered work from 2009 through 2011. NMFS Permits Division authorized 34 takes of belugas per year of the project (there was no take issued for humpback whales or Steller sea lions) (73 FR 41318, 18 July 2008). The number of belugas potentially harassed, as defined under the MMPA, was fewer than the number of takes authorized. Takes of other marine mammal species were also limited. Scientific monitoring during that period showed that belugas continued to transit past the POA, and their passage to critical foraging grounds in upper Knik Arm was not blocked or impeded (POA, 2008).

In 2016, NMFS issued a Section 7 BiOp for the POA's TPP to evaluate sound attenuation devices for potential use during port expansion projects. The NMFS Permits Division authorized Level B harassment takes for 26 Cook Inlet belugas and 6 Western DPS Steller sea lions (81 FR 15048, 21 March 2016). During the project, belugas entered the Level B harassment exclusion zone on nine occasions. Only one 4-minute delay of start of operations was necessitated to avoid prohibited takes of belugas, and one authorized instance of potential Level B harassment occurred, affecting a single beluga (Cornick and Seagars 2016).

In 2018, NMFS issued a Letter of Concurrence (LOC) for ESA Section 7 consultation for the POA Fender Pile and Replacement Repair Project (NMFS 2018b). This project included pile installation of 4422-inround piles. Mitigation measures were implemented to avoid take of marine mammals; therefore, no take was authorized. No sightings of protected species occurred during pile installation activities. However, on 30 May 2019, a small group of belugas was observed by the construction crew before in-water work began. When the PSO arrived, they observed three adult belugas traveling northward and milling.

On 23 March 2020, NMFS issued a BiOp and ITS (NMFS 2020a) that consulted on the effects of the POA PCT Project (Phases 1 and 2) on the western DPS of Steller sea lions, humpback whales, and Cook Inlet belugas and their designated or proposed critical habitat. On 31 March 2020, NMFS issued two successive IHAs (85 FR 19294; NMFS 2020b, 2020c) to the POA for construction of the PCT. Construction of the PCT was planned and permitted as two distinct construction seasons, with PCT Phase 1 permitted under an IHA valid from 1 April 2020 through 31 March 2021 (NMFS 2020b), and work on PCT Phase 2 permitted under the successive IHA valid from 1 April 2021 through 31 March 2022 (NMFS 2020c). The PCT requested two modifications to the PCT Phase 2 IHA, and NMFS approved that process. The modifications to construction methods were necessary to ensure safe, accurate, and efficient construction of the PCT facility and led to other changes that reduced potential impacts to marine mammals, including a reduction in temporary pile numbers, avoidance of battered piles, and a reduction in overall installation and removal times, which together achieved the least practicable adverse impact on marine mammals. PCT in-water construction was completed in 2021 and the terminal was completed in 2022. Take by Level A harassment was authorized for three species in PCT Phase 1 and 4 species in PCT Phase 2, while take by Level B harassment was authorized for six species during both Phases.

In 2020, the POA applied for concurrence from the USACE that the POA Fender Pile Replacement and Repair Project qualifies under Nationwide Permit 3, Maintenance. Informal Section 7 consultation for this work was initiated on 25 September 2020 (POA 2020); no take was estimated or requested, and no MMPA authorization was issued. The purpose of the project was to replace 180 corroding and failing 22-inpin piles within the POA's existing fendering system. Pre- and post-earthquake (2018) inspections have shown that these pin piles were in a state of imminent failure and require emergency repair. It was determined through engineering evaluation that these piles were providing only 10 percent of the required resistance for safely berthing ships at the POA, presenting a substantial safety hazard and potential threat to commerce in Alaska. The fendering system consists of 107 fender assemblies, each supported by two pin piles.

To reinforce each fender assembly, a 22-in pile was installed inside each existing 24-in pile up to a 45-foot embedment depth using an impact and/or vibratory hammer. Installing the new pile within the existing pile reduced noise impacts and the potential for incidental dock damage during maintenance. For piles that were determined to be in extremely poor condition or that had already failed, a diving contractor cut the pile off at the mudline and removed the non-embedded portion of the pile. In-water work included pile installation and fender repair within previously disturbed areas; no excavation or fill was associated with this project. The POA implemented mitigation and monitoring measures (shutdown zones and PSO monitoring).

In 2021, NMFS issued an IHA for construction of the SFD (86 FR 50057, 07 September 2021). Take by Level B harassment of six marine mammal species and take by Level A harassment of two of those six species was authorized in the IHA. Construction of the SFD was completed in 2022.

In 2024, NMFS issued an IHA for the NES1 construction and demolition project (89 FR 2832, 16 January 2024). Take by Level B harassment of seven marine mammal species and take by Level A harassment of two of those seven species was authorized in the IHA. In-water work for the NES1 began in summer 2024.

With the exception of NES1, these projects are anticipated to have a temporary effect on marine mammal habitat. The result of the NES1 project would be restoration of shoreline and subtidal areas to a more natural condition, resulting in a permanent net benefit to marine mammal habitat in Cook Inlet. In addition, all of the above projects resulted in short-term behavioral effects for most individuals impacted and they had no known long-term effects on marine mammal populations. These previously authorized takes would not have aggregate effects when combined with the proposed takes for the CTR Project because the previous and proposed takes are limited to temporary, brief Level A or Level B harassment.

3.2.2 Marine Mammal Habitat

The mouths of rivers, such as those near the POA, are important beluga feeding habitat. Harbor seals (*Phoca vitulina*) use coastal haulouts in upper Cook Inlet, including mud flats near river mouths. Harbor seals are not known to haul out near the POA; however, they are frequently seen foraging near the mouth of Ship Creek (Cornick *et al.* 2011; Shelden *et al.* 2013; 61N Environmental 2021, 2022a). Small numbers of harbor porpoises (*Phocoena phocoena*) have been consistently reported in upper Cook Inlet between April and October (Shelden *et al.* 2014). During POA construction during 2005 through 2011, 2016, and 2020 through 2022, harbor porpoises were reported in the port vicinity (Prevel-Ramos *et al.* 2006; Markowitz and McGuire 2007; Cornick and Saxon-Kendall 2008, 2009; Cornick *et al.* 2010, 2011; Cornick and Seagars 2016; POA 2021: Table 4-2; 61N Environmental 2021, 2022a, 2022b, 2022c). Other species that may be encountered infrequently or rarely in the Project area include killer whales (*Orcinus orca*), gray whales (*Eschrichtius robustus*), humpback whales (*Megaptera novaeangliae*), and Steller sea lions (*Eumetopias jubatus*). Killer whales have been documented preying on belugas in upper Cook Inlet; however, they have not been observed during POA construction or scientific monitoring. Steller sea lions were observed during construction or dredging activities near the POA in 2009, 2016, and 2019 through 2022 (ICRC 2009; Cornick and Seagars 2016; 61N Environmental 2021, 2022a, 2022b, 2022c).

Pursuant to the ESA, critical habitat has been designated for Cook Inlet belugas (76 FR 20180, 11 April 2011) (Figure 3-1). The beluga is the only ESA-listed marine mammal in the vicinity of the project area that has critical habitat designated in Cook Inlet.[13] More information on beluga critical habitat is in Section 3.2.3.1, below.

The area surrounding the POA was excluded from the Cook Inlet beluga critical habitat designation for national security reasons (76 FR 20180). Although the immediate area around the POA is excluded from designated critical habitat, underwater noise from installation and removal of stability template steel pipe piles and removal of sheet piles would likely be perceptible to belugas within designated critical habitat beyond the exclusion zone for some installation and removal methods and pile sizes. Noise from impact and vibratory pile driving may extend across Knik Arm, and affect areas outside of the POA Exclusion zone from CIBW Critical Habitat. However, increased noise levels will only be present during construction activities, and will cease when pile driving ends. Pile driving is not expected on all days during the construction season (April – November), and is not expected at all during the months of December – March. Noise exposure is therefore expected to be temporary and intermittent with long periods of typical background noise levels on a daily and seasonal scale.

3.2.3 Marine Mammals

The marine mammals with potential to be harassed, incidental to construction of CTR, are the Cook Inlet beluga; Western DPS of the Steller sea lion; harbor seal ; harbor porpoise; killer whale; gray whale; and the Hawaii, Mexico, and Western North Pacific DPSs of the humpback whale. Belugas, harbor seals, and harbor porpoises are the species most likely to be sighted during construction of CTR.

Table 3-1 provides a summary of the abundance, occurrence, and status of the marine mammals likely to occur in the CTR Project area based on NMFS' 2022 Stock Assessment Reports (Carretta *et al.* 2023; Young *et al.* 2023) and, for belugas, the recently released update on their abundance (Goetz *et al.* 2023). Information regarding the distribution, population size, and conservation status for each species will be included in the FRN of the proposed rule, and NMFS incorporates those descriptions by reference here and summarizes them below. The POA's LOA and IHA application and NMFS' FRN of the proposed rule (89 FR 85686, 28 October 2024) also contain detailed information regarding life history functions, hearing abilities, and distribution, which is also incorporated by reference and briefly summarized below.

The occurrence of the seven species of marine mammals that may occur or are expected or likely to occur in or transit near the action area is based on the following criteria:

- Common – occurring consistently in moderate to large numbers;
- Uncommon – occurring in low numbers or on an irregular basis; and
- Rare – records for some years but limited.

Table 3-1. Marine Mammals in or near the CTR Project Area at the POA

Species	Abundance (Population/Stock or DPS)	MMPA Designation	ESA Listing	Occurrence in Project Area
Harbor seal (*Phoca vitulina*)	28,411 (Cook Inlet/Shelikof Strait Stock)	None	None	Common

[13] Critical habitat for Steller sea lions and humpback whales does not occur near the CTR Project area or in upper Cook Inlet.

Species	Abundance (Population/Stock or DPS)	MMPA Designation	ESA Listing	Occurrence in Project Area
Steller sea lion (*Eumatopias jubatus*)	49,837[a] (Western Stock and DPS)	Depleted & Strategic	Endangered	Uncommon
Harbor porpoise (*Phocoena phocoena*)	31,046 (Gulf of Alaska Stock)	Strategic	None	Uncommon
Killer whale (Orca) (*Orcinus orca*)	1,920[a] (Eastern North Pacific Alaska Resident Stock) 587 (Eastern North Pacific, Gulf of Alaska, Aleutian Islands, & Bering Sea Transient Stock)	None None	None None	Rare
Cook Inlet beluga *(Delphinapterus leucas)*	331[b] (Cook Inlet Stock and DPS)	Depleted & Strategic	Endangered	Common
Gray whale (*Eschrichtius robustus*)	26,960 (Eastern North Pacific Stock and DPS)	None	None	Rare
Humpback whale *(Megaptera novaeangliae)*	11,278 (Hawaii Stock and DPS) NA (Mexico-North Pacific Stock)	None Depleted & Strategic	None Threatened	Rare

Source: Mexico - North Pacific stock humpback whale population estimate: Martinez-Aguilar 2011. Hawai'i stock humpback whale population estimate: Becker *et al.* 2022. Gray whale population estimate: Durban *et al.* 2017; Carretta *et al.* 2023. Beluga population estimate: Goetz *et al.* 2023. All other population estimates: Young *et al.* 2023.
Notes: DPS = Distinct Population Segment; ESA = Endangered Species Act; MMPA = Marine Mammal Protection Act.
[a] Nmin was used.
Note: DPS = Distinct Population Segment; ESA = Endangered Species Act; MMPA = Marine Mammal Protection Act.
[b] Nbest = 331 individuals (Goetz *et al.* 2023).

3.2.3.1 ESA-Listed Marine Mammals

For conciseness, the details regarding marine mammals in this document are limited to only those needed to evaluate whether a significant environmental impact exists. Additional details and depth of analysis regarding marine mammals can be found in the LOA and IHA application and the notice of the proposed rule (89 FR 85686, 28 October 2024).

Cook Inlet Beluga Whale

Status and Distribution

The Cook Inlet beluga Stock and DPS resides year-round in Cook Inlet (Laidre *et al.* 2000; Castellote *et al.* 2020) and is the most isolated beluga stock in Alaska (Young *et al.* 2023). No systematic surveys for abundance of Cook Inlet belugas were conducted prior to 1994; however, the ADF&G conducted a survey of Cook Inlet belugas in August 1979 and estimated 1,293 individuals (Calkins 1989). This survey provides the best available estimate for historical beluga abundance in Cook Inlet and was used by NMFS to establish 1,300 belugas as the carrying capacity in Cook Inlet (65 FR 34590).

NMFS began comprehensive, systematic aerial surveys of belugas in Cook Inlet in 1994. These surveys documented a decline in abundance of nearly 50 percent between 1994 and 1998, from an estimate of 653 to 347 whales (Rugh *et al.* 2000). Annual abundance surveys were conducted each June from 1999 through 2012, but in 2013, NMFS changed the survey to a biennial schedule.

Analysis of survey data from 1999 to 2016 indicated that the population continued to decline at an annual rate of 0.4 percent (Shelden *et al.* 2015, 2017). However, using a Bayesian statistical method developed by Boyd *et al.* (2019), the analysis conducted by Shelden and Wade (2019) indicates that from 2008 to 2010, the Cook Inlet beluga population was declining at an annual rate of 2.3 percent (Shelden and Wade 2019). The most recent surveys were conducted in 2021 and 2022 and produced an abundance estimate of 331 belugas (Table 3-2) with a 95 percent probability range of 290 to 386 whales (Goetz *et al.* 2023). This analysis indicates that from 2012 to 2022, the Cook Inlet beluga population was increasing at an annual rate of 0.9 percent (Goetz *et al.* 2023).

On June 15, 2023, NMFS released an updated abundance estimate for CIBWs (Goetz *et al.*, 2023) that incorporates aerial survey data from June 2021 and 2022, which represents an update from the most recent SAR (Young *et al.*, 2023), and suggest that the CIBW population is stable or may be slightly increasing. The methodology in the 2023 report is the same as that used for NMFS's SARs (Young *et al.* 2023), and incorporates the same time-series of data from previous years. The only change was the inclusion of more recent data from 2021 and 2022 surveys; the 2021 data collection efforts were delayed from 2020 due to COVID-19. Goetz *et al.* (2023) estimated that the population size is currently between 290 and 386, with a median best estimate of 331. In accordance with the MMPA, this population estimate will be incorporated into the 2024 draft CIBW SAR and subject to the standard review process before being finalized. It is appropriate to consider the CIBW estimate of abundance reported by Goetz *et al.* (2023) in our analysis rather than the older SAR estimate currently available (Young *et al.*, 2023) because the methodology is identical to that used in the 2021 SAR and it represents the most recent and best available science.

Table 3-2. Annual Cook Inlet Beluga Abundance Estimates

1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2014	2016	2018	2022
367	435	386	313	357	366	278	302	375	375	321	340	284	312	340	328	279	331

Source: Hobbs *et al.* 2000, 2011, 2012; Rugh *et al.* 2003, 2004a, 2004b, 2005a, 2005b, 2005c, 2006a, 2006b, 2007; Hobbs and Shelden 2008; Allen and Angliss 2010, 2011; Shelden *et al.* 2013, 2015, 2017; Shelden and Wade 2019; Boyd *et al.* 2019; Goetz *et al.* 2023.
Note: Abundance surveys were not completed in 2013, 2015, 2017, 2019, and 2020. An abundance estimate was not calculated from the 2022 survey data.

In 1999, NMFS received petitions to list the Cook Inlet beluga DPS as an endangered species under the ESA (64 FR 17347); however, it was not until 17 October 2008, that NMFS announced the listing of the population as endangered under the ESA (73 FR 62919). The Cook Inlet beluga stock was designated as depleted under the MMPA in 2000, indicating that the size of the stock was below its Optimum Sustainable Population (OSP) level (65 FR 34590). The population has remained below its OSP level since the designation but would be considered recovered once the population estimate rises above the OSP level. In September 2022, NOAA Fisheries completed the ESA 5-year review for the Cook Inlet beluga DPS and determined that the Cook Inlet beluga DPS should remain listed as endangered (NMFS 2022a).

Foraging Ecology

Cook Inlet belugas feed on a wide variety of prey species, particularly those that are seasonally abundant. In spring, the preferred prey species are eulachon and cod (gadids). Other fish and invertebrate species found in the stomachs of belugas include porifera, polychaetes, mysids, amphipods, shrimp, crabs, and marine worms. Some of the species may be found in beluga stomachs from secondary ingestion because species such as cod feed on polychaetes, shrimp, amphipods, and mysids, as well as other fish (*e.g.,* walleye pollock [*Gadus chalcogrammus*], and flatfish) and invertebrates (Quakenbush *et al.* 2015).

From late spring through summer, most beluga stomachs sampled contained Pacific 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 (Chinook, pink, coho, sockeye, and chum) spawn in rivers throughout Cook Inlet (Moulton 1997; Moore *et al.* 2000).

Pacific salmon, overall, represent the highest percent frequency of occurrence of prey species in Cook Inlet beluga 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).

Distribution in Cook Inlet

Belugas are year-round residents in Cook Inlet (Rugh *et al.* 2000; Castellote *et al.* 2020), though they display seasonal movements throughout the Inlet. Large aggregations of belugas occur near the mouths of rivers and streams when anadromous fish are present (Moore *et al.* 2000; Shelden and Wade 2019; McGuire *et al.* 2020; Castellote *et al.* 2020).

During spring and summer, belugas generally aggregate near the warmer waters of river mouths where prey availability is high and predator occurrence is low (Moore *et al.* 2000; Shelden and Wade 2019; McGuire *et al.* 2020; Castellote *et al.* 2020). Since the mid-1990s, most belugas (96 to 100 percent) aggregate in shallow areas near river mouths in upper Cook Inlet, and they are rarely sighted in the central or southern portions of Cook Inlet during summer (Hobbs *et al.* 2008). Important calving grounds are located near the river mouths of upper Cook Inlet, and peak calving occurs between July and October (McGuire *et al.* 2016). Data regarding fall and winter habitat use by belugas is limited, but a few tagging studies have attempted to fill this knowledge gap (Hobbs *et al.* 2005, 2012; Goetz *et al.* 2012). Generally fewer observations of belugas are reported from the Anchorage and Knik Arm area from November through April (76 FR 20180; Rugh *et al.* 2000, 2004a).

Presence in the CTR Project Area

Belugas are the marine mammals most likely to be encountered in the Project area. As part of their permitting requirements for the MTRP, the POA conducted a NMFS-approved monitoring program for belugas and other marine mammals focused on the POA area from 2005 to 2011. The POA also conducted NMFS-approved monitoring in 2016 for the TPP, and from 2020 to 2022 for the PCT and SFD projects. Knik Arm is one of three areas in upper Cook Inlet where belugas concentrate during spring, summer, and early fall. Most belugas observed in or near the POA are transiting between upper Knik Arm and other portions of Cook Inlet, as the POA itself is not considered high-quality foraging habitat or a primary habitat for calving. Belugas tend to follow their anadromous prey and travel in and out of Knik Arm with the tides. Their use of Knik Arm is concentrated between August and October and may be highest in October (61N Environmental 2021, 2022a, 2022c), lowest in winter (December through February), and remain low in spring and early summer (March–July; Funk *et al.* 2005; U.S. Army Garrison Fort Richardson 2009; Hobbs *et al.* 2011, 2012; 61N Environmental 2021, 2022a, 2022c).

Critical Habitat

On April 11, 2011, NMFS designated two areas of critical habitat for CIBW (76 FR 20179). The designation includes 7,800 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. From spring through fall, Area 1 critical habitat has the highest concentration of CIBWs due to its important foraging and calving habitat. Area 2 critical habitat has a lower concentration of CIBWs in spring and summer but is used by CIBWs in fall and winter. Critical habitat does not include two areas of military usage: the Eagle River Flats Range on Fort Richardson and military lands of JBER between Mean Higher High Water and MHW.

Additionally, the POA, adjacent navigation channel, and turning basin (approximately 6.84 km^2) were excluded from the critical habitat designation due to national security reasons (76 FR 20180, April 11, 2011). The POA exclusion area is within Area 1, however, marine mammal monitoring results from the POA suggest that this exclusion area is not a particularly important feeding or calving area. CIBWs have been occasionally documented to forage around Ship Creek (south of the POA) but are typically transiting through the area to other, potentially richer, foraging areas to the north (*e.g.,* Six Mile Creek, Eagle River, Eklutna River) (*e.g.,* 61N Environmental, 2021, 2022a, 2022b, 2022c, Easley-Appleyard and Leonard, 2022). These locations contain predictable salmon runs, an important food source for CIBWs, and the timing of these runs has been correlated with CIBW movements into the upper reaches of Knik Arm (Ezer *et al.*, 2013). More information on CIBW critical habitat can be found at *https://www.fisheries.noaa.gov/action/critical-habitat-cook-inlet-beluga-whale*.

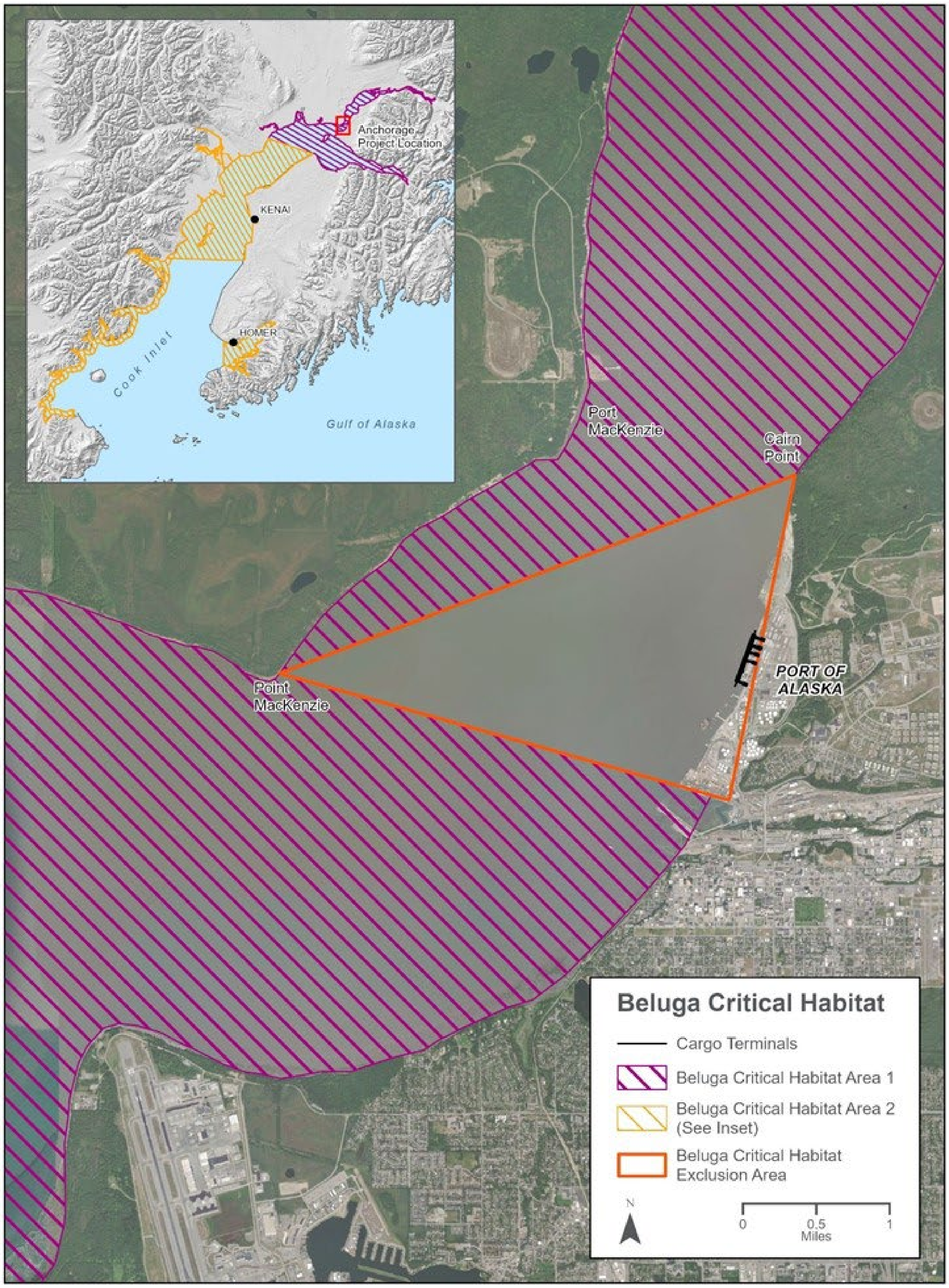

Figure 3-1. Cook Inlet Beluga Critical Habitat and Exclusion Zone at the POA

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 (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.

The area around the POA, while exempted from the designated Critical Habitat due to national security issues, does contain the requisite bathymetric features in the first PCE, as well as the presence of primary prey species. However, given the industrialized nature of the POA and the historical use of the site from early 1900s, the other physical features are more difficult to confirm. Sediment contamination was examined during a 2008 U.S. Army Corps of Engineers dredging project near the Port, and contaminant levels of volatile and semi-volatile organic compounds, total recoverable petroleum hydrocarbons, PCBs, pesticides, cadmium, mercury, selenium, silver, arsenic, barium, chromium, and lead were found to be suitable for in-water discharge (USACE 2008).

Ambient and background noise levels at the POA have been measured, and are addressed quantitatively in Section 3.1.1. Generally, noise levels are elevated due to both anthropogenic activities (*i.e.,* commercial shipping, dredging, and construction) and normal environmental factors (*e.g.,* high current velocity, ice movement, seismic activity). Neither contaminants or noise have been shown to approach the "harmful" and "habitat abandonment" thresholds described in the PCEs, and CIBW presence continues to be documented in and around the POA (61N, 2021, 2022a, 2022b). In total, the exempted area surrounding the POA represents approximately 0.35 percent of the designated Critical Habitat Area 1.

Biologically Important Areas

Wild *et al.* (2023) delineated portions of Cook Inlet, including near the proposed project area, as a Biologically Important Area (BIA) for the small and resident population of CIBWs based on scoring methods outlined by Harrison *et al.* (2023) (see *https://oceannoise.noaa.gov/biologically-important-areas* for more information). The BIA is used year-round by CIBWs for feeding and breeding, and there are limits on food supply such as salmon runs and seasonal movement of other fish species (Wild *et al.*, 2023). The boundary of the CIBW BIA is consistent with NMFS' critical habitat designation, and does not include the aforementioned exclusion areas (*e.g.,* the POA and surrounding waters) (Wild *et al.*, 2023).

Steller Sea Lion

Status and Distribution

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 in the Project area. The Western DPS was listed under the ESA as threatened in 1990, and its continued population decline resulted in a change in listing status to endangered in 1997 (62 FR 24345). 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). For the region that encompasses Cook Inlet (Central Gulf of Alaska), the annual trend in counts (annual rates of change) of Western DPS Steller sea lions is 3.78 for non-pups (adults and juveniles) and 3.01 for pups for the period 2006 through 2021 (Young *et al.* 2023; Sweeney *et al.* 2022). The most recent abundance estimate for the Western DPS is 11,987 pups and 37,333 non-pups, totaling 49,837 individuals (Young *et al.* 2023).

Foraging Ecology

Steller sea lions feed on seasonally abundant prey throughout the year, predominately on species that aggregate in schools or for spawning. They adjust their distribution based on the availability of prey species. Principal prey include eulachon, walleye pollock, capelin (*Mallotus villosus*), mackerel (*Scomber scombrus*), Pacific salmon, Pacific cod, flatfishes, rockfishes, Pacific herring, sand lance, skates, squid, and octopus (Womble and Sigler 2006; Womble *et al.* 2009).

Presence in Cook Inlet

Steller sea lions have not been documented in upper Cook Inlet during beluga aerial surveys conducted annually in June from 1994 through 2012 and in 2014 (Shelden *et al.* 2013, 2015, 2017; Shelden and Wade 2019); however, an increase in individual Steller sea lion sightings near the POA has occurred in recent years.

Presence in the CTR Project Area

Steller sea lions were observed near the POA in June 2009, 2016, and 2019 through 2022 (ICRC 2009; Cornick and Seagars 2016; POA 2019b; 61N Environmental 2021, 2022a, 2022b, 2022c). In 2009, three Steller sea lion sightings occurred that were believed to be the same individual (ICRC 2009). In 2016, Steller sea lions were observed on two separate days. On 02 May 2016, one individual was sighted. On 25 May 2016, five Steller sea lion sightings occurred within a 50-minute period, and these sightings occurred in areas relatively close to one another (Cornick and Seagars 2016). Given the proximity in time and space, it is believed these five sightings were of the same individual Steller sea lion. In 2019, one Steller sea lion was observed in June at the POA during transitional dredging (POA 2019b). Six sightings of individual Steller sea lions occurred near the POA in May and June 2020 during PCT Phase 1 construction monitoring that took place from 27 April through 24 November 2020 (61N Environmental 2021). In 2021, a total of eight sightings of individual Steller sea lions occurred in May, June, and September near the POA during PCT Phase 2 construction monitoring (61N Environmental 2022a). In May through June 2022, four Steller sea lion sightings occurred during the transitional dredging and SFD construction monitoring (61N Environmental 2022b, 2022c). During NMFS marine mammal monitoring, one Steller sea lion was observed in August 2021 in the middle of the inlet looking and diving (Easley-Appleyard and Leonard 2022). In 2022, three Steller sea lion sightings occurred during the transitional dredging monitoring and three occurred during SFD construction monitoring (61N Environmental 2022b, 2022c). All sightings occurred during summer, when the sea lions were likely following ongoing salmon runs. Sea lion observations near the POA may be increasing due to more consistent observation effort or increased presence.

Humpback Whale

Humpback whales worldwide were designated as endangered under the Endangered Species Conservation Act in 1970 and were listed under the ESA at its inception in 1973. However, on 08 September 2016, NMFS published a final decision that changed the status of all humpback whale DPSs under the ESA (81 FR 62259), effective 11 October 2016. The decision recognized the existence of 14 DPSs based on distinct breeding areas in tropical and temperate waters. Five of the 14 DPSs were classified under the ESA (four endangered and one threatened), while the other nine DPSs were delisted. On 21 April 2021, NMFS published a final rule to designate critical habitat for three of the listed DPSs (86 FR 21082). No critical habitat was designated in or near the CTR Project area.

The most comprehensive photo-identification data available suggest that approximately 89 percent of all humpback whales in the Gulf of Alaska are members of the Hawaii DPS, 11 percent are from the Mexico DPS, and less than 1 percent are from the Western North Pacific DPS (Wade 2021; Carretta *et al.* 2023;

Young *et al.* 2023). The Hawaii DPS is not listed under the ESA, the Mexico DPS is listed as threatened, and the Western North Pacific DPS is listed as endangered. Members of different DPSs are known to intermix in feeding grounds; therefore, all waters off the coast of Alaska should be considered to have ESA-listed humpback whales.

The 2022 NMFS Alaska and Pacific Stock Assessment Reports (SARs) described a revised stock structure for humpback whales which modifies the previous stocks designated under the MMPA to align more closely with the ESA-designated 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, 2023). 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, 2023). 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).

Humpback whales experienced large population declines due to commercial whaling operations in the early twentieth century. Barlow (2003) estimated the population of humpback whales at approximately 1,200 animals in 1966. The population in the North Pacific grew to between 6,000 and 8,000 by the mid-1990s. Current threats to humpback whales include vessel strikes, releases of chemicals or hydrocarbons into the marine environment, climate change, and commercial fishing operations (Carretta *et al.* 2023; Young *et al.* 2023).

Foraging Ecology

Humpback whales target aggregations of krill (family Euphausiidae; Nemoto 1957) and small schooling fish, including herring (Krieger and Wing 1984), capelin (Witteveen *et al.* 2008), sand lance (Hazen *et al.* 2009), and juvenile salmon (Chenoweth *et al.* 2017). In Alaska waters, the species composition of prey taken by humpback whales varies, likely due to prey availability and individual preference (Witteveen *et al.* 2011).

Presence in Cook Inlet

Humpback whales are encountered regularly in lower Cook Inlet and occasionally in mid-Cook Inlet; however, sightings are rare in upper Cook Inlet. During aerial surveys conducted in summers between 2005 and 2012, Shelden *et al.* (2013) reported dozens of sightings in lower Cook Inlet, a handful of sightings in the vicinity of Anchor Point and in lower Cook Inlet, and no sightings north of 60° North latitude. NMFS changed to a biennial survey schedule starting in 2014 after analysis showed there would be little reduction in the ability to detect a trend given the current growth rate of the population (Hobbs 2013). No survey took place in 2020. Instead, consecutive surveys took place in 2021 and 2022 (Shelden *et al.* 2022). During the 2014 to 2022 aerial surveys, sightings of humpback whales were recorded in lower Cook Inlet and mid-Cook Inlet, but none were observed in upper Cook Inlet (Shelden *et al.* 2015, 2017, 2019, 2022). Vessel-based observers participating in the Apache Corporation's 2014 survey operations recorded three humpback whale sightings near Moose Point in upper Cook Inlet and two sightings near Anchor Point, while aerial and land-based observers recorded no humpback whale sightings, including in upper Cook Inlet (Lomac-MacNair *et al.* 2014). Observers monitoring waters between Point Campbell and Fire Island during summer and fall 2011 and spring and summer 2012 recorded no humpback whale sightings (Brueggeman *et al.* 2013). Monitoring of Turnagain Arm during ice-free months between 2006 and 2014 yielded one humpback whale sighting (McGuire, unpublished data; cited in LGL Alaska Research Associates, Inc., and DOWL 2015).

Presence in the CTR Project Area

Few humpback whale sightings have occurred in the project area. Humpback whales were not documented during POA construction or scientific monitoring from 2005 to 2011, in 2016, or 2020 (Prevel-Ramos *et al.* 2006; Markowitz and McGuire 2007; Cornick and Saxon-Kendall 2008, 2009; Cornick *et al.* 2010, 2011; ICRC 2009, 2010, 2011, 2012; Cornick and Pinney 2011; Cornick and Seagars 2016; 61N Environmental 2021). Observers monitoring the Ship Creek Small Boat Launch from 23 August to 11 September 2017 recorded two sightings, each of a single humpback whale, which was presumed to be the same individual (POA 2017). In 2017, an event involved a stranded whale that was sighted near several locations in upper Cook Inlet before washing ashore at Kincaid Park; it is unclear whether the humpback whale was alive or deceased upon entering Cook Inlet waters. No humpback whales were observed during the 2020 to 2021 PCT construction monitoring, the NMFS marine mammal monitoring, or during the 2022 transitional dredging and SFD construction monitoring from April to June 2022 (61N Environmental 2021, 2022a, 2022b, 2022c; Easley-Appleyard and Leonard 2022). One humpback whale was observed in July during 2022 transitional dredging monitoring (61N Environmental 2022c).

Gray Whale

Status and Distribution

There are two populations of gray whales present in the North Pacific: the Western North Pacific Stock and the Eastern North Pacific Stock (Carretta *et al.* 2023). The current stock structure for gray whales in the Pacific has been in the process of being re-examined for a number of years and remains uncertain as of the most recent (2022) Pacific SAR (Carretta *et al.* 2023); gray whales are not addressed in the Alaska SAR (Young *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).

The Western North Pacific Stock of gray whales is listed as endangered, and no critical habitat has been designated for this species. The Eastern North Pacific Stock recovered from whaling exploitation, was delisted under the ESA in 1994 and is not considered depleted (Carretta *et al.* 2023). Western North Pacific gray whales are not known to feed in or travel to upper Cook Inlet (Conant and Lohe 2023; Weller *et al.* 2023). Gray whales near the project area are assumed to be from the Eastern North Pacific Stock.

An Unusual Mortality Event (UME) along the West Coast and Alaska was declared for gray whales in January 2019 (NMFS 2022e) and ended in 2023 (NMFS 2024). Between 2019 and 2023, 146 gray whales stranded off Alaska. Preliminary findings for several of the whales indicate evidence of emaciation, but the UME is still under investigation, and the cause of the mortalities remains unknown (NMFS 2022e).

Foraging Ecology

Gray whales are mainly bottom feeders. They obtain their food by scraping the sides of their heads along the ocean floor and scooping up sediments. They capture small invertebrates on their baleen by expelling the sediment and other particles through the baleen fringes (ADF&G 2022). In Alaska waters, gray whales eat primarily amphipod crustaceans, although a wide variety of species were reported from gray whale stomachs, such as amphipods (*e.g., Anonyx*, *Atylus*, *Lembos*, *Pontoporeia*), decapods (*e.g., Chionoecetes*, *Nectocrangdon*, *Nephrops*), and other invertebrates (mollusks, polychaete worms, and even sponges) (Moore *et al.* 2003; ADF&G 2022).

Presence in Cook Inlet

Gray whales are infrequent visitors to Cook Inlet but may be seasonally present during spring and fall in the lower inlet (BOEM 2021). Migrating gray whales pass through the inlet during their spring and fall migrations to and from their primary summer feeding areas in the Bering, Chukchi, and Beaufort seas (Swartz 2018; Carretta *et al.* 2019; BOEM 2021; Silber *et al.* 2021).

Gray whales are rarely documented in upper Cook Inlet. In 2020, an individual swam upstream in Cook Inlet during a very high tide and was trapped when the water receded (George 2020). The gray whale was first encountered in May near the Seward Highway Bridge and a week later, the tide finally pushed the whale into Turnagain Arm. On 12 June, a dead gray whale was spotted near the mouth of the Susitna River. It is suspected that this was the same gray whale seen in May (George 2020). There is no indication that work at the PCT during this period had any effect on the animal. Based on photos and video NMFS collected of the whale, veterinarians determined the whale was in fair to poor condition.

Presence in the CTR Project Area

Gray whales are rarely encountered in the project area. Gray whales were not documented during POA construction or scientific monitoring from 2005 to 2011 or during 2016 (Prevel-Ramos *et al.* 2006; Markowitz and McGuire 2007; Cornick and Saxon-Kendall 2008, 2009; ICRC 2009, 2010, 2011, 2012; Cornick *et al.* 2010, 2011; Cornick and Pinney 2011; Cornick and Seagars 2016). One gray whale was observed during the 2020 PCT construction near Port Mackenzie (61N Environmental 2021) (possibly the same whale that stranded on 12 June 2020, described above) and a second was observed off Ship Creek during 2021 PCT construction monitoring (61N Environmental 2022a). During NMFS marine mammal monitoring in 2021, on 10 August, one gray whale surfaced directly in front of the Point Woronzof PSO station traveling west out of the inlet approximately 700 m offshore (Easley-Appleyard and Leonard 2022). No gray whales were observed during the 2022 transitional dredging or SFD construction monitoring from May to August (61N Environmental 2022b, 2022c).

3.2.3.2 Non-ESA-Listed Marine Mammals

Harbor Seal

Harbor seals inhabit waters all along the western coast of the U.S., British Columbia, and north through Alaska waters to the Pribilof Islands and Cape Newenham. Twelve recognized stocks of harbor seals occur in Alaska. Harbor seals in the Project area are members of the Cook Inlet/Shelikof stock; no other stock is present in the Project area. 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).

The current abundance estimate for the Cook Inlet/Shelikof stock is based on aerial survey data from 1996 through 2018 and is estimated at 28,411 individuals, with a negative population growth trend of -

111 seals per year (Young *et al.* 2023). The estimated average annual subsistence harvest of the Cook Inlet/Shelikof stock was 233 individuals between 2004 and 2008, and 104 individuals in 2014 (Muto *et al.* 2022). Harbor seals are not listed under the ESA or designated as depleted or strategic under the MMPA, but like all marine mammals, they are protected under the MMPA.

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). Research on satellite-tagged harbor seals observed several movement patterns in Cook Inlet (Boveng *et al.* 2012). In 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 after release (south of Nikiski; Boveng *et al.* 2012).

The presence of harbor seals in upper Cook Inlet is seasonal. Harbor seals are commonly observed along the Susitna River and other tributaries in upper Cook Inlet during eulachon and Pacific salmon migrations (NMFS 2003). The major haulout sites for harbor seals are in lower Cook Inlet; however, a few haulouts are located in upper Cook Inlet, including near the Little and Big Susitna rivers, Beluga River, Theodore River, and Ivan River (Montgomery *et al.* 2007; Barbara Mahoney, pers. comm., 16 November 2020). During aerial surveys of upper Cook Inlet from 1993 to 2012, harbor seals were observed 24 to 96 km (15 to 60 miles) south-southwest of Anchorage at the Chickaloon, Little Susitna, Susitna, Ivan, McArthur, and Beluga rivers (Shelden *et al.* 2013). No known harbor seal haulout or pupping sites occur in the vicinity of the POA.

Harbor seals are commonly observed in the Project area, particularly foraging near the mouth of Ship Creek (Cornick *et al.* 2011; Shelden *et al.* 2013; 61N Environmental 2021, 2022a), which is approximately 1,600 m from the midpoint of the CTR Project. During annual marine mammal surveys conducted by NMFS since 1994, harbor seals have been observed in Knik Arm and in the vicinity of the POA (Shelden *et al.* 2013), but are not known to haul out in the Project area.

Harbor seals were observed during construction monitoring at the POA from 2005 through 2011 and in 2016; data were unpublished for 2005 through 2007 (Prevel-Ramos *et al.* 2006; Markowitz and McGuire 2007; Cornick and Saxon-Kendall 2008, 2009; Cornick *et al.* 2010, 2011). Harbor seals were observed in groups of one to seven individuals (Cornick *et al.* 2011; Cornick and Seagars 2016). Harbor seals were also observed near the POA during construction monitoring for PCT Phase 1 in 2020 and PCT Phase 2 in 2021, NMFS marine mammal monitoring in 2021, and transitional dredging monitoring and SFD construction monitoring in 2022 (61N Environmental 2021, 2022a, 2022b, 2022c; Easley-Appleyard and Leonard 2022). Sighting rates of harbor seals have been highly variable and may have increased from MTRP monitoring between 2005 and 2011, and PCT monitoring in 2020 and 2021. It is unknown whether any potential increase was due to local population increases or habituation to ongoing construction activities. It is possible that increased sighting rates are correlated with more intensive monitoring efforts in 2020 and 2021, when the POA used 11 PSOs spread among four monitoring stations.

During 2020 PCT Phase 1 construction monitoring, harbor seals were regularly observed in the vicinity of the POA with frequent observations near the mouth of Ship Creek, southeast of the CTR Project location. Harbor seals were observed almost daily during pile driving, with 54 sightings documented in July, 66 in August, and 44 in September (61N Environmental 2021). During 2021 PCT Phase 2 construction, harbor seals were observed during pile driving with the highest numbers of sightings in June (87 individuals) and September (124 individuals). Preliminary observation data indicate that the most common behavior of harbor seals documented during the 2020 PCT Phase 1 construction is described as "looking and sinking," with that behavior documented throughout all hours of observation. Over the 13 days of SFD construction monitoring in May and June 2022, 27 groups of one individual harbor seal were observed

(61N Environmental 2022b). Seventy-two groups of 75 total harbor seals (single individuals and three groups of two individuals) were observed during transitional dredging monitoring in 2022 (61N Environmental 2022c).

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 split the Southeast Alaska stock into three separate stocks, resulting in five separate stocks for this species in Alaskan waters. 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, which is a strategic stock (Young *et al.* 2023).

The Gulf of Alaska stock, which includes individuals in Cook Inlet, is currently estimated at 31,046 individuals (Young *et al.* 2023). Dahlheim *et al.* (2000) estimated abundance and density of harbor porpoises in Cook Inlet from surveys conducted in the early 1990s. The estimated density of animals in Cook Inlet was 7.2 per 1,000 square km, with an abundance estimate of 136 (Dahlheim *et al.* 2000), indicating that only a small number use Cook Inlet. Hobbs and Waite (2010) estimated a harbor porpoise density in Cook Inlet of 13 per 1,000 square km from beluga aerial surveys in the late 1990s. Neither of these surveys included coastlines, which have been documented to be used heavily by harbor porpoises (Shelden *et al.* 2014).

Harbor porpoises have been observed in Knik Arm during monitoring efforts since 2005. During POA construction from 2005 through 2011 and in 2016, harbor porpoises were reported in 2009, 2010, and 2011 (Prevel-Ramos *et al.* 2006; Markowitz and McGuire 2007; Cornick and Saxon-Kendall 2008, 2009; Cornick *et al.* 2010, 2011; Cornick and Seagars 2016). In 2009, a total of 20 harbor porpoises were observed during construction monitoring, with sightings in June, July, August, October, and November. Harbor porpoises were observed twice in 2010: once in July and again in August. In 2011, POA monitoring efforts documented harbor porpoises five times, with a total of six individuals in August, October, and November at the POA (Cornick *et al.* 2011). During other monitoring efforts conducted in Knik Arm, four sightings of harbor porpoises occurred in 2005 (Shelden *et al.* 2014), and a single harbor porpoise was observed in the vicinity of the POA in October 2007 (URS 2008). No harbor porpoises were observed in 2016. A total of 18 harbor porpoises were observed near the POA from 27 April through 24 November 2020 during Phase 1 PCT construction monitoring (61N Environmental 2021). In 2021, a total of 27 harbor porpoises were observed near the POA during the PCT Phase 2 construction monitoring, which took place between 26 April and 29 September 2021 (61N Environmental 2022a). During the 2021 NMFS marine mammal monitoring, one harbor porpoise was observed in August and six were observed in October (Easley-Appleyard and Leonard 2022). During 2022, five harbor porpoises were sighted during transitional dredging monitoring (61N Environmental 2022c). None were sighted during the 2022 SFD construction monitoring that occurred between May and June 2022 (61N Environmental 2022b).

Killer Whale

Three distinct ecotypes of killer whale are found in the northeastern Pacific Ocean: resident, transient, and offshore killer whales. Two stocks have the potential to be in the Project area, the Eastern North Pacific Alaska Residents and the Gulf of Alaska, Aleutian Islands, and Bering Sea Transients. Both ecotypes overlap in the same geographic area; however, they maintain social and reproductive isolation and feed on different prey species. The population of the Eastern North Pacific Alaska Resident stock of killer whales contains an estimated 2,347 animals and the Gulf of Alaska, Aleutian Islands, and Bering Sea Transient stock of killer whales is estimated to contain 587 animals (Muto *et al.* 2022). Killer whales are rare in Cook Inlet, and most individuals are observed in lower Cook Inlet (Shelden *et al.* 2013).

Few killer whales, if any, are expected to approach or be in the vicinity of the Project during construction of CTR. No killer whales were spotted in the vicinity of the POA during surveys by Funk *et al.* (2005), Ireland *et al.* (2005), or Brueggeman *et al.* (2007, 2008a, 2008b). Killer whales have also not been documented during any POA construction or scientific monitoring from 2005 to 2011, in 2016, or in 2020 (Prevel-Ramos *et al.* 2006; Markowitz and McGuire 2007; Cornick and Saxon-Kendall 2008; ICRC 2009, 2010, 2011, 2012; Cornick *et al.* 2010, 2011; Cornick and Pinney 2011; Cornick and Seagars 2016; 61N Environmental 2021). Two killer whales, one male and one juvenile of unknown sex, were sighted offshore of Point Woronzof in September 2021 during PCT Phase 2 construction monitoring (61N Environmental 2022a). The pair of killer whales moved up Knik Arm, reversed direction near Cairn Point, and traveled southwest out of Knik Arm toward the open water of Upper Cook Inlet. No killer whales were sighted during the 2021 NMFS marine mammal monitoring or 2022 transitional dredging and SFD construction monitoring that occurred between May and June 2022 (Easley-Appleyard and Leonard 2022; 61N Environmental 2022b, 2022c).

3.2.3.3 Marine Mammal Acoustics and Hearing

Estimating the potential effects of sound on marine mammal species that may be present in the action area involves analysis of the manner in which sound interacts with the physiology of marine mammals and the potential responses of those animals to sound.[14] General information about sound and marine mammal hearing is provided in this section, and potential effects of sound on marine mammal species are provided in Section 4.6.2.3. An understanding of the frequency ranges marine mammals are able to hear is essential to the consideration of the effects of pile driving on marine mammals specified in the POA's LOA and IHA application and explained in the notice of the proposed rule (89 FR 85686, 28 October 2024) to be issued under the MMPA. The exposure estimates associated with the activities specified in the application and the notice of the proposed rule were considered in addition to other factors that may affect the impacts of those exposures on marine mammals.

Overview of Sound and Marine Mammal Hearing

Hearing is the most important sensory modality for marine mammals because they rely on sound to obtain detailed information about their surroundings, communicate, navigate, reproduce, socialize, and avoid predators. Therefore, the surrounding soundscape is a key component of marine mammal habitat and can be considered their acoustic habitat (Clark *et al.* 2009). Underwater sound comes from numerous natural sources (biological and physical processes) and anthropogenic sources. Biological sounds include marine life (*e.g.,* marine mammals, fish, snapping shrimp). Physical sounds include wind and wave activity, rain, cracking sea ice, undersea earthquakes, and volcano eruptions. Anthropogenic sound includes shipping and other vessel traffic, military activity, marine construction, oil and gas exploration, and more. Some of these natural and anthropogenic sounds are present more or less everywhere in the ocean all of the time; therefore, background sound in the ocean is commonly referred to as "ambient noise" (Discovery of Sound in the Sea 2019).

Sound travels in waves, the basic components of which make up 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 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, except in certain cases in shallower water. Amplitude is the height of the sound pressure wave or the "loudness" of a sound and is typically described using the relative unit of the decibel. When underwater objects vibrate

[14] For example, predicting how many marine mammals may be harassed required potential effects to be evaluated within the context of applicable laws and regulations. Both the MMPA and ESA require that all anticipated responses to sound resulting from the proposed research activities be considered relative to their potential impact on animal growth, survivability, and reproduction. Although a variety of effects may result from an acoustic exposure, not all effects may impact survivability or reproduction (e.g., short-term changes in respiration rate would have no effect on survivability or reproduction).

or activity occurs, sound-pressure waves are created. These waves alternately compress and decompress the water as the sound wave travels. Underwater sound waves radiate in a manner similar to ripples on the surface of a pond, and may be directed either in a beam or beams or may radiate in all directions (omnidirectional sources). The compressions and decompressions associated with sound waves are detected as changes in pressure by aquatic life and human-made sound receptors such as hydrophones.

The sum of various natural and anthropogenic sound sources that comprise background noise at any given location and time depends not only on the source levels (as determined by current weather conditions and levels of biological and human activity) but also on the ability of sound to propagate through the environment. In turn, 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 numerous varying factors, background noise 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.* 1995a). 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 soundscape or could form a distinctive signal that may affect marine mammals.

The sound level of a region is defined by the total acoustical energy being generated by known and unknown sources. In general, ambient sound levels tend to increase with increasing wind speed and wave height. Precipitation can be an important component of total sound at frequencies above 500 Hz and possibly down to 100 Hz during quiet times. Marine mammals can contribute to ambient sound levels, as can some fish and snapping shrimp. The frequency band for biological contributions is from approximately 12 Hz to more than 100 kilohertz (kHz). In deep water, low-frequency ambient sound from 1 to 10 Hz comprises mainly turbulent pressure fluctuations from surface waves and the motion of water at the air-water interface. At these frequencies, sound levels depend only slightly on wind speed. Between 20 and 300 Hz, distant ships transiting dominates wind-related sounds. Above 300 Hz, the ambient sound level depends on weather conditions, with wind- and wave-related effects mostly dominating the soundscape. Vessel noise typically dominates the total background sound for frequencies between 20 and 300 Hz. In general, the frequencies of anthropogenic sounds are below 1 kHz and, if higher frequency sound levels are created, they attenuate rapidly.

In Cook Inlet, existing anthropogenic sources include shipping and other vessel traffic (*e.g.,* dredging, commercial and recreational fishing) from multiple port locations, pile driving for non-CTR Project activities, geophysical surveys for research and other purposes, and commercial and recreational fisheries

Current data indicate that not all marine mammal species have equal hearing capabilities (*e.g.,* Richardson *et al.* 1995a; Wartzok and Ketten 1999; Au and Hastings 2008). To reflect this, Southall *et al.* (2007, 2019) recommended that marine mammals be divided into functional hearing groups based on directly measured or estimated hearing ranges on the basis of available behavioral response data, audiograms derived using auditory evoked potential techniques, anatomical modeling, and other data. Note that no direct measurements of hearing ability have been successfully completed for mysticetes (*i.e.,* low-frequency cetaceans). Subsequently, NMFS described generalized hearing ranges for these marine mammal hearing groups in their revision to the technical guidance for assessing effects of anthropogenic sound published in April 2018 and in July 2020 (NMFS 2018a). Generalized hearing ranges were chosen based on the approximately 65-dB threshold from the normalized composite audiograms, with the exception of 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) was retained.

On May 3, 2024, NMFS published a Draft Updated Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing-Underwater and In-Air Criteria for Onset of Auditory Injury and Temporary Threshold Shifts (Version 3.0) and solicited public comment on its draft Updated Technical Guidance, which includes updated hearing ranges and names for the marine mammal hearing groups, and is intended to replace the 2018 Technical Guidance once finalized (89 FR 36762). The public comment period ended on June 17th, 2024, and although the Guidance is not final, we expect the Guidance to represent the best available science once it is. Marine mammal hearing groups and their associated hearing ranges from NMFS (2018) and NMFS (2024) are provided in table 3-3. In the draft Updated Technical Guidance, mid-frequency cetaceans have been re-classified as high-frequency cetaceans, and high-frequency cetaceans have been updated to very-high-frequency (VHF) cetaceans. Additionally, the draft Updated Technical Guidance includes in-air data for phocid (PA) and otariid (OA) pinnipeds.

Specific to this action, gray whales and humpback whales are considered low-frequency (LF) cetaceans, belugas and killer whales are considered mid-frequency (MF) or high-frequency (HF) cetaceans under the 2018 and 2024 technical guidances, respectively, harbor porpoises are considered HF or very high frequency (VHF) cetaceans, Steller sea lions are otariid pinnipeds, and harbor seals are phocid pinnipeds.

Table 3-3. Marine Mammal Functional Hearing Groups

Hearing Group		Generalized Hearing Range	
2018 Technical Guidance	**2024 Draft Technical Guidance**	**2018 Technical Guidance[a]**	**2024 Draft Technical Guidance[b]**
Low-Frequency Cetaceans (Mysticetes – baleen whales)		7 Hz to 35 kHz	7 Hz to 36 kHz
Mid-Frequency Cetaceans (Odontocetes – toothed whales)	**High-frequency Cetaceans** (Odontocetes – toothed whales)	150 Hz to 160 kHz	
High-frequency Cetaceans (true porpoises, *Kogia*, river dolphins, Cephalorhynchid, *Lagenorhynchus cruciger* & *L. australis*)	**Very High-frequency Cetaceans** (true porpoises, *Kogia*, river dolphins, Cephalorhynchid, *Lagenorhynchus cruciger* & *L. australis*)	275 Hz to 160 kHz	200 Hz to 165 kHz
Phocid pinnipeds (true seals)		50 Hz to 86 kHz	40 Hz to 90 kHz
Otariid pinnipeds (sea lions and fur seals)		60 Hz to 39 kHz	60 Hz to 68 kHz

[a] Represents the generalized hearing range for the entire group as a composite (*i.e.,* all species in the group), where individual species hearing ranges are typically not as broad. Generalized hearing range chosen based on an approximately 65-dB threshold from the normalized composite audiogram, with the exception for lower limits for low-frequency cetaceans (Southall *et al.* 2007) and Phocid pinniped (approximation). Note: Hz = Hertz; kHz = kilohertz.
[b] Represents the generalized hearing range for the entire group as a composite (*i.e.,* all species within the group), where individual species' hearing ranges may not be as broad. Generalized hearing range chosen based on ~65 dB threshold from composite audiogram, previous analysis in NMFS 2018, and/or data from Southall *et al.* 2007; Southall *et al.* 2019. Additionally, animals are able to detect very loud sounds above and below that "generalized" hearing range.

3.3 Socioeconomic Environment

3.3.1 Subsistence

While Alaska Natives have traditionally harvested subsistence resources in this region for millennia, only limited hunting of harbor seals currently occurs in the upper Cook Inlet area. Take is authorized only for limited boat-based subsistence hunting.

Due to dramatic declines in the Cook Inlet beluga population, on 21 May 1999, legislation was passed to temporarily prohibit (until 01 October 2000) the taking of Cook Inlet belugas under the subsistence harvest exemption in Section 101(b) of the MMPA without a cooperative agreement between NMFS and the affected Alaska Native Organizations (Public Law No. 106-31, Section 3022, 113 Statute 57, 100). That prohibition was extended indefinitely on 21 December 2000 (Public Law No. 106-553, Section 1(a)(2), 114 Statute 2762). NMFS subsequently entered into six annual co-management agreements (2000 to 2003, 2005 to 2006) with the Cook Inlet Marine Mammal Council, an Alaska Native organization representing beluga hunters, which allowed for the annual harvest of one to two Cook Inlet belugas. On 15 October 2008, NMFS published a final rule that established long-term harvest limits on Cook Inlet belugas that may be taken by Alaska Natives for subsistence purposes (73 FR 60976). That rule prohibited harvest for a 5-year period (*e.g.,* 2008 to 2012, 2013 to 2017) if the average abundance for the Cook Inlet belugas from the prior 5 years (*e.g.,* 2003 to 2007) was below 350 whales. No subsistence harvest of belugas has occurred in Cook Inlet since 2005 (NMFS 2016b). These figures demonstrate that subsistence harvests of marine mammal species are minimal.

The only marine mammal species with subsistence value in upper Cook Inlet is the harbor seal. The Alaska Native subsistence harvest of harbor seals has been estimated by the Alaska Native Harbor Seal Commission (ANHSC) and ADF&G. The minimum, maximum, and average annual harvest for 2004 to 2008, 2011 to 2012, 2014, and 2017 was 177, 288, and 233 harbor seals, respectively (Muto *et al.* 2022). No subsistence takes of harbor seals are known to occur in the immediate vicinity of the POA.

While Steller sea lions are used for subsistence purposes in Alaska, in general, they are not regularly hunted in Cook Inlet, and no known hunting occurs in upper Cook Inlet, given their uncommon occurrence in the action area. Killer whales, harbor porpoises, and humpback whales in Cook Inlet are not used for subsistence purposes.

Chapter 4. Environmental Consequences

This section evaluates the anticipated environmental impacts resulting from implementation of each of the construction activities presented in Chapter 2. General characteristic impacts are described for each activity. The potential impacts would be applicable to the affected environment described in Chapter 3 Affected Environment, with slight variations due to local Project-level site conditions and resources.

The potential impacts have been described by their characteristics: type (direct, indirect, or cumulative), duration (short- or long-term), geographic extent (localized or beyond the Project site), and significance. Each of these characteristics is described in the following sections (Sections 4.1 through 4.4), and summarized in Table 4-1. Based on this review, this section describes the degree of effects for the affected resources described in Chapter 3.

4.1 Type of Potential Impacts

The categories described below are used to describe the timing and proximity of potential impacts on the action area only. They have no bearing on the significance of the potential impacts, as described below, and are used only to characterize the nature of potential impacts. For the purposes of this analysis the timing and proximity of impacts are defined by type below, per 40 CFR 1508.1(g).[15] The categories of impact include:

- Direct effects, which are caused by the action and occur at the same time and place.
- Indirect effects, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use; population density or growth rate; and related effects on air and water and other natural systems, including ecosystems.
- Cumulative effects, which are effects on the environment that result from the incremental effects of the action when added to the effects of other past, present, and reasonably foreseeable actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.

4.2 Duration of Potential Impacts

The duration of the potential impact can be defined as either short-term or long-term and indicates the period of time during which the environmental resource would be impacted. Duration takes into account the permanence of an impact or the potential for natural attenuation of an impact. In general, the impacts of construction and other activities undertaken to implement a proposed Project be short-term, and the impacts of the Project results would be long-term. For the purposes of this analysis, the duration of each potential impact is defined as follows:

- Short-Term Impact: A known or potential impact of limited duration, relative to the proposed Project and the environmental resource. For the purposes of this analysis, these impacts may be instantaneous or may last minutes, hours, days, or up to six years.

[15] The regulatory definition of effects or impacts also reads, "Effects include ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative. Effects may also include those resulting from actions which may have both beneficial and detrimental effects, even if on balance the agency believes that the effects will be beneficial." These effects are analyzed and incorporated into this EA's effects analysis but are not distinctly identified as a type category.

- Long-Term Impact: A known or potential impact of extended duration, relative to the proposed Project and the environmental resource that would last longer than five years.
- Permanent Impact: A known or potential impact that is likely to remain unchanged indefinitely.

4.3 Geographic Extent

Construction activities can cause impacts at a variety of geographic scales. For the purposes of this analysis, impacts are assessed in two ways:

- Localized: Site-specific and generally limited to the immediate surroundings of a Project site.
- Beyond the Project Site: Unconfined or unrestricted to the Project site. These impacts may extend throughout a watershed or beyond.

4.4 Significance of Potential Impacts

The 2022 revised CEQ regulations state that the significance of an action be analyzed the potentially affected environment and the degree of the effects of the action. Agencies should consider connected actions consistent with 40 CFR 1501.3(b).[16] NOAA's Interim Guidance on Application of Revised CEQ NEPA Regulations (17 June 2022) requires consideration of these criteria along with additional factors for determining whether the impacts of a proposed action are significant. To determine the proposed action's significance, NOAA qualitatively assessed the degree to which the alternatives would impact a particular resource. The qualitative assessment is based on a review of the available and relevant reference material, and is based on professional judgment using standards that include consideration of the permanence of an impact or the potential for natural attenuation of an impact; the uniqueness or irreplaceability of the resource; the abundance or scarcity of the resource; the geographic, ecological, or other context of the impact; and the potential that mitigation measures can offset the anticipated impact. For the purposes of this analysis, significance definitions are as follows:

- Negligible: The impacts on individual marine mammals and/or their habitat, if any, would be at the lowest levels of detection and barely measurable, with no perceptible consequences to individuals or the population, or to subsistence users.
- Minor: Impacts on individual marine mammals and/or their habitat are detectable and measurable; however, they are of low intensity, short-term, and localized. Impacts on individuals and/or their habitat do not lead to population-level effects, and would not affect the long-term subsistence use of the species.
- Moderate: Impacts on individual marine mammals and/or their habitat are detectable and measurable; they are of medium intensity, can be short-term or long-term, and can be localized or extensive. Impacts on individuals and/or their habitat could have population-level effects that could impact subsistence uses of the species, but the population can sufficiently recover from the impacts or enough habitat remains functional to maintain the viability of the species both locally and throughout their range.

[16] The CEQ regulations at 1501.3(b)(1) provide, "In considering the potentially affected environment, agencies should consider, as appropriate to the specific action, the affected area (national, regional, or local) and its resources, such as listed species and designated critical habitat under the Endangered Species Act. Significance varies with the setting of the proposed action. For instance, in the case of a site-specific action, significance would usually depend only upon the effects in the local area" and at 1501(b)(2), "In considering the degree of the effects, agencies should consider the following, as appropriate to the specific action: (i) Both short- and long-term effects; (ii) Both beneficial and adverse effects; (iii) Effects on public health and safety, and; (iv) Effects that would violate Federal, State, Tribal, or local law protecting the environment."

- Major: Impacts on individual marine mammals and/or their habitat are detectable and measurable; they are of severe intensity, can be long lasting or permanent, and are extensive. Impacts to individuals and/or their habitat would have severe population-level effects and compromise the viability of the species, as well as subsistence uses of the species.

4.5 Effects of Alternative 1 – No Action

Where a choice of "no action" by the agency would result in predictable actions by others, this consequence of the "no action" alternative should be included in the analysis (CEQ, Forty Most Asked Questions, 3.A). NMFS' view is that it is likely an applicant would choose to undertake its action in compliance with the law rather than proceed without an ITA. Under the No Action Alternative, NMFS would not issue the LOA and IHA to the POA authorizing take of small numbers of marine mammals. As a result, the exceptions to the prohibition on take of marine mammals per the MMPA would not apply, and NMFS assumes that the POA would not complete the CTR project as described in the LOA and IHA application.

Under the No Action Alternative, the cargo terminals would not be replaced, and the POA would continue to perform maintenance on the existing deteriorating infrastructure. In the short term, the existing conditions associated with the natural and social environments would be unchanged. Once the cargo terminals are no longer maintainable (estimated to occur within approximately 10 years), all the material brought into Alaska through the cargo terminals would have to go through an alternative port and then be transported to Anchorage and other destinations. Additional improvements would be needed for onshore transportation systems to bring the products to Anchorage and other destinations by truck or rail.

The sudden failure or closure of the cargo terminals due to a seismic event may severely affect the health and safety of residents statewide. Emergency response and recovery activities would be affected because the POA is the primary point of entry for supplies and construction materials throughout the region. Much of Alaska's food enters the state through the POA. Should the POA be unavailable, temporary disruptions to the food supply chain would occur while alternative means of transportation and distribution networks are established. The impacts of this are likely to be greater in more remote communities, as they have fewer transportation options. Failure of the cargo terminals due to a seismic event may also have negative environmental impacts.

4.6 Effects of Alternative 2 – Issuance of the Authorization

The following sections describe the environmental consequences of the Preferred Alternative. For each section, the type of impact is defined; the duration, geographic extent, and significance are identified; and an adverse or beneficial qualifier is applied (Table 4-1). Potential impacts are often reduced through mitigating measures. CEQ regulations (40 CFR 1508.1(s)) define mitigation as:

- Avoiding the impact altogether by not taking a certain action or parts of an action.
- Minimizing impacts by limiting the degree or magnitude of the action and its implementation.
- Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
- Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.
- Compensating for the impact by replacing or providing substitute resources or environments

Mitigating measures for the proposed construction activities are presented in Section 2.2.3.2. However, not all adverse impacts can be mitigated below the levels analyzed in this document. The environmental activities described in Section 2.2 and their associated levels of impacts described in Section 4.6 are the maximum level of adverse impact for projects that will receive NEPA compliance through this analysis.

Additional NEPA analysis would be completed if the proposed Project has adverse effects that are beyond the scope of those analyzed here, including adverse effects that are significant.

Table 4-1. Summary of Terms Used to Describe Potential Environmental Impacts

Type of Impact	Duration of Impact	Geographic Extent	Significance	Qualifier
No Effect Direct Indirect Cumulative	Short-term Long-term Permanent	Localized Beyond Project Site	Negligible Minor Moderate Major	Adverse Beneficial

4.6.1 Impacts on Marine Mammal Habitat

The CTR Project would result in direct, short- and long-term, localized, minor, adverse impacts to habitats used by marine mammals due to the installation and removal of temporary piles and disposal of material in the Anchorage Harbor Open Water Disposal Site. The footprint of CTR and the disposal site would be located in an area that has been highly modified by industrial activity, including annual dredging and disposal. Therefore, the baseline condition is poor-quality marine mammal habitat. The Project area experiences high levels of vessel traffic and relatively high underwater and in-air noise levels. The Project area is not considered high-quality habitat for marine mammals or marine mammal prey, such as fish, so these impacts, while adverse, would be minor. Additionally, it would not result in permanent impacts to designated critical habitat for belugas, as the temporary piles would be installed and removed and the permanent piles would be installed in the critical habitat exclusion zone surrounding the POA. Although the waters around the POA are excluded from designated critical habitat, underwater noise from the installation and removal of temporary piles and the installation of permanent piles would be perceptible in designated critical habitat beyond the exclusion zone. However, increased noise levels would only be present during construction activities, and would cease when pile driving ends. Pile driving is not expected on all days during the construction season (April – November), and is not expected at all during the months of December – March. Noise exposure is therefore expected to be temporary and intermittent with long periods of typical background noise levels on a daily and seasonal scale. Section 7 consultation under the ESA requires an analysis of potential impacts on critical habitat; therefore, additional information on potential effects to designated critical habitat for Cook Inlet belugas will be included in the BiOp for the CTR Project.

The final rule and LOA and any subsequent IHA(s), if issued, would contain the information regarding potential impacts on marine mammal habitat developed through the consultation and authorization processes and summarized in the Final EA.

4.6.1.1 Habitat Loss and Modification

The CTR project would cause temporary and minimal impacts to marine mammal habitat. The footprint of the site would occur mostly within the same footprint as existing marine infrastructure; the new T1 and T2 would extend approximately 140 ft (47-m) seaward of the existing terminals. Approximately 14,000 square ft of low-quality marine habitat would be replaced by steel piles, and the permanent impacts on marine habitat would be minimal. The greatest impact on marine mammals associated with the Project would be a temporary loss of habitat because of displacement and disturbance due to elevated noise levels. Displacement of marine mammals by noise would not be permanent, and no long-term effects to marine mammal habitat would occur. Pile installation and removal would occur only for a relatively small portion of each day, allowing ample recovery time should displacement or modification of behavior occur. The Project is not expected to result in habitat-related effects that could cause substantial or long-term consequences for individual marine mammals or their populations since installation and removal of piles would be temporary and intermittent.

4.6.1.2 Acoustic Environment

The proposed CTR Project would result in direct, short-term, localized, minor, and adverse changes in the acoustic environment in Knik Arm during in-water construction activities. Noise levels in water would increase during the in-water installation and removal of temporary and permanent piles. Depending on the pile size, pile type, and method of installation or removal, noise levels that could harass marine mammals to the level of take under the MMPA are generally limited to tens of meters to approximately 13.6 km (7.3 nautical miles).

Vibratory and impact hammers would be used for installation of 48-, 72- and 144-in permanent piles. Vibratory hammers would be used for installation and removal of 24- and/or 36-in temporary piles. Some temporary and permanent steel pipe piles would be installed or removed in the dry, depending on construction sequencing and tide heights. To avoid potential impacts on marine mammals from in-water pile installation and removal, conducting these activities in the dry woooould be maximized as feasible. It is anticipated that the permanent and temporary piles in the three bents nearest the shore for all five trestles would be installed in the dry at low tide levels. An additional bent would be installed in the dry for the northernmost trestle of T1 and for the three trestles of T2. Estimated numbers of piles of each size that would be installed and/or removed in the dry are presented in Table 2-2.

When a pile is installed or removed in the dry, it is assumed that no marine mammals are exposed to elevated sound levels that are defined as Level B harassment, and no take of marine mammals occurs. Take of marine mammals from pile installation and removal in the dry is therefore not requested, and marine mammal monitoring will not be conducted during pile installation and removal in the dry. Although some piles would be installed or removed in the dry, it is anticipated that most piles would be installed or removed in water.

4.6.1.3 Prey Species

Currently, no regulatory criteria exist to evaluate underwater noise impacts on fish from a vibratory hammer. However, since vibratory hammers do not produce impulsive noise and sound source levels (SSLs) are lower than those produced from an impact hammer, it is not expected that in-water pile installation or removal using vibratory hammers for CTR will affect local fish species. In-water pile installation with an impact hammer is expected to produce underwater sound pressure waves that may displace, harm, or kill fish exposed to harmful sound levels. The effects of sound on fish are varied and range from avoidance to acute and sometimes fatal effects; fish may suffer damage to auditory receptors and rupture of the swim bladder to chronic effects (*e.g.,* behavioral changes, long-term stress) (Hastings and Popper 2005). However, in-water pile installation and removal would be intermittent and temporary, further reducing the potential for impacts on fish, and ultimately marine mammals.

During the POA's MTRP, the effects of impact and vibratory installation of 30-in (76-cm) steel sheet piles at the POA on 133 caged juvenile coho salmon in Knik Arm were studied (Hart Crowser Incorporated *et al.*, 2009; Houghton *et al.*, 2010). Acute or delayed mortalities, or behavioral abnormalities were not observed in any of the coho salmon. Furthermore, results indicated that the pile driving had no adverse effect on feeding ability or the ability of the fish to respond normally to threatening stimuli (Hart Crowser Incorporated *et al.*, 2009; Houghton *et al.*, 2010).

The POA anticipates that in-water pile installation and removal would occur between April 1 and November 30. Adult and juvenile salmon and other fish species use habitat throughout Knik Arm during the timeframe in which in-water impact pile driving would occur. Construction therefore has the potential to adversely affect Fishery Management Plan-managed fish and temporarily degrade habitat quality during in-water impact hammer operations. While some fish within the distance for fish injury criteria may be killed or harmed, impacts would otherwise be short-term and local.

Essential Fish Habitat (EFH) has been designated in the estuarine and marine waters in the vicinity of the proposed project area for all five species of salmon (*i.e.,* chum salmon, pink salmon, coho salmon, sockeye salmon, and Chinook salmon; North Pacific Fishery Management Council (NPFMC), 2020, 2021). Salmon are common prey of marine mammals, as well as for other species (NPFMC, 2020). However, there are no designated habitat areas of particular concern in the vicinity of the POA and therefore, adverse effects on EFH in this area are not expected. Potential effects on fish would be similar to those discussed in more detail in the CTR EFH Technical Report (POA 2024c). Impacts to fish from underwater noise are not anticipated to cause cumulative impacts to marine mammals or marine mammal habitat.

4.6.1.4 Water Quality and Turbidity

Accidental spills during construction of the CTR Project are possible but unlikely to occur from construction equipment associated with the Project. Spills are unlikely because the selected Contractor would be required to provide spill cleanup protocols in a Spill Prevention, Control, and Countermeasure Plan to prevent the introduction of hazardous materials into the waters surrounding the POA during in-water pile installation and over-water construction operations.

Installation of permanent piles (and installation and removal of temporary piles) would cause an increase in turbidity near each pile. However, turbidity from this activity would not be expected to extend beyond an approximately 25-foot radius of the pile (Everitt *et al.* 1980). Due to the implementation of a marine mammal shutdown zone, the high silt loads in the Project area, and the unlikely drift of suspended sediments beyond the shutdown zone, such turbidity is unlikely to measurably affect marine mammals during passage through or while foraging within the Project area.

During shoreline stabilization and protection, approximately 50,000 cubic yards of fill material are expected to be disposed of at the Anchorage Harbor Open Water Disposal Site, less than the amount disposed in years prior. Impacts on zooplankton, fish, and marine mammals, including Cook Inlet belugas, are anticipated to be brief, intermittent, and minor, if impacts occur at all. Belugas and other species that inhabit upper Cook Inlet and Knik Arm are adapted to an environment that is highly variable and experiences high turbidity levels. Suspended sediment concentrations in upper Cook Inlet can be higher than 1,700 milligrams of sediment per liter near Anchorage (Wright *et al.* 1973). Negative impacts on marine species, including belugas, from turbidity associated with disposal of fill materials are not anticipated.

Impacts on marine mammals are also possible through the release of pollutants into the water column from the disposal of contaminated fill or the disturbance of existing contaminants in marine sediments. The risk of contaminated fill being dumped at the Anchorage Harbor Open Water Disposal Site will be mitigated by testing the fill material prior to disposal. Fill material would be tested for contaminants (*e.g.,* trace metals, per- and polyfluorinated alkyl substances) and must measure below a regulatory threshold prior to being disposed of in water or on land (USACE 2021).

4.6.2 Impacts on Marine Mammals

Acoustic stimuli associated with in-water pile installation and removal during construction of the proposed CTR Project have the greatest potential to directly and adversely affect marine mammals. The effects of sounds from pile installation and removal on marine mammals might include one or more of the following: tolerance, masking of natural sounds, behavioral disturbance, temporary or permanent hearing impairment, and non-auditory physical effects (Richardson *et al.* 1995a). The duration, geographic extent, and significance of these impacts are dependent on several factors, including marine mammal context (*e.g.,* age, size, depth of the animal during exposure); the energy needed to install or remove the pile, which is related to hammer type, pile size, depth driven, and substrate; the standoff distance between the pile and receiver; received levels and frequencies; and the sound propagation properties of the environment.

Impacts on marine mammals from pile installation and removal are expected to result primarily from acoustic pathways. As such, the degree of effect is intrinsically related to the received level and duration of the sound exposure, which are in turn influenced by the distance between the animal and the source. The farther from the source, the less intense the exposure to noise should be. The substrate and depth of habitat also affect the sound propagation properties of the environment. Shallow environments are typically more structurally complex, which leads to rapid sound attenuation. Additionally, substrates that are soft (*e.g.,* sand) absorb or attenuate the sound more readily than hard substrates (*e.g.,* rock), which may reflect the acoustic wave. Soft, porous substrates also likely require less time to install the pile, and possibly less-forceful equipment, which ultimately decreases the intensity of the acoustic source.

4.6.2.1 Threshold Shifts: Permanent and Temporary

In general, noise has the potential to induce hearing threshold shifts if the energy accumulated by the received level exceeds the thresholds necessary to do so. The accumulation of energy is a function of the source level, received level, and duration of exposure. NMFS defines a noise-induced threshold shift 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 2018a). NMFS defines permanent threshold shift (PTS), a type of auditory injury, 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 2018a). Available data from humans and other terrestrial mammals indicate that a 40-dB threshold shift approximates PTS onset (see NMFS 2018a for review). NMFS defines temporary threshold shift (TTS) as a temporary (short-term), 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 2018a). Based on data from cetacean 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).

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 affect marine mammals, ranging from negligible to major (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 not as many competing sounds are present. Alternatively, a larger amount and longer duration of TTS sustained during a time when communication is critical for successful mother/calf interactions could have more serious impacts. NMFS notes 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 NMFS can infer that strategies exist for coping with this condition to some degree, though likely not without cost. Therefore, the impacts resulting from direct exposure to the proposed pile driving will vary depending on the level of threshold shift an animal experiences (*i.e.,* no hearing shifts may represent short-term, localized, negligible, adverse impacts; TTS may represent short-term, localized, minor, adverse impacts; and auditory injury may represent permanent, localized, moderate, adverse impacts).

4.6.2.2 Behavioral Harassment

Behavioral disturbance may include a variety of adverse 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. Disturbance may result in changing durations of surfacing and dives, number of blows per surfacing, or moving direction and/or speed; reduced/increased vocal activities; changing/cessation of certain behavioral activities (such as socializing or feeding); visible startle response or aggressive behavior (such as tail/fluke slapping or jaw clapping); and/or avoidance of areas where sound sources are located. 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.* 1995a; Wartzok *et al.* 2003; Southall *et al.* 2007, 2019; Weilgart 2007; Archer *et al.* 2010). 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). 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.

Numerous studies have shown that underwater sounds from industry activities are often readily detectable by marine mammals in-water at distances of many km. Studies have also shown that marine mammals at distances of more than a few km often show no apparent response to industry activities of various types (Miller *et al.* 2005; Bain and Williams 2006). This is often observed, even in cases when sounds must be readily audible to the animals based on measured received levels and hearing sensitivity of that mammal group.

Masking is the obscuring of sounds of interest by other sounds, often at similar frequencies. Marine mammals are highly dependent on sound, and their ability to recognize sound signals amid other noise is important in communication; predator and prey detection; and, in the case of toothed whales, echolocation. Although some degree of masking is inevitable when high levels of human-made broadband sounds are introduced into the ocean, marine mammals have evolved systems and behaviors that function to reduce the impacts of masking. Structured signals, such as the echolocation click sequences of small, toothed whales, may be readily detected even in the presence of strong background noise because their frequency content and temporal features usually differ strongly from those of the background noise (Au and Moore 1988, 1990). The components of background noise that are similar in frequency to the sound signal in question primarily determine the degree of signal masking. Masking effects of underwater sounds from the POA’s proposed activities on marine mammal calls and other natural sounds are anticipated to be limited.

Evidence exists of other marine mammal species continuing to call in the presence of industrial activity. For example, the annual acoustic monitoring near BP Exploration (Alaska) Inc.’s Northstar production facility during the fall bowhead whale (*Balaena mysticetus*) migration westward through the Beaufort Sea has recorded thousands of calls each year (Richardson *et al.* 1995b; Aerts and Richardson 2008). Construction, maintenance, and operational activities have been occurring at this facility for decades. To compensate for and reduce masking, some baleen whales may alter the frequencies of their communication sounds (Richardson *et al.* 1995a; Parks *et al.* 2007). The echolocation clicks produced by the aforementioned marine mammals are usually far above the frequency range of the sounds produced by pile installation and other construction sounds (*e.g.,* dredging, gravel fill). Blackwell (2005) and URS (2007) reported that background noise at the POA (physical environment and maritime operations) contributed more to received levels than pile installation did at distances greater than 1,300 m from the source, which is slightly smaller than the Level B harassment zone for impact installation of unattenuated piles.

Pile installation and removal operations could result in temporary, localized masking through overlapping frequencies of the marine mammal signals or by increasing sound levels such that animals are unable to detect important signals over the increased noise. A passive acoustic study in the MTRP construction vicinity in 2009 measured the frequencies of noise produced as less than 10 kHz, with one exception of impact pile installation, which extended to 20 kHz (Širović and Kendall 2009).

Kendall and Cornick (2015) provide a comprehensive overview of 4 years of scientific marine mammal monitoring conducted during the POA's Expansion Project. Observations were made independently of pile installation (*i.e.,* PSOs were not construction-based and did not have shutdown responsibilities). The authors investigated beluga behavior before and during pile installation at the POA. Sighting rates, mean sighting duration, behavior, mean group size, group composition, and group formation were compared between the two periods. A total of approximately 2,329 hours of sampling effort was completed across 349 days from 2005 to 2009. Overall, 687 belugas in 177 groups were documented during the 69 days that belugas were sighted. A total of 353 and 1,663 hours of pile installation took place in 2008 and 2009, respectively. There was no relationship between monthly beluga sighting rates and monthly pile installation rates ($r = 0.19$, $p = 0.37$). Sighting rates before ($n = 12$; 0.06 ± 0.01) and during ($n = 13$; 0.01 ± 0.03) pile installation were not significantly different. However, sighting duration of belugas decreased significantly during pile installation (39 ± 6 minutes before and 18 ± 3 minutes during).

Significant differences in behavior were detected before versus during pile installation. Belugas primarily traveled through the study area both before and during pile installation; however, traveling increased relative to other behaviors during pile installation. Documentation of milling (*i.e.,* non-directed movement) began in 2008 and was observed on 21 occasions. No acute behavioral responses were documented. Mean group size decreased during pile installation; however, this difference was not statistically significant. In addition, group composition was significantly different before and during pile driving, with more white (*i.e.,* likely older) animals being present during pile driving (Kendall and Cornick 2015). Cook Inlet belugas were primarily observed densely packed before and during pile driving; however, the number of densely packed groups increased by approximately 67 percent during pile driving. There were also significant increases in the number of dispersed groups (approximately 81 percent) and lone white whales (approximately 60 percent) present during pile driving than before pile driving (Kendall and Cornick 2015).

Saxon-Kendall *et al.* (2013) recorded echolocation clicks (which can be indicative of feeding behavior) during the MTR Project at the POA both while pile driving was occurring and when it was not. This indicates that while feeding is not a predominant behavior observed in Cook Inlet belugas sighted near the POA (61N Environmental 2021, 2022a, 2022b, 2022c; Easley-Appleyard and Leonard 2022) Cook Inlet belugas still exhibit feeding behaviors during pile driving activities. In addition, Castellote *et al.* (2020) found low echolocation detection rates in lower Knik Arm (*i.e.,* Six Mile, Port MacKenzie, and Cairn Point) and suggested that Cook Inlet belugas moved through that area relatively quickly when entering or exiting the Arm. No whistles or noisy vocalizations were recorded during the MTR construction activities; however, it is possible that persistent noise associated with construction activity at the MTR project masked beluga vocalizations and/or that Cook Inlet belugas did not use these communicative signals when they were near the MTR Project (Saxon-Kendall *et al.* 2013).

During the PCT and SFD project construction monitoring, no definitive behavioral reactions to the in-water activity or avoidance behaviors were documented (61N Environmental 2021, 2022a, 2022b). However, potential reactions (where a group reversed its trajectory shortly after the start of in-water pile driving occurred; a group reversed its trajectory as it got closer to the sound source during active in-water pile driving; or upon an initial sighting, a group was already moving away from in-water pile driving, raising the possibility that it had been moving towards, but was sighted only after they turned away) and instances where Cook Inlet belugas moved toward active in-water pile driving were recorded. During these instances, impact driving appeared to cause behavioral reactions more readily than vibratory hammering (61N Environmental 2021, 2022a, 2022b). One minor difference documented during PCT construction was a slightly higher incidence of milling behavior and diving during the periods of no pile driving and slightly higher rates of traveling behavior during periods when Cook Inlet belugas were potentially disturbed by pile driving (61N Environmental 2021, 2022a). In general, belugas were more likely to display no reaction or continue to move toward the PCT or SFD during pile installation and removal.

Easley-Appleyard and Leonard (2022) also asked PSOs to complete a questionnaire post-monitoring that provided NMFS with qualitative data regarding CIBW behavior during observations. Specifically during pile driving events, the PSOs noted that CIBW behaviors varied; however, multiple PSOs noted seeing behavioral changes specifically during impact pile driving and not during vibratory pile driving. CIBWs were observed sometimes changing direction, turning around, or changing speed during impact pile driving, whereas there were numerous instances where CIBWs were seen traveling directly towards the POA during vibratory pile driving before entering the Level B harassment zone (61N Environmental, 2021, 2022a, 2022b). The PSOs also reported that it seemed more likely for CIBWs to show more cryptic behavior during active impact and vibratory pile driving (e.g., surfacing infrequently and without clear direction), though this seemed to vary across months (Easley-Appleyard and Leonard, 2022).

During marine mammal monitoring efforts for geotechnical sampling for the Seward Highway Milepost 75 to 90 (along Turnagain Arm) Project, belugas were observed on 15 of the 16 days of monitoring at Twentymile Bridge from 06 to 23 April 2015. Even though no in-water work occurred at night (at Twentymile Bridge), roadway flaggers present throughout the night indicated that they could hear belugas at the bridge site during nighttime hours. During the 2015 season, there were 18 observations of beluga groups, ranging in size from 3 to 30. Shutdowns typically occurred when belugas were at the mouth of Twentymile River to ensure that the animals did not enter the harassment zone during in-water geotechnical sampling (HDR 2015). These data indicate that belugas may use areas near marine construction projects when in-water work is not occurring.

Recently, McHuron et al. (2023) developed a model to predict general patterns related to the movement and foraging decisions of pregnant CIBWs in Cook Inlet. They found that the effects of disturbance from human activities, such as pile driving activities occurring at the POA assuming no mitigation measures, are inextricably linked with prey availability. If prey are abundant during the summer and early fall, and prey during winter is above some critical threshold, pregnant CIBWs can likely cope with intermittent disruptions, such as those produced by pile driving at the POA (McHuron et al., 2023). However, they stress that more information needs to be acquired regarding CIBW prey and CIBW body condition, specifically in their critical habitat, to better understand possible behavioral responses to disturbance.

NMFS anticipates that disturbance to belugas would manifest in the same manner as previously described around industrial activity when they are exposed to noise during the CTR Project: whales may move quickly and silently through the area. NMFS does not anticipate that belugas would abandon entering or exiting Knik Arm, as this is not evident based on previous years of monitoring data (*e.g.,* Kendall and Cornick 2015; 61N Environmental 2021), and the pre-pile driving clearance mitigation measure is designed to further avoid any potential displacement. Therefore, behavioral impacts resulting from the proposed pile driving represent a short-term, localized, negligible, adverse, direct impact on belugas and other marine mammals in the CTR Project area.

4.6.2.3 Applicable Noise Criteria and Take Estimates

Noise Criteria and Source Sound Levels

The POA relied on the NMFS Technical Guidance for assessing Level A harassment and relied on NMFS interim criteria to assess Level B harassment levels when preparing their application. To best ensure we have considered an adequate estimate of take by Level A harassment, and in order to support consideration of the best available science, we have conducted basic comparative calculations using both the existing Technical Guidance (NMFS, 2018), and the draft Updated Technical Guidance (NMFS, 2024) for the purposes of understanding the number of takes by Level A harassment. These thresholds are provided in Table 4-2. The references, analysis, and methodology used in the development of the thresholds are described in NMFS' 2018 Technical Guidance, and NMFS' 2024 draft Updated Technical Guidance, both of which may be accessed at: *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-acoustic-technical-guidance*.

The POA's proposed activity includes the use of impulsive (impact pile driving) and non-impulsive (vibratory driving) sources.

Table 4-2. Summary of Auditory Injury Onset Acoustic Thresholds for Assessing Level A Harassment, and Acoustic Criteria for Assessing Level B Harassment, of Marine Mammals from Exposure to Noise from Impulsive (Pulsed) and Non-impulsive (Continuous) Underwater Sound Sources

Species Group	NMFS 2018 Acoustic Thresholds (Received Level)				NMFS 2024 Acoustic Thresholds (Received Level)			
	Hearing Group	Impulsive (Pulsed or Intermittent) [dB]		Non-impulsive (Continuous) [dB]	Hearing Group	Impulsive (Pulsed or Intermittent) [dB]		Non-impulsive (Continuous) [dB]
	Level A Harassment (PTS Onset)				***Level A Harassment (Auditory Injury Onset)***			
Cetaceans	LF	$L_{pk,flat}$	219	$L_{E,LF,24h}$: 199	LF	$L_{p,0\text{-}pk,flat}$	222	$L_{E,p,LF,24h}$: 197
Cetaceans	LF	$L_{E,LF,24h}$	183		LF	$L_{E,p,LF,24h}$	183	
Cetaceans	MF	$L_{pk,flat}$	230	$L_{E,MF,24h}$: 198	HF	$L_{p,0\text{-}pk,flat}$	230	$L_{E,p,HF,24h}$: 201
Cetaceans	MF	$L_{E,MF,24h}$	185		HF	$L_{E,p,HF,24h}$	193	
Cetaceans	HF	$L_{pk,flat}$	202	$L_{E,HF,24h}$: 173	VHF	$L_{p,0\text{-}pk,flat}$	202	$L_{E,p,VHF,24h}$: 181
Cetaceans	HF	$L_{E,HF,24h}$	155		VHF	$L_{E,p,VHF,24h}$	159	
Pinnipeds	PW	$L_{pk,flat}$	218	$L_{E,PW,24h}$: 201	PW	$L_{p,0\text{-}pk,flat}$	223	$L_{E,p,PW,24h}$: 195
Pinnipeds	PW	$L_{E,PW,24h}$	185		PW	$L_{E,p,PW,24h}$	183	
Pinnipeds	PW				PA	$L_{p,0\text{-}pk,flat}$	162	$L_{E,p,PA,24h}$: 154
Pinnipeds	PW				PA	$L_{E,p,PA,24h}$	140	
Pinnipeds	OW	$L_{pk,flat}$	232	$L_{E,OW,24h}$: 219	OW	$L_{p,0\text{-}pk,flat}$	230	$L_{E,p,OW,24h}$: 199
Pinnipeds	OW	$L_{E,OW,24h}$	203		OW	$L_{E,p,OW,24h}$	185	
Pinnipeds	OW				OA	$L_{p,0\text{-}pk,flat}$	177	$L_{E,p,OA,24h}$: 177
Pinnipeds	OW				OA	$L_{E,p,OA,24h}$	163	

Level B Harassment			
Species Group	**Hearing Group**	**Impulsive (Pulsed or Intermittent) [dB RMS]**	**Non-impulsive (Continuous) [dB RMS]**
Cetaceans	LF	160 dB RMS	120 dB RMS (or background level if > 120 dB RMS)
Cetaceans	MF	160 dB RMS	120 dB RMS (or background level if > 120 dB RMS)
Cetaceans	HF	160 dB RMS	120 dB RMS (or background level if > 120 dB RMS)
Pinnipeds	PW pinnipeds	160 dB RMS	120 dB RMS (or background level if > 120 dB RMS)
Pinnipeds	OW pinnipeds	160 dB RMS	120 dB RMS (or background level if > 120 dB RMS)
Pinnipeds	Harbor Seals (airborne)	90 dB RMS re 20 µPa	

	Other pinnipeds (airborne)	100 dB RMS re 20 µPa

Source: NMFS 2018a, 2020d
Note: HF = high-frequency; $L_{pk,flat}$ = peak sound pressure level (unweighted); $L_{E,24h}$ = sound exposure level (SEL), cumulative 24 hours; LF = low-frequency; MF = mid-frequency; OW = otariid in water; PW = phocid in water; RMS = root mean square.

Distance to Sound Thresholds and Areas

Sound propagation and the distances to the sound isopleths defined by NMFS for Level A harassment of marine mammals under the 2018 Technical Guidance and draft 2024 Updated Technical Guidance were estimated using the NMFS User Spreadsheet and draft User Spreadsheet (available at *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-acoustic-technical-guidance*), which provides simple calculations to estimate cumulative sound exposure levels (SEL_{cum}) and the potential for auditory injury. As part of our analysis under the MMPA, NMFS computes the distances to isopleths for the different functional hearing groups based on an unweighted sound level with corresponding distance. The model applies simple Weighting Factor Adjustments for the five functional hearing groups and incorporates a duty cycle to account for the number of pile strikes per unit time (NMFS 2018a, 2024). The simple spreading loss to account for sound propagation and the distances to the sound isopleths defined by NMFS for onset of auditory injury and Level B harassment of marine mammals were estimated based on the following:

$$TL = TL_c \log10 (R/D)$$

Where

- TL (transmission loss) is the difference between the reference sound source level (SSL) dB root mean square (RMS) and the Level B harassment threshold dB (122.2 dB for vibratory);
- TL_c is the TL coefficient;
- R is the estimated distance to where the sound level is equal to the Level B harassment threshold (122.2 dB for continuous noise and 160 dB for impulsive noise); and
- D is the distance at which the SSL was measured.

The estimated distance to the onset of auditory injury and Level B harassment isopleths can be calculated by rearranging the terms in the above equation to the following:

$$R = D\ 10^{(TL/TLc)}$$

For estimated distances to the onset of auditory injury, the SSL is based on the cumulative SEL (SEL_{cum}) over time, which is computed based on the following for vibratory pile driving:

$$SEL_{cum} = SEL + 10\ Log_{10}\ (seconds)$$

And the following for impact pile driving:

$$SEL_{cum} = Single\text{-}Strike\ SEL + 10\ Log_{10}\ (number\ of\ events)$$

Where number of events is expressed as seconds for vibratory pile driving or pile strikes for impact pile driving.

These models were used to predict distances of underwater sound levels generated by pile installation and removal for the CTR Project. Isopleths were calculated for each combination of pile size, hammer, and use of a bubble curtain; and for the number of piles and duration that could be installed each day.

Isopleths were calculated for some pile combinations that are not expected to be used but that could become necessary if an unexpected or high-risk situation arises. For example, it is anticipated that all temporary piles would be installed with a vibratory hammer; however, if an obstruction is encountered that prevents advancement of a temporary pile, use of an impact hammer on that temporary pile may become necessary. Similarly, it is anticipated that a bubble curtain would be used with an impact hammer for all pile sizes when water depths exceed 3 m, but if a human safety risk materializes, it may be necessary to stabilize the pile by partially installing it. It may not be possible to lift and lay down these large, heavy piles on a barge once they have been stabbed and the impact hammer has been attached. The POA would coordinate with NMFS as soon as possible if construction methods differ significantly from what is proposed here.

The primary sound-generating activities associated with construction of the Project would be impact hammer installation and vibratory hammer installation and removal of steel pipe piles. Impact hammer pile installation produces impulsive sounds that typically have differing potential to cause physical effects to marine mammals, particularly in regard to hearing. Such sounds have the potential to result in physical injury because they are characterized by a relatively rapid rise in ambient pressure followed by a period of diminishing, oscillating maximal and minimal pressures. Vibratory hammer installation and removal of steel pipe piles that would be used primarily to build temporary construction components would also take place during construction of the Project.

Sound Source Levels of Proposed Activities

The intensity of pile driving sounds is greatly influenced by factors such as the type of piles (material and diameter), hammer type, and the physical environment (*e.g.,* sediment type) in which the activity takes place. In order to calculate the distances to the Level A harassment and the Level B harassment sound thresholds for the methods and piles being used in this project, we used acoustic monitoring data from sound source verification studies (both at the POA and elsewhere) to develop proxy source levels for the various pile types, sizes and methods (Table 4-3).

The POA collected sound measurements during pile installation and removal for 3 seasons (Austin *et al.* 2016; Illingworth & Rodkin [I&R] 2021a, 2021b); a summary of these data and findings can be found in appendix A of the POA's application.

Vibratory Driving

NMFS concurs that the source levels proposed by the POA for vibratory installation and removal of all pile types are appropriate to use for calculating harassment isopleths for the POA's proposed CTR activities (Table 4-3). The proposed sound levels for vibratory removal are based on an analysis done for the POA's NES1 IHA (89 FR 2832, January 14, 2024), and are partially based on sound source verification data measured at the POA during the PCT project (Illingworth and Rodkin, 2021a). Interestingly, the analyzed RMS SPL for the unattenuated vibratory removal of 24-inch (61-cm) piles was much louder than the unattenuated vibratory removal of 36-inch piles (91-cm), and even louder than the unattenuated vibratory installation of 24-inch piles. Illingworth and Rodkin (2023) suggest that at least for data recorded at the POA, the higher 24-inch (61-cm) removal levels are likely due to the piles being removed at rates of 1,600 to 1,700 revolutions per minute (rpm), while 36-inch (91-cm) piles, which are significantly heavier than 24-inch (61-cm) piles), were removed at a rate of 1,900 rpm. The slower rates combined with the lighter piles would cause the hammer to easily "jerk" or excite the 24-inch (61-cm) piles as they were extracted, resulting in a louder rattling sound and louder sound levels. This did not occur for the 36-inch (91-cm) piles, which were considerably heavier due to increased diameter, longer length, and greater thickness.

The TPP found that for vibratory installation of 48-in piles, an air bubble curtain provided about a 9-dB reduction at 10 m. An 8-dB reduction at close-in positions was estimated for vibratory pile driving that occurred during the PCT project in 2021 (I&R 2021b). The PCT 2020 measurements indicated 2 to 8 dB reduction for the 48-in piles at 10 m, but no apparent broadband reduction was found in the far-field at about 2,800 m (I&R 2021a).Far-field sound levels were characterized by very low frequency sound at or below 100 Hz, causing broadband measurements to remain above the ambient RMS level at approximately 2.8km from the source. However, levels at frequencies above 100 Hz were effectively reduced by the bubble curtain system. Because the species of marine mammals most likely to be present at the POA during the proposed CTR project are most sensitive to frequencies over 100 Hz, NMFS considers the use of bubble curtains during vibratory driving to be an effective and important mitigation measure for CIBW.

Based on the aforementioned measurements conducted at POA, for vibratory driving during the CTR Project, it is assumed that a well-designed and robust bubble curtain system would achieve a mean reduction of 7 dB at the source, and would also reduce sound levels at frequencies over 100 Hz at longer ranges. The POA proposes to use a bubble curtain when water depth is greater than 3 m during vibratory installation of all permanent (72-in) piles, and during vibratory driving of temporary (24-in or 36-in) piles during the months of August through October, when CIBWs are most likely to be present. The use of a bubble curtain is a required condition of the potential authorization for incidental take analyzed in this EA.

Impact Driving

NMFS concurs that the source levels proposed by the POA for impact installation of all pile types are appropriate to use for calculating harassment isopleths for the POA's proposed CTR activities (Table 4-3). Impact driving of 24-in and 36-in piles is not currently proposed; however, in the unlikely event that vibratory driving is insufficient to stabilize a temporary pile, impact driving may be necessary. Sound source verification studies at the POA during the PCT project did not measure impact driving of 24-in or 36-in piles; therefore proxy sound levels from Navy (2015) are proposed.

The TPP measured reductions of 9 to 12 dB for a 48-in pile installed with an impact hammer using a confined air bubble curtain. The PCT 2020 measurements (I&R 2021a) found reductions of about 10 dB when comparing the attenuated conditions that occurred with that project to unattenuated conditions for the TPP. As with the TPP, there appeared to be less reduction in the far field. The TPP did not report the reduction in sound levels in the acoustic far field; however, the computed distances to 125 dB RMS isopleths were essentially reduced by half with the bubble curtain (from 1,291 to 698 m).

It is currently unclear whether the POA's proposed bubble curtain system for the CTR project would be confined or unconfined; confined systems are typically more effective, especially in sites like Knik Arm, with high current velocity. Therefore, for impact pile installation for the CTR Project, it is assumed that a well-designed and robust bubble curtain system would achieve a mean reduction of 7 dB from the source. The POA proposes to use a bubble curtain system on all permanent piles in all months, which would be installed with both vibratory and impact hammers. The bubble curtain by necessity would be installed around each permanent pile as it is moved into position, and therefore the bubble curtain would be available as a mitigation measure to reduce sound levels throughout each driving event for permanent 72-in piles when water depth is greater than 3 m. To account for piles driven in water less than 3m deep, NMFS has estimated approximately 0.5 unattenuated 72-in piles would be driven (approximately 43 minutes of impact driving and 5 minutes of vibratory driving) each month.

Concurrent activities

The POA proposes to concurrently operate up to two hammers to install or extract piles at different parts of the project site, in order to reduce the need for pile driving during months of high beluga presence. When two noise sources have overlapping sound fields, the sources are considered additive and combined using the rules of dB addition. For addition of two simultaneous sources, the difference between the two sound source levels is calculated, and if that difference is between 0 and 1 dB, 3 dB are added to the higher sound source levels; if the difference is between 2 and 3 dB, 2 dB are added to the highest sound source levels; if the difference is between 4 and 9 dB, 1 dB is added to the highest sound source levels; and with differences of 10 or more dB, there is no addition. For two simultaneous sources of different type (*i.e.,* impact and vibratory driving), there is no sound source addition.

Possible concurrent scenarios and the predicted source values and transmission loss coefficients for these combinations are shown in Table 4-3.

Transmission Loss for Pile Installation and Removal

For all piles driven with an active bubble curtain ("attenuated" impact and vibratory driving), and for unattenuated impact installation, the POA proposed to use 15 as the TL coefficient, meaning they assume practical spreading loss (i.e., the POA assumes TL = $15*Log_{10}$(range)); NMFS concurs with this value and has assumed practical spreading loss for all (attenuated impact and vibratory) driving and unattenuated impact driving.

The TL coefficient that the POA proposed for unattenuated vibratory installation and removal of piles is 16.5 (*i.e.,* TL = $16.5*Log_{10}$(range)). This value is an average of measurements obtained from two 48-in (122-cm) piles installed via an unattenuated vibratory hammer in 2016 (Austin et al., 2016). To assess the appropriateness of this TL coefficient to be used for the proposed project, NMFS examined and analyzed additional TL measurements recorded at the POA. This includes a TL coefficient of 22 (deep hydrophone measurement) from the 2004 unattenuated vibratory installation of one 36-in (91-cm) pile at Port MacKenzie, across Knik Arm from the POA (Blackwell, 2004), as well as TL coefficients ranging from 10.3 to 18.2 from the unattenuated vibratory removal of 24-in (61 cm) and 36-in (91-cm) piles and the unattenuated vibratory installation of one 48-in (122-cm) pile at the POA in 2021 (I&R 2021, 2023). To account for statistical interdependence due to temporal correlations and equipment issues across projects, values were averaged first within each individual project, and then across projects. The mean and median value of the measured TL coefficients for unattenuated vibratory piles in Knik Arm by project are equal to 18.9 and 16.5, respectively. NMFS proposes to use the project median TL coefficient of 16.5 during unattenuated vibratory installation and removal of all piles during the CTR project. This value is representative of all unattenuated vibratory measurements in the Knik Arm, i.e., including data from POA and Port MacKenzie. Further, 16.5 is the mean of the 2016 measurements, which were made closer to the CTR proposed project area than other measurements and were composed of measurements from multiple directions (both north and south/southwest).

In certain scenarios, the POA may perform concurrent vibratory driving of two piles. The POA proposed, and NMFS concurs, that in the event that both piles are unattenuated, the TL coefficient would be 16.5; if both piles are attenuated, the TL coefficient would be 15. In the event that one pile is attenuated and one is unattenuated, the POA proposed a TL coefficient of 15.75 to be used in the acoustic modeling. NMFS evaluated the contributions of one attenuated and one unattenuated vibratory-driven pile to the sound field (assuming a 7-dB reduction in source level due to the bubble curtain for the attenuated source), and determined that the unattenuated source would likely dominate the received sound field. Therefore, the POA's proposed TL coefficient is conservative, and NMFS concurs with this value.

Table 4-3. Estimates of Unweighted Underwater Sound Levels Generated during Pile Installation and Removal

Method and Pile Type	Unweighted Sound Level at 10 M					
Vibratory Hammer	**Unattenuated (without bubble curtain)**			**Attenuated (with bubble curtain)**		
	dB RMS	**TL Coefficient**	**Data Source for Source Levels**	**dB RMS**	**TL Coefficient**	**Data Source for Source Levels**
24-in steel installation	161	16.5[a]	U.S. Navy 2015	158.5	15.0[c]	I&R 2021a
24-in steel removal	169		NMFS average 2023[b]	157		I&R 2021a
36-in steel installation	166		U.S. Navy 2015	160.5		I&R 2021a, 2021b
36-in steel removal	159		NMFS average 2023[b]	154		I&R 2021a
72-in steel	171		I&R 2003, unpublished data for Castrol Oil berthing dolphin in Richmond, CA	164		Assumed 7-dB reduction supported by I&R 2021a
144-in steel	160		Added 7 dB to measured result of 153 dB from attenuated 144-in piles as reported in I&R 2021b	153		I&R 2021b
Concurrent 36- and 36-in	171	16.5	Decibel addition	163.5	15	Decibel addition
	169[d]	15.75		169[d]	15.75	
Concurrent 36-in and 72-in	169[e]			166	15	

Impact Hammer	**Unattenuated (without bubble curtain)**					**Attenuated (with bubble curtain)**				
	dB RMS	**dB SEL**	**dB peak**	**TL Coefficient**	**Data Source for Source Levels**	**dB RMS**	**dB SEL**	**dB peak**	**TL Coefficient**	**Data Source for Source Levels**
24-in steel	193	181	210	15.0[c]	U.S. Navy 2015	186	174	203	15.0[c]	Assumed 7-dB reduction supported by I&R 2021a
36-in steel	193	184	211		U.S. Navy 2015	186	177	204		Assumed 7-dB reduction supported by I&R 2021a
72-in steel	203	191	217		I&R model. Estimate based on interpolation of data for piles 24 to 144 in in diameter.	196	184	210		Assumed 7-dB reduction supported by Caltrans Compendium (2020)
144-in steel	209	198	221		I&R model. Estimate based on interpolation of data for 24-, 36-, 48-, and 96-in piles.	207	193	219		I&R 2021b

Note: dB = decibels; I&R = Illingworth & Rodkin, LLC; RMS = root mean square; SEL = sound exposure level; TL = transmission loss.
[a] Austin *et al.* 2016
[b] NMFS-developed values (see text for details).
[c] NMFS default value (Practical Spreading Loss).
[d] One pile attenuated and one pile unattenuated (*e.g.* one pile in less than 3 m of water)
[e] 36-in pile unattenuated; 72-in pile attenuated

Table 4-4. Calculated Distance of Level A and Level B Harassment Isopleths by Pile Type and Pile Driving Method

<table>
<tr><th rowspan="2">Activity</th><th rowspan="2">Pile Type / Size</th><th rowspan="2">Attenuated or Unattenuated</th><th colspan="5">Level A harassment distance (m)</th><th rowspan="2">Level B harassment distance (m) all hearing groups[1]</th></tr>
<tr><th>LF</th><th>HF</th><th>VHF</th><th>PW</th><th>OW</th></tr>
<tr><td rowspan="8">Impact</td><td rowspan="2">24-in (61-cm)</td><td>Unattenuated</td><td>732</td><td>94</td><td>1,133</td><td>651</td><td>243</td><td>1,585</td></tr>
<tr><td>Attenuated</td><td>250</td><td>32</td><td>387</td><td>222</td><td>83</td><td>541</td></tr>
<tr><td rowspan="2">36-in (91-cm)</td><td>Unattenuated</td><td>1,160</td><td>148</td><td>1,796</td><td>1,031</td><td>385</td><td>1,585</td></tr>
<tr><td>Attenuated</td><td>397</td><td>51</td><td>613</td><td>352</td><td>132</td><td>541</td></tr>
<tr><td rowspan="4">72-in (182-cm)</td><td>Unattenuated</td><td>10,896</td><td>1,390</td><td>16,861</td><td>9,679</td><td>3,608</td><td>7,356</td></tr>
<tr><td>Attenuated (1 pile per day)</td><td>3,720</td><td>474.7</td><td>5,757</td><td>3,305</td><td>1,232</td><td rowspan="3">2,512</td></tr>
<tr><td>Attenuated (2 piles per day)</td><td>5,906</td><td>753.5</td><td>9,139</td><td>5,246</td><td>1,956</td></tr>
<tr><td>Attenuated (3 piles per day)</td><td>7,739</td><td>987.4</td><td>11,976</td><td>6,875</td><td>2,563</td></tr>
<tr><td rowspan="6">Vibratory Installation</td><td rowspan="2">24-in (61-cm)</td><td>Unattenuated</td><td>14.1</td><td>5.9</td><td>11.8</td><td>17.8</td><td>6.6</td><td>2,247</td></tr>
<tr><td>Attenuated</td><td>10</td><td>3.8</td><td>8.1</td><td>12.8</td><td>4.3</td><td>2,630</td></tr>
<tr><td rowspan="2">36-in (91-cm)</td><td>Unattenuated</td><td>28.4</td><td>11.9</td><td>23.6</td><td>35.7</td><td>13.3</td><td>4,514</td></tr>
<tr><td>Attenuated</td><td>13.6</td><td>5.2</td><td>11.1</td><td>17.5</td><td>5.9</td><td>3,575</td></tr>
<tr><td rowspan="2">72-in (182-cm)</td><td>Unattenuated</td><td>24.6</td><td>10.3</td><td>20.5</td><td>31</td><td>11.5</td><td>9,069</td></tr>
<tr><td>Attenuated</td><td>9.2</td><td>3.5</td><td>7.5</td><td>11.9</td><td>4</td><td>6,119</td></tr>
<tr><td rowspan="4">Vibratory Removal</td><td rowspan="2">24-in (61-cm)</td><td>Unattenuated</td><td>55.2</td><td>23.1</td><td>45.9</td><td>69.5</td><td>25.8</td><td>6,861</td></tr>
<tr><td>Attenuated</td><td>10.4</td><td>4</td><td>8.5</td><td>13.4</td><td>4.5</td><td>2,583</td></tr>
<tr><td rowspan="2">36-in (91-cm)</td><td>Unattenuated</td><td>13.7</td><td>5.7</td><td>11.4</td><td>17.2</td><td>6.4</td><td>1,699</td></tr>
<tr><td>Attenuated</td><td>6.6</td><td>2.5</td><td>5.4</td><td>8.4</td><td>2.8</td><td>1,318</td></tr>
<tr><td rowspan="5">Concurrent Vibratory / Vibratory</td><td rowspan="3">36-in AND 36-in</td><td>Attenuated / Attenuated</td><td>44.7</td><td>17.2</td><td>36.5</td><td>57.5</td><td>19.4</td><td>5,667</td></tr>
<tr><td>Attenuated / Unattenuated</td><td>107.6</td><td>43.3</td><td>88.8</td><td>136.9</td><td>48.5</td><td>9,363</td></tr>
<tr><td>Unattenuated / Unattenuated</td><td>127.7</td><td>53.5</td><td>106.3</td><td>160.7</td><td>59.7</td><td>9,069</td></tr>
<tr><td rowspan="2">36-in AND 72-in</td><td>Attenuated / Attenuated</td><td>60</td><td>23.1</td><td>49</td><td>77.3</td><td>26</td><td>8,318</td></tr>
<tr><td>Unattenuated / Attenuated</td><td>98.9</td><td>39.8</td><td>81.6</td><td>125.8</td><td>44.6</td><td>9,363</td></tr>
</table>

Concurrent Vibratory / Impact	36-in AND 72-in	Attenuated / Attenuated (1 pile per day)	3,720	474.7	5,757	3,305	1,232	3,575
		Attenuated / Attenuated (2 piles per day)	5,906	753.5	9,139	5,246	1,956	
		Attenuated / Attenuated (3 piles per day)	7,739	987.4	11,976	6,875	2,563	
		Unattenuated / Attenuated (1 pile per day)	3,720	474.7	5,757	3,305	1,232	4,514
		Unattenuated / Attenuated (2 piles per day)	5,906	753.5	9,139	5,246	1,956	
		Unattenuated / Attenuated (3 piles per day)	7,739	987.4	11,976	6,875	2,563	

[1] Distances to thresholds are as modeled; however, interaction with shorelines would truncate zones. See figures 6-1 thorough 6-10 in the POA's application for further details.

The TL coefficient used for vibratory pile installation and removal is 16.5 as measured during the 2016 TPP (Austin *et al.* 2016). The NMFS default value of 15.0, which assumed practical spreading loss, is used for impact pile installation. See Table 4-3 and Appendix A of the LOA and IHA application for more detail.

Estimated Take of Marine Mammals

Potential estimates of take, pursuant to the analysis required under the MMPA, were derived based on the data available and the expected frequency of observing the species during the CTR Project. To estimate take, numbers of marine mammals are rounded up to the nearest integer, because a fraction of a marine mammal cannot be exposed to noise or taken. Calculations used to estimate exposure from pile installation for all marine mammals are described below. NMFS notes that the estimated take does not necessarily equate to individual animals (*i.e.,* the same harbor seal may be exposed on different days).

Gray Whales

Sightings of gray whales in the Project area are rare, and the potential risk of exposure of a gray whale to sounds exceeding the Level B harassment threshold is low. Few, if any, gray whales are expected to approach the Project area. However, based on three separate sightings of a single gray whale near the POA in 2021 (61N Environmental 2021, 2022a; NMFS 2021 unpublished data), it is anticipated that exposure of up to six individuals could occur during each construction year of pile installation and removal for the Project (Table 4-4). This could include three sightings of a cow-calf pair or six sightings of single gray whales.

It is assumed that all Level A takes of gray whales would occur during impact pile installation when the Level A zones are large. The proportion of active hammer time each year that is anticipated to involve use of an impact hammer was used to estimate the number of gray whales that could potentially be exposed to Level A harassment levels (Table 4-5).

Table 4-5. Estimated Number of Potential Exposures (Takes) of Gray Whales for Each Construction Year

Year	Total Hammer Duration (hours)	Proportion of Hammer Use That is Impact	Estimated Potential Exposures			Population Size	% of Population
			Total	Level A	Level B		
Year 1	153.9	0.64	6	4	2		0.02

Year 2	135.4	0.65	6	4	2	26,960 (Eastern North Pacific Stock)	
Year 3	135.2	0.29	6	2	4		
Year 4	137.9	0.63	6	4	2		
Year 5	137.2	0.60	6	4	2		
Year 6	149.0	0.58	6	3	3		

Note: hrs = hours.

Humpback Whales

Sightings of humpback whales in the Project area are rare, and the potential risk of exposure of a humpback whale to sounds exceeding the Level B harassment threshold is low. Few, if any, humpback whales are expected to approach the Project area. However, based on two sightings in 2017 of what was likely a single individual at the Anchorage Public Boat Dock at Ship Creek (ABR, Inc. 2017) south of the Project area, it is anticipated that exposure of up to six individuals could occur during each construction year of pile installation and removal for the Project (Table 4-5). This could include three sightings of a cow-calf pair or six sightings of single humpback whales.

It is assumed that all Level A takes of humpback whales would occur during impact pile installation when the Level A zones are large. The proportion of active hammer time each year that is anticipated to involve use of an impact hammer was used to estimate the number of humpback whales that could potentially be exposed to Level A harassment levels (Table 4-6).

Table 4-6. Estimated Number of Potential Exposures (Takes) of Humpback Whales for Each Construction Year

Year	Total Hammer Duration (hours)	Proportion of Hammer Use That is Impact	Estimated Potential Exposures			Population Size	% of Population
			Total	Level A	Level B		
Year 1	153.9	0.64	4	3	1	Unknown (Mexico - North Pacific Stock) or 11,278 (Hawai‘i Stock)	NA or 0.04
Year 2	135.4	0.65	4	3	1		
Year 3	135.2	0.29	4	2	2		
Year 4	137.9	0.63	4	3	1		
Year 5	137.2	0.60	4	3	1		
Year 6	149.0	0.58	4	3	1		

Note: NA = not applicable.

Harbor Seals

Harbor seals are not known to reside in the Project area, but they are seen regularly near the mouth of Ship Creek from July through September when Pacific salmon are running. With the exception of newborn pups, all ages and sexes of harbor seals could occur in the Project area. Any harassment of harbor seals during in-water pile installation and removal would involve a limited number of individuals that may potentially swim through the Project area or linger near Ship Creek. Harbor seals that are disturbed by noise may alter their behavior (*e.g.,* modify foraging patterns) and be temporarily displaced from the Project area.

Marine mammal monitoring data were used to examine hourly sighting rates for harbor seals in the Project area. Sighting rates of harbor seals were highly variable and appeared to have increased during monitoring between 2005 and 2022. It is unknown whether any potential increase was due to local population increases or habituation to ongoing construction activities. The highest individual hourly sighting rate recorded for a previous year (rounded) was used to quantify take of harbor seals for in-water pile installation and removal associated with the CTR Project. This occurred in 2021 during PCT Phase 2 construction, when harbor seals were observed from May through September. A total of 220 harbor seals were observed over 734.9 hours of monitoring, at an average rate of 0.2994 harbor seals sightings per hour. The maximum monthly sighting rate occurred in September and was 0.51 harbor seals per hour. Based on these data, it is estimated that approximately one harbor seal (0.51 rounded up) may be observed near the Project per hour of hammer use. This approximate sighting rate of one harbor seal per hour was also used for harbor seal exposure calculations for the SFD Project (86 FR 31870).

During the 699.5 hours of anticipated in-water pile installation and removal over the course of years 1 through 5 of the project, it is estimated that up to 702 harbor seals (1 harbor seal per hour * 699.5 hours, rounded up annually to total 702) may potentially be exposed to in-water noise levels exceeding the Level B harassment thresholds for in-water pile installation and removal during the CTR Project. In the 6th year of construction, for which NMFS may issue a separate IHA, it is estimated that up to 149 harbor seals may potentially be exposed to in-water noise levels exceeding the Level B harassment thresholds for in-water pile installation and removal. Over the full duration of the CTR Project, a total of approximately 851 harbor seals may potentially be exposed to in-water noise levels exceeding the Level B harassment thresholds for in-water pile installation and removal.

Of the 524 harbor seal sightings in 2020 and 2021 combined, 93.7 percent of the sightings were of single individuals; only 5.7 percent of sightings were of two individual harbor seals, and only 0.6 percent of sightings reported three harbor seals. It is possible that a single individual may linger near the POA, especially near Ship Creek, and be counted multiple times each day as it moves around and resurfaces in different locations. The number of harbor seals actually taken would, therefore, likely be smaller than the number of potential exposures that is reported.

Harbor seals often are curious about onshore activities and may choose to approach closely. The mouth of Ship Creek, where harbor seals linger, is approximately 1,500 m from the southern end of the CTR Project. It is assumed that all Level A takes of harbor seals would occur during impact pile installation when the Level A zones are larger than the 100-meter minimum shutdown zone. The proportion of active hammer time each year that is anticipated to involve use of an impact hammer was used to estimate the number of harbor seals that could potentially be exposed to Level A harassment levels (Table 4-7). Exposure is anticipated to be further minimized because pile installation and removal would occur intermittently over the construction period. Few harbor seals are expected to approach the Project area, and this small number of direct, short-term, localized potential exposures is anticipated to have a negligible adverse effect on the population as a whole.

Table 4-7. Estimated Number of Potential Exposures (Takes) of Harbor Seals for Each Construction Year

Year	Total Hammer Duration (hours)	Proportion of Hammer Use That is Impact	Estimated Potential Exposures			Population Size	% of Population
			Total	Level A	Level B		
Year 1	153.9	0.64	154	99	55	28,411	0.54
Year 2	135.4	0.65	136	89	47		0.48
Year 3	135.2	0.29	136	40	96		0.48
Year 4	137.9	0.63	138	87	51		0.49
Year 5	137.2	0.60	138	83	55		0.49

Year 6	149.0	0.58	149	87	62		0.52

Steller Sea Lions

Steller sea lions are anticipated to be encountered in low numbers in the Project area (Section 3.2.3.1). Similar to the approach used above for harbor porpoises, the POA used previously recorded sighting rates of Steller sea lions near the POA to estimate requested take for this species. During SFD construction in May and June of 2022, the hourly sighting rate for Steller sea lions was 0.028. The hourly sighting rate for Steller sea lions in 2021, the most recent year with observations across most months, was approximately 0.01. The highest number of Steller sea lions that have been observed during the 2020-2022 monitoring efforts at the POA was nine individuals (eight during PCT Phase 1 monitoring and one during NMFS' 2021 monitoring).

Recent counts of sightings of Steller sea lions around the POA may include multiple re-sights of single individuals. For instance, in 2016, Steller sea lions were observed on 2 separate days. On May 2, 2016, one individual was sighted, while on May 25, 2016, there were five Steller sea lion sightings within a 50-minute period, and these sightings occurred in areas relatively close to one another (Cornick and Seagars, 2016). Given the proximity in time and space, it is believed these five sightings were of the same individual sea lion. The POA is concerned that multiple re-sights of a single individual within a day may overestimate the true number of individuals exposed to sound levels at or above harassment thresholds over the course of the proposed project. Therefore, given the uncertainty around Steller sea lion occurrence at the POA and potential that occurrence is increasing, the POA estimated that approximately 0.14 Steller sea lions per hour (the May and June 2022 rate of 0.028 Steller sea lions per hour multiplied by a factor of 5) may be observed near the proposed CTR project areas per hour of hammer use. However, the highest number of Steller sea lions sightings during the 2020-2022 monitoring efforts at the POA was nine (eight during PCT Phase 1 monitoring and one during NMFS' 2021 monitoring).

Given the POA's estimate assumes a higher Steller sea lion sighting rate (0.14) than has been observed at the POA and results in an estimate that is more than double the maximum number of Steller sea lions observed in a year, NMFS believes that the sighting rate proposed by the POA overestimates potential exposures of this species. Based on the ensonified areas, which closely resemble the observable area from the PCT project, the potential for re-sightings of individual animals, and the uncertainty around increased occurrence of Steller sea lions in and around upper Cook Inlet, NMFS instead proposes that nine Steller sea lions (the maximum number observed in a single year between 2020 and 2022 during projects with similar sized harassment isopleths) may be taken each year during the project.

During the 699.5 hours of anticipated in-water pile installation and removal over the course of years 1 through 5 of the project, it is estimated that up to 45 Steller sea lions may potentially be exposed to in-water noise levels exceeding the Level B harassment thresholds for in-water pile installation and removal during the CTR Project. In the 6th year of construction, for which NMFS may issue a separate IHA, it is estimated that up to 9 Steller sea lions may potentially be exposed to in-water noise levels exceeding the Level B harassment thresholds for in-water pile installation and removal (Table 4-8). Over the full duration of the CTR Project, a total of approximately 54 Steller sea lions may potentially be exposed to in-water noise levels exceeding the Level B harassment thresholds for in-water pile installation and removal.

Steller sea lions often are curious of onshore activities and may choose to approach closely. Additionally, given the potential difficulty of tracking individual Steller sea lions, Level A take for a small number of Steller sea lions is requested. It is assumed that all Level A takes of Steller sea lions would occur during impact pile installation when the Level A zones are larger than the 100-meter minimum shutdown zone. The proportion of active hammer time each year that is anticipated to involve use of an impact hammer was used to estimate the number of Steller sea lions that could potentially be exposed to Level A harassment levels. Similar to harbor seals, exposure is anticipated to be further minimized because pile installation and removal would occur intermittently over the construction period. Few Steller sea lions are expected to approach the Project area, and this small number of direct, short-term, localized potential exposures is anticipated to have a negligible adverse effect on the population as a whole.

Table 4-8. Estimated Number of Potential Exposures (Takes) of Steller Sea Lions for Each Construction Year

Year	Total Hammer Duration (hours)	Proportion of Hammer Use That is Impact	Estimated Potential Exposures			Population Size	% of Population
			Total	Level A	Level B		
Year 1	153.9	0.64	9	6	3	49,837	0.018
Year 2	135.4	0.65	9	6	3		
Year 3	135.2	0.29	9	3	6		
Year 4	137.9	0.63	9	6	3		
Year 5	137.2	0.60	9	6	3		
Year 6	149.0	0.58	9	6	3		

Harbor Porpoise

Monitoring data recorded from 2005 through 2022 were used to evaluate hourly sighting rates for harbor porpoises in the Project area. During most years of monitoring, no harbor porpoises were observed. However, there has been an increase in harbor porpoise sightings in upper Cook Inlet over the past 2 decades (Shelden *et al.* 2014). The highest sighting rate for any recorded year during in-water pile installation and removal was an average of 0.037 harbor porpoises per hour during PCT construction in 2021, when observations occurred across most months. Given the uncertainty around harbor porpoise occurrence at the POA and potential that occurrence is increasing, the POA calculated requested takes using a sighting rate of 0.5 harbor porpoises per hour. For the recent NES1 project (88 FR 76576, November 6, 2023), NMFS estimated that a more realistic sighting rate would be closer to approximately 0.07 harbor porpoises per hour (the 2021 rate of 0.037 harbor porpoises per hour doubled). However, the sizes of the ensonified areas for the NES1 project are much smaller than those predicted for the proposed CTR project. Based on the larger ensonified areas, which more closely resemble the observable area from the PCT project, the cryptic nature of the species, and the potential for increased occurrence of harbor porpoise in and around upper Cook Inlet, NMFS estimates that approximately 0.15 harbor porpoises per hour (four times the maximum observed 2021 rate of 0.037 per hour) may be observed near the proposed CTR area.

During the 699.5 hours of anticipated in-water pile installation and removal over the course of years 1 through 5 of the project, it is estimated that up to 108 harbor porpoise (0.15 harbor porpoise per hour * 699.5 hours, rounded up annually to total 108) may potentially be exposed to in-water noise levels exceeding the Level B harassment thresholds for in-water pile installation and removal during the CTR Project. In the 6th year of construction, for which NMFS may issue a separate IHA, it is estimated that up to 23 harbor porpoise may potentially be exposed to in-water noise levels exceeding the Level B harassment thresholds for in-water pile installation and removal. Over the full duration of the CTR Project, a total of approximately 131 harbor porpoise may potentially be exposed to in-water noise levels exceeding the Level B harassment thresholds for in-water pile installation and removal.

Large Level A zones associated with impact pile installation may make it difficult to detect and track harbor porpoises during impact hammer use. A small number of Level A exposures (takes) is therefore requested. It is assumed that all Level A takes of harbor porpoises would occur during impact pile installation when the Level A zones are larger than the 100-meter minimum shutdown zone. The proportion of active hammer time each year that is anticipated to involve use of an impact hammer was used to estimate the number of harbor porpoises that could potentially be exposed to Level A harassment levels (Table 4-9).

With in-water pile installation and removal occurring intermittently over the construction period, the potential for exposure within the Level B harassment isopleths is anticipated to be low. Few harbor porpoises are expected to approach the Project area, and the small number of takes requested and the direct, short-term, localized potential exposure are expected to have a negligible adverse effect on individual animals and no measurable effect on the population as a whole.

Table 4-9. Estimated Number of Potential Exposures (Takes) of Harbor Porpoises for Each Construction Year

Year	Total Hammer Duration (hours)	Proportion of Hammer Use That is Impact	Estimated Potential Exposures			Population Size	% of Population
			Total	Level A	Level B		
Year 1	153.9	0.64	24	16	8	31,046	0.077
Year 2	135.4	0.65	21	14	7		0.068
Year 3	135.2	0.29	21	7	14		0.068
Year 4	137.9	0.63	21	14	7		0.068
Year 5	137.2	0.60	21	13	8		0.068
Year 6	149.0	0.58	23	14	9		0.074

Killer Whales

Numbers of resident and transient killer whales in upper Cook Inlet are very small in comparison with their overall population sizes. Few, if any, killer whales are expected to approach the Project area. No killer whales were sighted during previous monitoring programs for POA construction projects, including the 2016 TPP, 2020 and 2021 PCT, and 2022 SFD projects (Prevel-Ramos *et al.* 2006; Markowitz and McGuire 2007; Cornick and Saxon-Kendall 2008, 2009; Cornick *et al.* 2010, 2011; ICRC 2009, 2010, 2011, 2012; Cornick and Pinney 2011; Cornick and Seagars 2016; 61N Environmental 2021, 2022b). During PCT Project construction in 2021, two killer whales were sighted (61N Environmental 2022a), the first time this species has been documented near the POA. The infrequent sightings of killer whales reported in upper Cook Inlet tend to occur when their primary prey (anadromous fish for resident killer whales and belugas for transient killer whales) are also in the area (Shelden *et al.* 2003). Previous sightings of transient killer whales have documented pod sizes in upper Cook Inlet between one and six individuals (Shelden *et al.* 2003).

The potential for exposure of killer whales within the Level B harassment isopleths is anticipated to be extremely low for the CTR Project. Level B harassment take is conservatively estimated at no more than one small pod (six individuals) per construction year (Table 4-10). Few killer whales are expected to approach the Project area, and this direct, short-term, localized potential exposure is expected to have a negligible adverse effect on an individual animal and no effect on killer whale populations as a whole.

While unlikely, it is possible that killer whales could approach the POA from the northern portion of Knik Arm, and immediately enter into a Level A harassment zone before PSOs are able to shut down pile driving activities. The POA estimates, and NMFS concurs, that one pod (assumed to be six individuals) could be taken by Level A harassment over course of the CTR project.

Table 4-10. Estimated Number of Potential Exposures (Takes) of Killer Whales for Each Construction Year

Year	Total Hammer Duration (hours)	Proportion of Hammer Use That is Impact	Estimated Potential Exposures			Population Size	% of Populatio n
			Total	Level A	Level B		
Year 1	153.9	0.64	6		6	1,920 (E. North Pacific AK Resident Stock) or 587 (E. North Pacific, Gulf of AK, Aleutian Islands, & Bering Sea Transient Stock)	
Year 2	135.4	0.65	6		6		
Year 3	135.2	0.29	6	6	6		0.31 or 1.02
Year 4	137.9	0.63	6		6		
Year 5	137.2	0.60	6		6		
Year 6	149.0	0.58	6	0	6		

Cook Inlet Belugas

Several marine mammal monitoring programs have been conducted at the POA over the last 18 years and Cook Inlet belugas are the most commonly encountered marine mammal. The methodology used to conduct marine mammal monitoring programs has evolved and advanced over the last 2 decades. Due to the changes in monitoring protocol over the years, the monitoring data from earlier years is not always comparable to the most recent data. Likewise, the approach for calculating take has evolved based on the most recent monitoring protocol. Potential exposure of belugas to elevated sounds levels from pile installation and removal was calculated following the method outlined below and explained in greater detail in the CTR LOA and IHA application and FRN of the proposed rule (89 FR 85686, 28 October 2024).

Data Source Considerations

The marine mammal monitoring programs for the PCT and SFD projects produced a unique and comprehensive data set of beluga locations and movements (61N Environmental 2021, 2022a, 2022c; Easley-Appleyard and Leonard 2022) that is the most current data set available for Knik Arm. This data set was used to estimate potential beluga exposure to elevated sound levels for the CTR Project. This data set is most likely to accurately represent future beluga attendance at the Project site, which may be affected by beluga population size, beluga movement patterns through Knik Arm, environmental change including climate change, differences in salmon and other prey abundance among years, and other factors. More details about the data used are provided in the POA's LOA and IHA application and the FRN of the proposed rule (89 FR 85686, 28 October 2024).

Closest Point of Approach Methodology for Calculating Sighting Rates

To calculate monthly sighting rates of Cook Inlet belugas, the closest point of approach (CPOA) for each beluga group was determined (for details on marine mammal data collection methods, see 61N Environmental 2021, 2022a, 2022c; Easley-Appleyard and Leonard 2022). Piecewise regression, a common tool for modeling ecological thresholds (Atwood *et al.* 2016; Whitehead 2016; Lopez *et al.* 2020), detected breakpoints in a cumulative density distribution of the CPOA locations across all calendar months. The distances from the CTR Project site detected by the breakpoint analysis were used to define five sighting rate distance bins for calculation of beluga exposures (takes). Each breakpoint (196; 2,338; 3,155; and 6,974 m) and the complete data set of observations (greater than 6,974 m) were rounded up to the nearest meter and considered the outermost limit of each sighting rate bin, resulting in five identified bins (Table 4-11).

Table 4-11. Beluga Monthly Sighting Rates for Different Bin Sizes

Bin Number	Distance (m)	Belugas/Hour							
		April	May	June	July	August	Sept.	Oct.	Nov.
1	≤ 196	0.05	0.06	0.10	0.04	0.82	0.59	0.51	0.10
2	≤ 2,338	0.34	0.16	0.15	0.09	1.55	1.42	1.09	0.65
3	≤ 3,155	0.36	0.22	0.21	0.09	2.02	1.89	1.98	0.72
4	≤ 6,974	0.67	0.33	0.29	0.13	2.24	2.18	2.42	0.73
5	>6,974	0.71	0.39	0.30	0.13	2.29	2.23	2.56	0.73

To determine the number of takes by Level B harassment required for the project, Level B harassment isopleths were calculated for each pile size and hammer expected to create elevated noise levels. For belugas, the monthly sighting rate for each Level B harassment isopleth was determined by identifying the sighting rate distance bin with the corresponding Level B harassment isopleth, and then summing all of the belugas sighted within that sighting rate distance bin for each calendar month in all years and dividing by the number of hours of observation for that month in all years, giving belugas per hour per month for each sighting rate distance bin (Table 4-11). The number of hours expected from each activity for each month was then multiplied by the monthly sighting rate to determine the number of belugas expected to be seen each month that could potentially be exposed to elevated sound levels during the specified activity.

Beluga Take Estimates

Level B harassment take estimates for Cook Inlet belugas were calculated by multiplying the total number of vibratory and impact installation or removal hours per month for each activity based on the anticipated construction schedule with the corresponding sighting rate (belugas per hour per month) and sighting rate distance bin (Table 4-12).

Table 4-12. Allocation of Each Level B Isopleth to a Sighting Rate Bin and Beluga Monthly Sighting Rates for Different Pile Sizes and Hammer Types

<table>
<tr><th rowspan="2">Activity</th><th rowspan="2">Level B Isopleth Distance (m)</th><th rowspan="2">Sighting Rate Bin Number and Distance</th><th colspan="8">Belugas/Hour</th></tr>
<tr><th>Apr</th><th>May</th><th>Jun</th><th>Jul</th><th>Aug [1]</th><th>Sep [1]</th><th>Oct [1]</th><th>Nov</th></tr>
<tr><td colspan="11">Unattenuated Values (without the use of a bubble curtain)</td></tr>
<tr><td>36-in Vibratory Removal[1,2]</td><td>1,699</td><td>2 (2,338 m)</td><td>0.34</td><td>0.16</td><td>0.15</td><td>0.09</td><td>1.55</td><td>1.42</td><td>1.09</td><td>0.65</td></tr>
<tr><td>36-in Vibratory Installation[1,2]</td><td>4,514</td><td>4 (6,974 m)</td><td>0.67</td><td>0.33</td><td>0.29</td><td>0.13</td><td>2.24</td><td>2.18</td><td>2.42</td><td>0.73</td></tr>
<tr><td>72-in Vibratory Installation[3]</td><td>9,069</td><td rowspan="3">5 (> 6,974)</td><td rowspan="3">0.71</td><td rowspan="3">0.39</td><td rowspan="3">0.30</td><td rowspan="3">0.13</td><td rowspan="3">2.29</td><td rowspan="3">2.23</td><td rowspan="3">2.56</td><td rowspan="3">0.73</td></tr>
<tr><td>Concurrent 36-in AND 36-in Vibratory Installation</td><td>9,069</td></tr>
<tr><td>Concurrent 36-in AND 36-in OR 72-in Vibratory Installation[4]</td><td>9,363</td></tr>
<tr><td>36-in Impact Installation[1,2]</td><td>1,585</td><td>2 (2,338 m)</td><td>0.34</td><td>0.16</td><td>0.15</td><td>0.09</td><td>1.55</td><td>1.42</td><td>1.09</td><td>0.65</td></tr>
<tr><td>72-in Impact Installation[3]</td><td>7,356</td><td>5 (> 6,974)</td><td>0.71</td><td>0.39</td><td>0.30</td><td>0.13</td><td>2.29</td><td>2.23</td><td>2.56</td><td>0.73</td></tr>
<tr><td colspan="11">Attenuated Values (with the use of a bubble curtain)</td></tr>
<tr><td>36-in Vibratory Removal[2]</td><td>1,318</td><td>2 (2,338)</td><td>0.34</td><td>0.16</td><td>0.15</td><td>0.09</td><td>1.55</td><td>1.42</td><td>1.09</td><td>0.65</td></tr>
<tr><td>36-in Vibratory Installation[2]</td><td>3,575</td><td rowspan="3">4 (6,974 m)</td><td rowspan="3">0.67</td><td rowspan="3">0.33</td><td rowspan="3">0.29</td><td rowspan="3">0.13</td><td rowspan="3">2.24</td><td rowspan="3">2.18</td><td rowspan="3">2.42</td><td rowspan="3">0.73</td></tr>
<tr><td>72-in Vibratory Installation[3]</td><td>6,119</td></tr>
<tr><td>Concurrent 36-in AND 36-in Vibratory Installation</td><td>5,667</td></tr>
<tr><td>Concurrent 36-in AND 72-in Vibratory Installation</td><td>8,318</td><td>5 (> 6,974)</td><td>0.71</td><td>0.39</td><td>0.30</td><td>0.13</td><td>2.29</td><td>2.23</td><td>2.56</td><td>0.73</td></tr>
<tr><td>36-in Impact Installation[1,2]</td><td>541</td><td>2 (2,338)</td><td>0.34</td><td>0.16</td><td>0.15</td><td>0.09</td><td>1.55</td><td>1.42</td><td>1.09</td><td>0.65</td></tr>
<tr><td>72-in Impact Installation</td><td>2,512</td><td>3 (3,155 m)</td><td>0.36</td><td>0.22</td><td>0.21</td><td>0.09</td><td>2.02</td><td>1.89</td><td>1.98</td><td>0.72</td></tr>
</table>

[1] Unattenuated vibratory and impact driving of temporary and permanent piles during the months of August through October would be limited to the minimum possible number of piles that must be driven in-water in depths < 3 m.
[2] Unattenuated and attenuated vibratory installation of 36-in temporary piles both result in bin 4; vibratory removal of this pile type results in bin 2 in both attenuated and unattenuated conditions. Unattenuated and attenuated impact pile driving of 36-in piles results in bin 2 in both conditions.
[3] Unattenuated vibratory and impact installation of permanent (72-in) piles would be minimized to the extent possible by driving as many piles as possible in the dry for all months of the construction seasons. To account for piles driven in water less than 3m deep, NMFS has estimated approximately 0.5 unattenuated 72-in piles would be driven (approximately 43 minutes of impact driving and 5 minutes of vibratory driving) each month. Impact driving (attenuated and unattenuated) results in Bin 2; vibratory driving (attenuated and unattenuated) results in Bin 5.

[4] Both concurrent driving of 2 temporary piles (1 attenuated, 1 unattenuated) and 1 temporary (unattenuated) and 1 permanent (attenuated) piles result in a Level B harassment isopleth of 9,363 m.

For the PCT and SFD projects, NMFS accounted for the implementation of mitigation measures by applying an adjustment factor to beluga take estimates since some Level B harassment takes would likely be avoided based on required shutdowns for belugas at the Level B harassment zones (84 FR 72154 and 86 FR 50057). For the PCT project, NMFS compared the number of potentially realized takes at the POA to the number of authorized takes for previous projects from 2008 to 2017 and found that the percentage of potentially realized takes ranged from 12 to 59 percent with an average of 36 percent (84 FR 72154; Table 4-13). NMFS then applied the highest percentage of previous potentially realized takes (59 percent during the 2009–2010 season) to ensure that potential impacts on belugas were fully evaluated and to provide the POA with an adequate number of authorized beluga takes. In doing so, NMFS assumed that approximately 59 percent of the takes calculated would potentially be realized during PCT and SFD construction (84 FR 72154 and 86 FR 50057). It was also assumed that 41 percent of the expected beluga Level B harassment takes would be avoided by successful implementation of required mitigation measures.

Table 4-13. Comparison of Reported and Authorized Takes for Cook Inlet Belugas

Project	Valid Dates of Incidental Harassment Authorization	Reported Takes	Authorized Takes	Percentage of Takes That Occurred
MTRP	15 July 2008 to 14 July 2009	12	34	35
MTRP	15 July 2009 to 14 July 2010	20	34	59
MTRP	15 July 2010 to 14 July 2011	13	34	38
MTRP	15 July 2011 to 14 July 2012	4	34	12
TPP	01 April 2016 to 31 March 2017	1	15	7
PCT Phase 1	01 April 2020 to 31 March 2021	26	55	47
PCT Phase 2	01 April 2021 to 31 March 2022	27	35	77
SFD	08 August 2021 to 07 August 2022	2	24	8

Notes: MTRP = Marine Terminal Redevelopment Project; PCT = Petroleum and Cement Terminal; SFD = South Floating Dock; TPP = Test Pile Program.

The adjustment for successful implementation of mitigation measures for the CTR Project was calculated using the percentage of potentially realized takes for the PCT project (Table 4-14). The recent data from PCT Phase 1 and PCT Phase 2 most accurately reflect the current marine mammal monitoring program, the current program's effectiveness, and beluga attendance in the Project area. Between the two phases of the PCT project, 90 total Level B takes were authorized and 53 were potentially realized, equating to an overall percentage realized of 59 percent. The SFD project, during which only 7 percent of authorized take occurred, represents installation of only 12 piles during a limited time period and does not represent the much higher number of piles and longer construction season anticipated for this Project (Table 2-10).

Table 4-14. Beluga Monthly and Total Estimated Level B Take

	Apr	May	Jun	Jul	Aug[2]	Sep[2]	Oct[2]	Nov
Year 1[1]								
36" vibratory installation[3]	1.68	2.01	1.76	0.78	13.44	13.10	7.26	1.47
36" vibratory removal[3]	0.26	0.12	0.11	0.07	1.16	1.06	0.82	0.49
72" vibratory installation (attenuated)	0.50	0.59	0.51	0.23	3.17	3.09	3.43	0.06

72" vibratory installation (unattenuated)[4]	0.06	0.03	0.03	0.01	0.19	0.19	0.21	0.06
72" impact installation (attenuated)	2.35	3.36	3.19	1.40	24.67	23.08	24.18	3.62
72" impact installation (unattenuated) [4]	0.49	0.27	0.21	0.09	1.60	1.56	1.79	0.51
							Year 1 total	151
Year 2[1]								
36" vibratory installation[3]	2.01	1.67	1.47	0.65	11.20	10.91	6.05	1.47
36" vibratory removal[3]	0.26	0.12	0.11	0.07	1.16	1.06	0.82	0.00
72" vibratory installation (attenuated)	0.50	0.47	0.42	0.18	3.17	2.73	3.03	0.43
72" vibratory installation (unattenuated)[4]	0.06	0.03	0.03	0.01	0.19	0.19	0.21	0.06
72" impact installation (attenuated)	2.35	2.72	2.58	1.14	24.67	20.36	21.34	3.62
72" impact installation (unattenuated) [4]	0.49	0.27	0.21	0.09	1.60	1.56	1.79	0.51
							Year 2 total	137
Year 3[1]								
36" vibratory installation[3]	4.36	4.35	3.82	1.68	29.13	28.38	15.73	1.47
36" vibratory removal[3]	0.26	0.37	0.34	0.21	2.33	2.12	0.82	0.49
72" vibratory installation (attenuated)	0.39	0.20	0.17	0.05	0.93	0.91	1.01	0.31
72" vibratory installation (unattenuated)[4]	0.06	0.03	0.03	0.01	0.19	0.19	0.21	0.06
72" impact installation (attenuated)	1.83	1.12	1.07	0.34	7.28	6.81	7.13	2.59
72" impact installation (unattenuated) [4]	0.49	0.27	0.21	0.09	1.60	1.56	1.79	0.51
							Year 3 total	136
Year 4[1]								
36" vibratory installation[3]	4.36	4.35	3.82	1.68	29.13	28.38	15.73	1.47
36" vibratory removal[3]	0.26	0.37	0.34	0.21	2.33	2.12	0.82	0.49

72" vibratory installation (attenuated)	0.39	0.20	0.17	0.05	0.93	0.91	1.01	0.31
72" vibratory installation (unattenuated)[4]	0.06	0.03	0.03	0.01	0.19	0.19	0.21	0.06
72" impact installation (attenuated)	1.83	1.12	1.07	0.34	7.28	6.81	7.13	2.59
72" impact installation (unattenuated) [4]	0.49	0.27	0.21	0.09	1.60	1.56	1.79	0.51
Year 4 total								138
Year 5[1]								
36" vibratory installation[3]	1.68	2.01	1.76	0.78	13.44	12.00	13.31	1.84
36" vibratory removal[3]	0.26	0.12	0.11	0.07	1.16	1.06	0.82	0.49
72" vibratory installation (attenuated)	0.28	0.47	0.42	0.18	2.80	2.73	3.03	0.31
72" vibratory installation (unattenuated)[4]	0.06	0.03	0.03	0.01	0.19	0.19	0.21	0.06
72" impact installation (attenuated)	1.31	2.72	2.58	1.14	21.77	20.36	21.34	2.59
72" impact installation (unattenuated) [4]	0.49	0.27	0.21	0.09	1.60	1.56	1.79	0.51
Year 5 total								143
Years 1 – 5 Total								705
Year 6								
36" vibratory installation[3]	1.68	1.67	1.47	0.65	11.20	10.91	4.84	1.47
36" vibratory removal[3]	0.26	0.12	0.11	0.07	1.16	4.25	8.15	4.89
72" vibratory installation (attenuated)	0.28	0.47	0.42	0.18	2.80	2.73	3.03	0.31
72" vibratory installation (unattenuated)[4]	0.06	0.03	0.03	0.01	0.19	0.19	0.21	0.06
72" impact installation (attenuated)	0.26	0.09	0.06	0.01	4.62	4.21	5.07	0.53
72" impact installation (unattenuated) [4]	0.49	0.27	0.21	0.09	1.60	1.56	1.79	0.51
144-in vibratory installation (attenuated)	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00

144-in impact installation (attenuated)	0.00	1.55	0.00	0.00	0.00	0.00	0.00	0.00
							Year 6 total	87
							Years 1 – 6 Total	792

[1] Concurrent driving scenarios that would improve the production efficiency in the months of April through July have been conservatively excluded from this analysis.
[2] Unattenuated vibratory driving of temporary and permanent piles during the months of August through October would be limited to the minimum possible number of piles that must be driven in-water in depths < 3 m.
[3] Attenuated and unattenuated bins for this activity are the same.
[4] Unattenuated vibratory and impact installation of permanent (72-in) piles would be minimized to the extent possible by driving as many piles as possible in the dry for all months of the construction seasons. This calculation assumes 0.5 72-in piles per month may be driven in water depths < 3m and thus be unattenuated.

NMFS and the POA agree that the 59 percent adjustment accurately accounts for the efficacy of the POA's marine mammal monitoring program and shutdown protocol. It was therefore assumed that approximately 59 percent of the takes calculated for this Project would potentially be realized. This adjusts the calculated potential exposures of belugas for years 1 – 5 from 705 to 415.9, and for all years from 792 to 467.3, which are rounded up annually to 419 and 471 total Level B beluga takes, respectively (beluga take estimates are rounded up annually and then summed; see Table 4-15).

Table 4-15. Summary Table of Annual Beluga Potential Take Exposures

Year	Beluga Take Estimate[a]			Percent of Cook Inlet Beluga Population[b]
	Without AF	With 59% AF	With 59% AF (rounded up)	
Year 1	151	89.1	90	32.3
Year 2	137	80.8	81	29.0
Year 3	136	80.2	81	29.0
Year 4	138	81.4	82	29.4
Year 5	143	84.4	85	30.5
Years 1 – 5 Total	**705**	**415.9**	**419**	*
Year 6	87	51.3	52	18.6
Project Total	**792**	**467.3**	**471**	*

Notes: AF = adjustment factor. Numbers may not sum precisely due to rounding.
[a] Beluga take estimates are rounded up annually and then summed.
[b] The official abundance estimate for this stock is 279 individuals (Young *et al.*, 2023). However, a recent analysis using the same methodology as the most recent SAR estimates the population at 331 individuals (Goetz *et al.*, 2023), which would result in a percentage of 27.2.

No Level A take of belugas is anticipated or proposed for authorization. This small number of potential beluga exposures to Level B harassment is anticipated to have no measurable effect on individuals or the population as a whole.

Table 4-15 provides a summary of all marine mammal exposures that are proposed to be authorized for the CTR Project. The analysis of pile installation and removal associated with the CTR Project predicts potential exposures of marine mammals to noise from vibratory and impact pile installation and removal that could be classified as Level A and Level B harassment under the MMPA. No Level A harassment take is requested for Steller sea lions, killer whales, belugas, or humpback whales. In summary, the total amount of Level A harassment and Level B harassment proposed to be authorized for each marine mammal stock is presented in Table 4-16.

Table 4-16. Summary of Maximum Annual Marine Mammal Exposures Requested by Species

Species	Stock/DPS	Level A Harassment Exposures	Level B Harassment Exposures	Species Total	Abundance	Percent of Population[a]
Harbor seal	Cook Inlet/Shelikof Strait	99	55	154	28,411	0.54
Steller sea lion	Western DPS	6	3	9	52,932	0.02
Harbor porpoise	Gulf of Alaska	16	8	24	31,046	0.08
Killer whale	Resident Transient	6	6	12	1,920 587	0.6[b] or 2.04[b]
Beluga	Cook Inlet	0	90	90	331	27.2
Gray whale	Eastern North Pacific	4	2	6	29,960	0.02[b]
Humpback whale	Hawaii Mexico-North Pacific	3	1	4	11,278 UNK[c]	0.04 [b] or UNK[c]

Note: DPS = distinct population segment; NA = not applicable; UNK = unknown.
[a] Population estimates used in calculations are presented in Chapter 4.
[b] These percentages assume that all potential exposures come from each stock; therefore, each percentage should be adjusted down if multiple stocks are actually affected.
[C] Abundance estimates for the Mexico-North Pacific stock of humpback whales are considered unknown. 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 2004-2006 (Wade 2021). Assuming the population has been stable, the 4 takes of this stock proposed for authorization represents small numbers of this stock (0.18%of the stock assuming a N_{MIN} of 2,241 individuals and 0.52% of the stock assuming an N_{MIN} of 766 individuals).
[d] The abundance estimate used to determine the percentage of the Cook Inlet beluga stock proposed for authorization only considers members of the Cook Inlet beluga DPS, which includes animals present in the proposed action area (*i.e.,* 331 individuals (Goetz *et al.* 2023). It does not include the estimated 20 individuals that reside in Yakutat Bay, which may represent a separate DIP (Kim Sheldon, personal communication, October 4, 2023).

4.6.2.4 Vessel Strike Impacts to Marine Mammals

Project-related construction would require the use of a tugboat, barges, and a small skiff, which would likely temporarily increase the occurrence of such vessels in the Project area compared to baseline conditions. All temporary pile installation and removal as well as in-water sheet pile removal would take place from a floating work barge and crane.

The potential for striking marine mammals with vessels during the proposed pile driving is low. Studies of whale strikes have established that vessel speed is correlated with risk of striking a whale and with the resulting level of injury (Laist *et al.* 2001; Vanderlaan and Taggart 2007; Neilson *et al.* 2012). In Alaska, an analysis of the characteristics of whale strike incidents found that 44 percent of the vessels were traveling at speeds of 12 knots or greater, and 14 percent were traveling at speeds less than 12 knots prior to collision (for 17 percent, the vessel's activities prior to the collision were unknown; Neilson *et al.* 2012). In addition to vessel speed, factors that increase a vessel's risk of striking a whale include drifting with the engine off, sailing with the motor off, and following or watching whales (Neilson *et al.* 2012). The influence of vessel speed in contributing to either a lethal or a non-lethal injury was examined for records of ship strikes worldwide (Laist *et al.* 2001; Vanderlaan and Taggart 2007). Among collisions between motorized vessels and whales that caused lethal or severe injuries, 89 percent involved vessels moving at 14 knots or faster, and 11 percent involved vessels moving at 10 to 14 knots; no lethal or severe injuries were documented at speeds below 10 knots (Laist *et al.* 2001). Tugs, regardless of whether they are pulling barges, do not generally approach vessel speeds that have been reported to result in vessel strikes. Analysis of the influence of vessel type on whale strikes has not documented any instances of a tug striking a free-swimming whale in the wild (see Laist *et al.* 2001; Neilson *et al.* 2012).

Project-related vessels would move at slow speeds, or remain anchored or moored as they engage in support for pile installation and removal. Tugs, barges, and other Project-related vessels would therefore be at low risk of striking a whale or other marine mammal, and the potential for this adverse impact is discountable. Furthermore, required mitigation measures would ensure that direct physical interaction with marine mammals during dredging activities would be avoided.

4.7 Impacts on Subsistence

Residents of the Native Village of Tyonek are the primary subsistence users in the upper Cook Inlet area. In 1999, a moratorium was enacted (Public Law 106-31) prohibiting the subsistence harvest of Cook Inlet belugas except through a cooperative agreement between NMFS and the affected Alaska Native organizations. NMFS began working cooperatively with the Cook Inlet Marine Mammal Council, a group of tribes that traditionally hunted Cook Inlet belugas, to establish sustainable harvests. There has been no subsistence harvest of belugas since 2005 (NMFS 2016b). Harvests of harbor seals for traditional and subsistence uses by Alaska Natives have been low in upper Cook Inlet, although these data are not currently being collected and summarized. No harassment of marine mammals would occur in or near Tyonek's identified traditional subsistence hunting areas as it would generally be limited to within approximately 2 to 3 km (1.1 to 1.9 miles) of the POA within Knik Arm and only very temporarily beyond that. Additionally, as the harvest of marine mammals in upper Cook Inlet is historically a small portion of the total subsistence harvest, and the number of marine mammals using upper Cook Inlet is proportionately small, the number of marine mammals harvested in upper Cook Inlet is expected to remain low. Although the proposed CTR Project would likely result in temporary disturbances to small numbers of harbor seals and Steller sea lions (a species not traditionally hunted in upper Cook Inlet) during pile installation, any impacts are expected to be minor modifications to behavior (*e.g.,* avoidance of the immediate vicinity of the POA) or slight TTS for a limited number of individuals. NMFS does not anticipate that the Project would adversely impact the availability of marine mammal species for subsistence uses.

The CTR Project construction activities would not occur near a traditional subsistence hunting area and are not anticipated to affect the availability of marine mammals for subsistence uses. Even so, the POA communicated with representative Alaska Native subsistence users about the CTR Project construction activities. The POA would send letters to 15 tribal entities, including the communities of Kenaitze, Tyonek, Knik, Eklutna, Ninilchik, Salamatof, and Chickaloon, informing them of the CTR Project and NMFS' notice of proposed LOA and IHA, and identifying potential impacts on marine mammals as well as planned mitigation efforts. Tribes will have an opportunity to comment on the proposed LOA and IHA and to communicate with the POA. If any Tribes express concerns regarding proposed project impacts to subsistence hunting of marine mammals, a Plan of Cooperation between the POA and the concerned Tribe would be proposed.

NMFS does not anticipate that the authorized taking of affected species or stocks would reduce the availability of the species to a level insufficient for a harvest to meet subsistence needs by (1) causing the marine mammals to abandon or avoid hunting areas, (2) directly displacing subsistence users, or (3) placing physical barriers between marine mammals and subsistence hunters that cannot be sufficiently mitigated by other measures to increase the availability of marine mammals to allow subsistence needs to be met. Therefore, the direct or indirect, long-term, adverse impacts on subsistence beyond the Project site are expected to be negligible.

4.8 Cumulative Effects

In reviewing the information provided in the CTR LOA and IHA application about the action area, NMFS determined that activities with the potential to impact a resource would be expected to have additive or synergistic impacts if they affect the same population, even if the effects were separated geographically or temporally. Therefore, this cumulative effects analysis considers these potential impacts; however, it focuses on activities that may temporally or geographically overlap with the POA's proposal to construct CTR such that the effects of harassment warrant consideration for potential cumulative impacts to the following potentially affected marine mammal species: beluga, humpback whale, harbor porpoise, killer whale, gray whale, Steller sea lion, and harbor seal.

Incidental take of seven species of marine mammals is the primary environmental effect associated with the consideration of whether to issue the LOA and any potential subsequent IHA(s) to the POA. Individuals found in the action area may be adversely affected by activities anywhere within their habitat range, as a number of natural and human activities occur in Cook Inlet. These generally include subsistence hunting; pollution; fisheries interaction; vessel traffic; air traffic; coastal zone development, both at the POA and elsewhere; oil and gas development; mining; marine mammal research; and climate change.

The following sections briefly summarize the natural and human-related activities affecting the marine mammal species in the action area.

4.8.1 Subsistence Hunting

The practice of hunting marine mammals for food, clothing, shelter, heating, and other uses is an integral part of the cultural identity of Alaska Native peoples and communities. In Cook Inlet, Alaska Natives historically hunted belugas and continue to hunt harbor seals. However, NMFS determined that subsistence harvest activities by Alaska Natives would not contribute to significant cumulative impacts when considered with other past, current, or reasonably foreseeable future actions. As explained in Section 3.3.1, not all of the potentially affected marine mammal species in Cook Inlet are used for subsistence purposes and, of these, the only marine mammal species currently with subsistence value in Cook Inlet is the harbor seal. Alaska Natives have not hunted Cook Inlet belugas since 2005, and issuance of an LOA and IHA would not adversely affect annual rates of recruitment or survival of the Cook Inlet beluga stock (*i.e.,* the Proposed Action would not contribute to the population decline). Furthermore, based on harvest limitations established for harbor seals, known annual harvest rates (as monitored by ANHSC and ADF&G), combined with the fact that no subsistence takes of harbor seals are known to occur in the vicinity of the proposed CTR Project, NMFS has reasonably concluded that take associated with subsistence harvest would have no significant cumulative impacts on the harbor seal population.

4.8.2 Pollution

The amount of pollutants that enter this portion of Knik Arm is likely to increase as populations in urban areas continue to grow. Sources of pollutants in urban areas include runoff from streets and discharge from wastewater treatment facilities. Gas, oil, and coastal zone development projects (see Sections 4.8.5 and 4.8.6) also contribute to pollutants that enter Knik Arm through discharge. These sources of pollutants are expected to continue in Knik Arm; therefore, it would be anticipated that pollutants could increase in this portion of Knik Arm. However, the U.S. Environmental Protection Agency and the Alaska Department of Environmental Conservation will continue to regulate the amount of pollutants that enter Knik Arm from point and non-point sources through Alaska Pollutant Discharge Elimination System permits. As a result, permit holders will be required to renew their permits, verify that they meet permit standards, and upgrade facilities if necessary. Additionally, the extreme tides and strong currents in Knik Arm and Cook Inlet may contribute to a reduction in the amount of pollutants found there.

4.8.3 Fisheries Interaction

Fishing is a major industry in Alaska. Cook Inlet supports several commercial fisheries (e.g, chum, sockeye, coho, Chinook, and pink salmon) and recreational fisheries (e.g., Chinook and coho salmon, Pacific cod, and halibut). The average annual commercial harvest of salmon in upper Cook Inlet from 1966-2016 was 3.5 million (Shields and Dupuis, 2017). The most recent 10-year average annual commercial salmon fishery harvest is 2.5 million fish, and the 2022 harvest of 1.4 million was 44 percent less than the 10-year average. The 2022 upper Cook Inlet commercial harvest compared to the recent 10-year average was down 34% for chum, 43% for sockeye, 44% for coho, 58% for Chinook, and 72% for pink salmon. At this point, it is hard to know if these results are a short-term reflection of natural variation or are an indicator of a more systematic shift and downward trend. Salmon are the primary prey item for Cook Inlet beluga whales and these numbers may be a cause for concern; at best, they indicate there are fewer salmon available for commercial fisheries, recreational, personal and subsistence use, and beluga whales.

In 2024, NMFS issued a final rule to implement amendment 16 to the Fishery Management Plan for the Salmon Fisheries in the EEZ off Alaska, which establish Federal fishery management for all salmon fishing that occurs in the Cook Inlet Exclusive Economic Zone, which includes commercial drift gillnet and recreational salmon fishery sectors (89 FR 34718, 30 April 2024).

The 2024 List of Fisheries identifies Cook Inlet beluga whales, humpback whales, Dall's porpoise, harbor porpoise, harbor seal, and Steller sea lion as species likely to interact with salmon fisheries (89 FR 12257; 16 February 2024). Potential impacts from commercial fishing on marine mammals include ship strikes, harassment, gear entanglement, reduction of prey, and displacement from important habitat. For example, the Kenai River is a heavily-fished river in Alaska; belugas no longer use waters near the river during salmon fishing season, despite the fact that it has the largest salmon run in Cook Inlet and was heavily used beluga foraging habitat in the past (Ovitz, 2019).

Steller sea lion entanglements are rare in any Alaska commercial fishery, with the exception of the salmon troll fishery where they target the bait. There have been no serious injuries or mortalities of Steller sea lions in the salmon drift gillnet fishery in Cook Inlet observed by the Alaska Marine Mammal Observer Program (AMMOP) or reported through the Marine Mammal Authorization Program (MMAP) self-reports, suggesting that either this is a very rare occurrence, or that occurrences are not self-reported. Additionally, Cook Inlet is not an important foraging area for Steller sea lions and they are not usually present in the action area in large numbers.

Between 2005 and 2017, McGuire et al. (2020) documented 14 instances of scars on Cook Inlet belugas, based on stranding and dual-side photo identification, which could be from entanglement. Of these, 11 observations were possible entanglement scars that may have involved monofilament line, netting, or rope/line, and three were confirmed scars from a net injury, a heavy braided line, and a gillnet. However, AMMOP did not observe any serious injuries or mortalities of Cook Inlet beluga whales in salmon drift gillnet gear and none have been reported through the MMAP. It is uncertain where or in which fisheries these entanglements may have occurred.

As long as fish stocks are sustainable, subsistence, personal use, recreational, and commercial fishing would continue in Cook Inlet. As a result, continued prey competition, risk of ship strikes, potential harassment, potential for entanglement in fishing gear, and potential displacement from important foraging habitat would occur for beluga whales and other marine mammals. An important remaining unknown is the extent to which Cook Inlet marine mammal prey is made less available due to commercial, subsistence, personal use, and sport fishing either by direct removal of the prey or by human-caused habitat avoidance. Continued fisheries harvest management, annual salmon enumeration studies, and habitat protection are important to effectively manage fish resources and would help offset any potential cumulative effects. Further, future restoration projects and fishery management actions by other private or public entities within Upper Cook Inlet would also help offset potential cumulative effects. NMFS assumes that ADF&G will continue to manage fish stocks and monitor and regulate fishing in Cook Inlet to maintain sustainable stocks.

4.8.4 Vessel Traffic

Major contributors to vessel traffic throughout Cook Inlet include port facilities, oil and gas development, and commercial and recreational fishing.

The POA yields a high volume of vessel traffic that passes through or near the action area. The POA handles half of all Alaska inbound fuel and freight (shipped via marine, road, and air), half of which is delivered to final destinations statewide, outside the Municipality of Anchorage. It serves approximately 90 percent of Alaska's population (POA 2019a), providing access to fuel and non-fuel cargo items such as food, consumer goods, building materials, cars, cement, and other goods critical for Alaskans' everyday requirements. Seventy-five percent of all non-petroleum marine cargo shipped into Alaska (not including Southeast Alaska, which is served from barges directly from Puget Sound) moves through the POA (POA 2019a).

Major vessels calling to the POA include cargo ships, barges, tankers, dredgers, military ships, and tugboats (POA 2009). According to data from 1998 to 2011, an average of approximately 450 vessels call to the POA annually (POA 2014). The POA is proposing to modernize its facilities (see Section 4.8.5.2); however, these facility updates are not expected to increase vessel traffic. An increase in vessel traffic could occur, however, from continuing city and state development and growth.

Port MacKenzie is also located in Knik Arm and contributes to vessel traffic that passes through or near the action area. It receives approximately two large ships (a landing craft and/or a barge) annually, which is substantially fewer than the POA. The Port MacKenzie Rail Extension Project, when completed, would connect Port MacKenzie to the ARRC's existing mainline between Wasilla and Willow, and would provide freight service between Port MacKenzie and Interior Alaska. Currently, no funding is allocated for completion of the rail extension, and no work has been conducted since 2015. Additionally, Port MacKenzie has long-term plans to expand their deep-draft dock; however, no funding is currently allocated for design or construction. If it is expanded, the number of ships calling at Port MacKenzie is anticipated to increase. Increased vessel traffic could result in increased in-water noise and potential ship strikes to marine mammals.

Beyond Knik Arm and, to a lesser extent, other, smaller port facilities may contribute to vessel traffic in Cook Inlet. These include Nikiski, the City of Kenai, Kasilof, Ninilchik, Williamsport, and Tyonek. Vessels ranging from tankers to fishing boats call to these ports (Kenai Peninsula Borough 2003). Gas and oil development, as well as commercial and recreational fishing vessels, also contribute to vessel traffic in the area.

Effects of vessel traffic on marine mammals in the area are largely unknown. Vessel traffic, especially large vessels, are channeled through dedicated shipping lanes so as to limit the footprint of the large vessel traffic, leaving large portions of the Inlet and particularly Knik Arm north of the POA free of large vessels and available for marine mammal use. However, small vessel use (e.g. personal watercraft) is much more difficult to characterize. Increased vessel traffic may contribute to increased pollution, increase in ambient noise, and increased risk of vessel strike. Increased pollution and increased ambient noise level may have long term sub-lethal effects such as increased contaminant load or masking of communication between marine mammals (Duarte et al., 2021). Commercial ships are a prominent source of anthropogenic noise across Cook Inlet, and particularly in the southern portion of Knik Arm, both in percent of overall anthropogenic noise time and mean duration of events. Sounds produced from commercial shipping are sometimes at levels loud enough to potentially mask beluga whale hearing and interfere with their communication (Castellote et al., 2018).

Marine mammals may also avoid areas with increased vessel noise (e.g., Malme et al. 1984, Palka and Hammond 2001). 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, however, is anticipated to 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).

Vessel strike has the potential to result in serious injury or mortality to marine mammals but rarely occurs and when it does occur is usually injurious to a singular marine mammal, limiting the potential of a population-level effect. The Proposed Action includes limited amounts of vessel traffic, mainly consisting of barges immediately adjacent to the work site. Facility updates are not expected to result in increased ship traffic. Therefore, no cumulative effects from vessel traffic are anticipated.

4.8.5 Coastal Zone Development

Coastal zone development in this area of Knik Arm may result in the loss of habitat, increased vessel traffic, increased pollutants, and increased noise associated with project construction and operation. Potential projects within the area include mining projects, renewable energy projects (Fire Island Wind Project Phase 2 and tidal energy development), and coastal construction (*e.g.,* port expansions and maintenance, roadway construction; see Figure 4-1). These activities are discussed below.

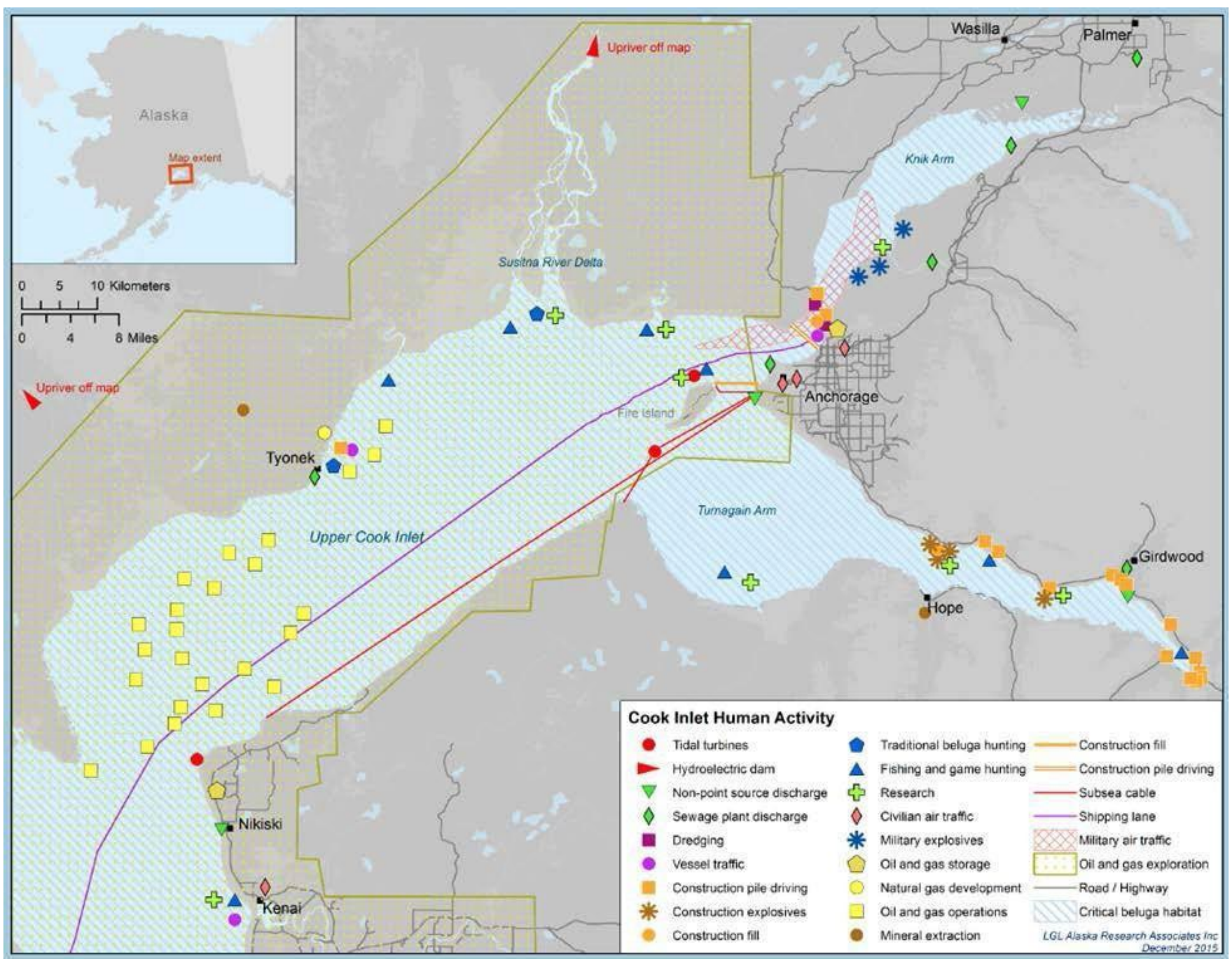

Figure 4-1. Example Development Activities in Cook Inlet

Source: LGL unpublished data 2015

4.8.5.1 Road and Railway Construction

Road and railway construction along the shores of Cook Inlet and its tributary rivers could have impacts on marine mammals via changes to the available habitat from increases in pollutants, runoff, and airborne noise. Construction and use of roadways and railroad tracks in coastal areas may directly affect hauled-out pinnipeds via airborne noise; however, there are no known pinniped haulouts in Upper Cook Inlet and individuals would regularly be exposed to airborne noise from existing roadways and train traffic, as well as overflights from aircraft. Potential road and railway expansion projects may include temporary construction stressors such as in-water dredging and pile driving, and may permanently remove small areas of coastal habitats.

Road and rail development that may affect Knik Arm includes Port MacKenzie development (road and Alaska Railroad), the Knik Arm Crossing Project; Matanuska-Susitna Borough/ Municipality of Anchorage Regional Connecting Transportation Improvement Projects; the Alaska Railroad Ship Creek and Wasilla Intermodal Transportation Centers; Alaska Railroad bridge construction and track realignment projects; and Alaska Railroad Glenn Highway Rail Crossing Improvements. Large-scale road and rail construction projects that could directly impact marine mammals in Knik Arm are limited to the Knik Arm Crossing Project, which is not included in the Municipality of Anchorage's long term 2050 Metropolitan Transportation Plan (MTP) (CITE), and for which funding was withdrawn in 2016 (CITE). There are no current plans to resume the Knik Arm Crossing project. The 2050 MTP shows additional planned transportation projects throughout the Municipality of Anchorage.

In other areas of Cook Inlet, the Alaska Department of Transportation and Public Facilities (DOT&PF) Seward Highway Milepost 75 to 90 (along Turnagain Arm) Project included geophysical and geotechnical (G&G) testing, onshore blasting, pile removal and installation at stream crossings, and fill placed into Turnagain Arm to facilitate roadway straightening. The project also included resurfacing 15 miles of roadway, straightening curves, installing new passing lanes and parking areas, and replacing eight existing bridges. Replacement of these bridges included vibratory and impact pile installation and removal of both 24- and 48-insteel pipe piles. In-water work on this project was avoided from 15 May to 15 June to avoid harassment of Cook Inlet belugas during the eulachon run, and work that was conducted in-water below mean high water required marine mammal monitoring by PSOs. This project was substantially completed in October 2023.

DOT&PF's Seward Highway Milepost 98.5 to 118 (Bird Flats to Rabbit Creek) Project proposes safety and capacity improvements to the alignment and road cross section. The upgrades would likely require widening the highway corridor either into the mountainside or toward the marine waters and may include relocating railroad track sections. Activities may include G&G testing, onshore blasting, pile installation and removal at stream crossings for new bridges, and fill placed into Turnagain Arm. The project is still in the early planning phases and no construction schedule was available in preparation of this EA.

The ARRC is proposing a bridge replacement project over Ship Creek at ARRC milepost 114.3 in downtown Anchorage (approximately 1 km upstream from the mouth of the creek). The mouth of Ship Creek is approximately 1 km south of the end of the CTR project site. The purpose of the project is to maintain rail safety and protect critical state infrastructure. To do so, ARRC proposes to replace the existing bridge in its entirety and replace it with a new steel bridge. If built, the project would require piles to be installed in water and fill placed below OHW. Pile construction would include both an impact and a vibratory hammer. ARRC has proposed several mitigation measures to reduce impacts on biological resources that use Ship Creek and Knik Arm. In-water work is proposed to occur between fall 2024 and winter 2025 to avoid impacts on local fisheries. Additionally, hammering activities have been proposed to occur when the tide is not fully inundating Ship Creek to avoid underwater noise from propagating into Knik Arm. Based on the current projected schedules, this project would be complete before CTR construction begins.

Ongoing and upcoming road and railway projects would contribute to potential increases in airborne and underwater noise, sedimentation and pollutants, and may permanently alter some areas of coastal habitats. However, all projects would be subject to appropriate permitting processes and mitigation measures intended to reduce impacts to less than significant. When combined with the potential for low to moderate increases in noise and pollutants due to the proposed action, no significant cumulative impacts to marine mammals are anticipated.

4.8.5.2 Don Young Port of Alaska

The POA is Alaska's largest seaport and provides 90 percent of the consumer goods for about 85 percent of all of Alaska. It currently includes three cargo terminals, two petroleum terminals, one dry barge berth, two railway spurs, a small craft floating dock, and 220 acres of land facility. It is located in the Municipality of Anchorage, and approximately 450 ships call at the POA each year. Ongoing activities at the POA contribute to the baseline conditions of underwater noise from industrial activities, vessel traffic, and water quality in the area.

The POA plans to continue to modernize POA facilities as part of the PAMP. In 2019, the POA completed construction of the South Backlands Stabilization Project, and construction of the PCT and SFD was completed in 2022. The current phase of the PAMP includes construction and demolition associated with the NES1 project and replacement of General Cargo Terminal 1 and Terminal 2. The POA completed pile driving work at the 2024; shoreline enhancement will take place during the 2025 construction season. This project is located approximately 0.5 km north of the CTR project site. Other phases of the PAMP include replacing POL2, NES Step 2, and demolition of Terminal 3. It should be noted that the NES Step 1 and 2 projects would remove existing filled areas and convert them to open marine waters, resulting in beneficial impacts on the marine environment, fish, and marine mammals.

Operations began at the POA in 1961 with a single berth. Since then, the POA has expanded to a terminal with five berths that moves more than 4 million tons of material across its docks each year (McDowell 2020). The POA plans to continue to modernize its facilities as part of the PAMP, which includes multiple construction projects (Figure 4-2) to enable continued port operations, update facilities for operational efficiency, accommodate modern shipping operations, and improve seismic resiliency.[17] CTR, as part of the PAMP, would include the conversion of approximately 13 acres of developed land back to intertidal and subtidal habitat within Knik Arm. Future phases of the PAMP will depend upon funding that is not yet secured. The PAMP website[15] describes the funding requests to the State of Alaska and alternative sources of funding such as taxes or cargo tariffs. Additional information is provided below.

[17] https://modernization.portofalaska.com/

Figure 4-2. Phases 1 through 5 of the PAMP

Design and permitting for replacement of Terminals 1 and 2 are part of Phase 2 of the PAMP, the CTR Project. Terminals 1 and 2 are the existing container and general cargo terminals and are the only deep-water marine cargo terminals in Anchorage. The POA cargo services supply goods for 87 percent of Alaska's population. Replacement of Terminals 1 and 2 is currently estimated to begin in 2025.

The CTR Project includes demolition of the two existing marine terminals and construction of two new marine terminals, 140 ft farther seaward than the existing terminals. Each terminal would include a pile-supported platform, pile-supported access trestles, a mooring system, and a fender system. Terminal 1 would support a lift-on/lift-off ship-to-shore rail mounted gantry crane system for the transfer of cargo. Terminal 2 would support a roll-on/roll-off and lift-on/lift-off cargo transfer system. Terminal 2 would also include a single mooring dolphin. Excavation and placement of fill and armor rock would take place adjacent to Terminals 1 and 2 to protect the shoreline.

Other future phases of the PAMP include replacing POL 2 as Part of Phase 3, and further stabilization of NES2 and demolition of Terminal 3 as part of Phases 4 and 5. It should be noted that the NES1 and NES2 projects would remove existing filled areas and convert them to open marine waters, resulting in beneficial impacts on the marine environment. The construction schedules for Phases 3 through 5 are currently uncertain.

USACE has been conducting maintenance dredging annually at the POA since 1965 and continues to do so throughout each year. The POA is dredged to the depth of minus 35 ft mean lower low water. Dredged materials are dumped 3,000 ft abeam of the POA dock face at the Anchorage Harbor Open Water Disposal Site. NMFS issued a LOC under the ESA for their current USACE permit in 2017. In 2023, USACE issued a Finding of No Significant Impact for the POA to conduct transitional dredging at the terminal facility and dredged material disposal offshore. These activities would provide the needed depths for berthing vessels at the new terminal facility (mentioned above). Once the POA's dredging is complete, USACE would likely maintain dredging at this location.

Dredging operations have also occurred annually at the Ship Creek Boat Ramp until 2023, located approximately 1.5 km southwest of the POA CTR location. The dredging at this site was accomplished in early May during minus 3-foot tides and is usually accomplished in 3 to 4 days using heavy machinery. Dredging at the POA does not seem to be a source of re-suspended contaminants (USACE 2023), and belugas often pass near the dredge (USACE 2008, 2023; ICRC 2012). Currently the dredging at Ship Creek Boat Ramp is suspended, and the POA does not plan to maintain this site in the future.

4.8.5.3 Port MacKenzie

As discussed in Section 4.8.4, Port MacKenzie also has the potential to expand its facilities, depending on future needs associated with large resource development projects. An increase in vessel traffic may have an effect on marine mammals. Construction activities, as well as the placement of piers and abutments, may have an effect on marine mammals, their habitat, and their prey species. However, NMFS is not currently aware of any specific planned and funded projects at Port MacKenzie. Any impacts to marine mammals from construction at Port MacKenzie would be expected to be consistent with those described for the NES1 and CTR projects at the POA. See also Section 4.8.7 about a potential tidal energy project at Port MacKenzie that is currently in the design phase.

4.8.6 Air Traffic

Commercial, military, and personal aircraft are prevalent throughout Alaskan airspace; in Anchorage, Ted Stevens International Airport (ANC) serves most commercial needs, and as of 2022 is the third busiest cargo airport worldwide. ANC counted 93,816 total landings (approximately 46% passenger flights and 54% cargo flights) between July 1 2022 and June 30, 2023 (Alaska International Airport System 2023). Smaller commercial and recreational aircraft frequently utilize Merrill Field and Lake Hood Seaplane

Base; military aircraft are based at JBER. In Alaska, aviation accounts for approximately 10% of all jobs, and up to 8% of the state's GDP (Alaska Department of Transportation and Public Facilities 2015).

Aircraft and air traffic may impact marine mammals in Cook Inlet through pollutants (addressed above) and noise transmitted via air or into the water during overflights (Erbe et al. 2018, Kuehne et al. 2020, Castellote et al. 2018). Castellote et al. (2018) noted four different categories of aircraft that could be identified on underwater passive acoustic recordings - Jet aircraft (commercial or military non-fighter), military fighter jets, helicopters, and propeller aircraft. Recordings made in and around Eagle Bay in August and September of 2010 68 instances of fighter aircraft noise, and 3 instances of non-fighter aircraft over 59 days of recordings. Elsewhere in Knik Arm, non-fighter aircraft were more commonly recorded, particularly in the vicinity of ANC (Castellote et al. 2018).

Underwater and in-air noise levels from aircraft are dependent on altitude (Erbe et al. 2018, Castellote et al. 2018). For sound that is transmitted underwater, the duration of these events is typically short (less than 30 seconds per event). All species of marine mammals found in Cook Inlet may perceive noise from aircraft overflights at some point in their lives, particularly in the areas around Anchorage, including Knik Arm, Eagle Bay, and ERF. Pinnipeds, which may temporarily haul out along the shoreline of Knik Arm, are likely to be exposed to aircraft noise both underwater and in air.

During visual monitoring conducted by NMFS in conjunction with a previous POA project, PSOs noted that belugas occasionally reacted to military jet activity from JBER (Easley-Appleyard and Leonard 2022). Belugas were notably far more likely to dive when the military jets passed overhead, especially at the North Extension Area station, where the noise was loud enough to require hearing protection for the PSOs. The belugas usually had extended dive times of 10+ minutes during these occurrences.

The proposed activity at the POA is likely to increase the amount of airborne transient noise events (i.e., aircraft overflights and artillery firing noise) to which marine mammals in and around Eagle Bay would be exposed. However, the existing acoustic environment in both air and water is characterized by transient anthropogenic noises occurring at irregular intervals, particularly from existing military jet aircraft. The proposed action does not include any increases in aircraft overflights. Increases in commercial and personal aircraft flights departing from or arriving at Anchorage-area airports would be expected to have a more noticeable impact on the ambient in-air noise levels. A moderate increase in transient, short-duration explosive noise events from increased artillery firing would not be expected to have any cumulative impacts on marine mammals present in Cook Inlet.

4.8.7 Tidal Energy

Tidal energy projects include in-water construction work and operations on a long time scale, which may impact marine mammals via noise and direct physical strike during both phases, and via small, short-term increases in pollutants and sedimentation during construction. Noise produced by construction of tidal energy systems would likely be analogous to that produced during other coastal pile driving projects. Operation of tidal turbines in other areas has been shown to generate tonal noise up to 8 kHz, with sound pressure levels varying with current velocity and turbine speed (Lossent et al. 2018, Risch et al. 2020). Previous studies of marine mammal reactions to tidal turbines show evidence of avoidance during operations on the scale of multiple km (Onoufriou et al. 2021).

A tidal energy project is in the preliminary stages of determining if a saltwater generator can be used to power the machine that provides cathodic protection to the Port MacKenzie dock. The saltwater generator could potentially generate 80 kilowatts of power (Poux 2022). Additionally, an application for a preliminary permit from the Federal Energy Regulatory Commission has been submitted for a proposed Turnagain Arm tidal electric generation water power project. The project is in the early planning stages and details such as equipment and placement are not currently available. Thus, it is not likely that the project will occur during the ITR period.

Ocean Renewable Power Company (ORPC), a developer of renewable power systems that harness energy from free-flowing rivers and tidal currents, submitted a preliminary permit application to FERC in May 2021 for a project in lower Cook Inlet. ORPC previously conducted site characterization and environmental studies in the region, and intends to develop a five-megawatt pilot project near East Foreland to verify the technical performance and environmental compatibility of its proposed project. Project results will assist in planning a phased build-out of up to a 100-megawatt commercial-scale project. ORPC will collaborate with Homer Electric Association, Inc. to sell the tidal energy produced. Work on this project kicked off in June 2024; tabletop studies and site preparation are expected though March 2025, after which a decision will be made regarding whether to pursue future work. If approved and funded, in-water construction would begin in approximately 2029 and operations would commence shortly thereafter and remain for an indefinite timeframe.

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

Future tidal energy projects in Cook Inlet and Knik Arm could increase noise exposure of marine mammals and potentially affect behavior and distribution of affected species. While potential avoidance reactions would mitigate the potential for physical strike, avoidance of the areas around Port MacKenzie and upper Knik Arm, in particular, could have negative effects on Cook Inlet beluga whale and, to a lesser extent, on other marine mammals. The Proposed Action includes a temporary increase in underwater and airborne noise. If construction and operation of the tidal energy projects noted above were to begin, cumulative impacts from underwater noise could include additional masking, avoidance and/or displacement, and other behavioral impacts to marine mammals in Cook Inlet.

4.8.8 Joint Base Elmendorf-Richardson

The Department of the Air Force is preparing an environmental impact statement (EIS) to assess the potential social, economic, and environmental impacts associated with modifying the conditions under which indirect live-fire weapons training can be conducted at JBER. The EIS would evaluate the potential impacts associated with indirect live-fire training during all seasons at the Eagle River Flats Impact Area as well as potential impacts associated with the proposed expansion of the Eagle River Flats by approximately 585 acres on JBER (DAF 2022). A Draft EIS is anticipated to be available in late 2024, with a Final EIS available in mid-2025 followed by a Record of Decision in early 2026. NMFS has not yet received a request for authorization for this project, but is a Cooperating Agency on the EIS. This project would include both short- and long-term changes to sedimentation and pollutants, as well as minimal increases in underwater noise, and a long-term increase in transient airborne noise events (*e.g.,* explosions and munitions firing activities) with the potential to harass marine mammals in and around Knik Arm.

JBER recently received approval from USACE for the establishment of a restricted area within Knik Arm to prevent vessels and individuals from entering the explosive arc area of the Six Mile Munitions Storage Area (88 FR 18051). Except for authorized vessels and individuals in support of military training and management activities the restriction is always in effect. The restricted area is located north of the Port.

Reasonably foreseeable future actions on JBER also include on-shore construction and maintenance activities with no potential to impact marine mammals.

Increased airborne noise from artillery firing is likely to overlap in time with a portion of the construction work at the POA. Marine mammals that could be impacted by this noise include Steller sea lions and harbor seals, which may temporarily haul out on shorelines around Knik Arm. Cumulative exposures to airborne and underwater noise from JBER and pile driving at the POA could result in increased stress in these individuals, and potential behavioral avoidance of the area. However, relatively few pinnipeds are present in Knik Arm, and behavioral reactions to noise are expected to be short-term and temporary. Therefore, NMFS does not anticipate significant cumulative effects from this action.

4.8.9 Oil and Gas Development

Cook Inlet is estimated to have 500 million barrels of oil and over 19 trillion cubic feet of natural gas that are undiscovered and technically recoverable (Wiggin, 2017). Schenk (2015) determined that there may also be unconventional oil and gas accumulations in Cook Inlet of up to 637 billion cubic feet (bcf) of gas and 9 million barrels of natural gas liquids. However, a 2022 forecast by the Alaska Division of Oil and Gas estimates that there is 820 bcf of proved gas reserves that is economic to develop (Alaska Department of Natural Resources, 2023).

Lease sales for oil and gas development in Cook Inlet began in 1959 (Alaska Department of Natural Resources, 2014), and prior to that there were attempts at oil exploration along the west side of Cook Inlet. By the late 1960s, 14 offshore oil production facilities were installed in upper Cook Inlet; today there are 17 offshore oil and gas platforms. Active oil and gas leases in Cook Inlet total 205 leases encompassing approximately 418,974 acres of State leased land of which 324,292 acres are offshore. There are no active oil and gas leases in Knik Arm; the closest active platform is near Tyonek, approximately 50 mi (80 km) west-southwest of the mouth of Eagle River. Oil and gas exploration areas do not extend into Knik or Turnagain Arms.

The Alaska Department of Natural Resources' Division of Oil and Gas has issued a preliminary best interest finding for proposed Cook Inlet area-wide oil and gas lease sales, 2019 through 2028. The lease sales could lead to increased oil and gas development in Cook Inlet; however, it is uncertain if oil and gas companies will be interested in acquiring these leases given the commodity prices, the state's tax structure, and the sustainable investment required to explore and develop offshore leases. Currently, 17 existing oil and gas drilling platforms are in Cook Inlet, 11 of which are active.

Potential impacts from gas and oil development include temporary increased noise from seismic activity, vessel and air traffic, pile driving, and well drilling; discharge of wastewater; small areas of habitat loss from the construction of oil and gas facilities; and contaminated food sources and/or injury from a natural gas blowout or oil spill. These activities may impact marine mammals by introducing man made noise into the environment, disturbing marine mammals with the presence of people and transportation, altering marine mammal habitat, and potentially injuring or killing individual marine mammals. All activities involving workers in marine environments have potential to temporarily disturb marine mammals; however, the only activities that could alter habitat are those that physically change parts of the marine environment or introduce chronic disturbances from noise or the presence of workers. Activities such as vessel traffic as well as accidental oil spills have occasionally resulted in marine mammal fatalities. The loudest of these oil and gas related activities typically are seismic surveying, pile-driving and other construction activities, and dredging; all of which have potential to compromise a marine mammal's ability to hear and properly interact with their natural environment. Persistent unclassified machinery noise likely related to the high concentration of oil and gas productions (e.g., subsea production machinery, pipelines connecting offshore platforms to land facilities) in Trading Bay have been documented (Castellote, et al. 2018); however the acoustic footprint of this industry is not well documented. Typically, the noise levels from these activities are loud enough to permanently injure marine mammal hearing, but usually occur at close range and over extended periods of time.

Recently, IHAs were issued to Hilcorp Alaska, LLC and Furie Operating Alaska, LLC for activities involving tug boats towing, holding, and positioning a jack-up rig in support of production drilling at existing platforms in middle Cook Inlet. Primary sources of rig-based acoustic energy have been identified as coming from the D399/D398 diesel engines, the PZ-10 mud pump, ventilation fans (and associated exhaust), and electrical generators. The source level of one of the strongest acoustic sources, the diesel engines, was estimated to be 137 dB re 1 µPa rms at 1 m in the 141-178 Hz bandwidth. Based on this measured level, the 120 dB rms acoustic received level isopleth would be 50 m away from where the energy enters the water (jack-up leg or drill riser). Drilling and well construction sounds are similar to vessel sounds in that they are relatively low-level and low-frequency. The impact of drilling and well construction sounds produced from a jack up rig is expected to be lower than a typical large vessel. Given the absence of any activity-, location-, or species-specific circumstances or other contextual factors that would increase concern, NMFS does not expect routine drilling noise to result in the take of marine mammals.

Some Cook Inlet marine mammal habitat has already been altered, primarily by the construction and use of oil and gas facilities in coastal areas, production platforms, and laying pipelines on the seafloor. To a lesser extent the release of drill cuttings and muds, the establishment of consistently used vessel routes to ship oil and gas, oil and gas spills, and release of contaminants into Cook Inlet have also modified marine mammal habitats. Though some habitat has been altered and alterations are expected to continue into the future due to these developments, practices, and accidents, collectively they constitute a small fraction of marine mammal habitats in Cook Inlet. Within a matter of years or perhaps a decade or more, disturbed habitats from the construction of, and routine operations of, oil and gas facilities often return to a state similar to that of unaffected areas (Henry et al., 2017; Manoukian et al., 2010).

Accidental oil and gas releases have occurred in Cook Inlet and are likely to occur in the future, mostly when transporting oil or gas during lease development in state waters, and from infrastructure projects such as port developments. Impacts from contacting oil spills could include elevated stress and physiological reactions to inhalation or ingestion of hydrocarbon toxins and fouling of baleen or fur. The existence of spill response infrastructure, protocols and an active spill response would help minimize effects from large oil spills on marine mammal populations. The overall cumulative effects of an oil spill would include temporary physiological effects among marine mammals and potential mortality depending on the location, size of the spill, and adequacy of response.

NMFS has received applications requesting takes of marine mammals incidental to seismic surveys; tug boats towing, holding, and positioning a jack-up rig; drilling operations; and associated construction in this area. For projects where an IHA is requested, marine mammal exposure is mitigated to effect the least practicable adverse impact. It is a common requirement for seismic operations to maintain extensive marine mammal monitoring (e.g., flights) and shutdown if Cook Inlet beluga whales are observed. The risk of these impacts may increase as oil and gas development increases; however, new development would undergo consultation and permitting requirements prior to exploration and development. If authorizations are issued to these applicants, they would be required to implement mitigation and monitoring measures to reduce impacts to marine mammals and their habitat in the area, and will be subject to the same MMPA and, when applicable, ESA standards.

The LOAs and IHAs proposed for oil and gas projects in Cook Inlet limit take by Level B harassment to no more than 20 belugas per year. While marine mammals could experience effects due to either noise or pollutants from both oil and gas activities and the proposed updates to the POA, any harassment from these oil and gas projects would not occur within Knik Arm and would be concentrated toward middle and lower Cook Inlet. Further, given the distance between the POA and the oil and gas projects and differences in the timing of activities, it is unlikely that a beluga or other marine mammal would be exposed to stressors associated with construction at the POA and oil and gas projects in a single day, allowing for the resumption of communication behaviors and reductions in stress levels for individuals.

Therefore, NMFS does not anticipate significant cumulative effects on belugas or other marine mammal species.

4.8.10 Mining

The Pebble Limited Partnership proposes to develop the Pebble copper-gold-molybdenum porphyry deposit (Pebble Deposit) as a surface mine in Southwest Alaska near Iliamna Lake, approximately 200 miles (321.9 km) southwest of Anchorage and 60 miles (96.6 km) west of Cook Inlet. The project would include development of the open pit mine, with associated infrastructure to include a 270-megawatt power generating plant. A 166-mile (267.2-km) natural gas pipeline from the Kenai Peninsula across Cook Inlet to the mine site is proposed as the energy source for the mine. USACE identified the Northern Route as the preferred transportation corridor for the mine in the Final Environmental Impact Statement for the project, published in July 2020 (USACE 2020a). The transportation corridor includes mine and port access roads, including an 82-mile (132.0-km) gravel access road along the northern edge of Iliamna Lake, and an Amakdedori port facility at Diamond Point in Iliamna Bay, approximately 165 miles (265.5 km) southwest of Anchorage. The construction and operation of the port facility could also impact marine mammals within Cook Inlet; however, the construction method and plans are currently unknown. If impacts such as behavioral harassment or hearing threshold shifts would occur for marine mammals from construction of the Pebble Limited Partnership port, those impacts would be farther removed in space (*i.e.,* lower in the inlet). On 25 November 2020, USACE issued a Record of Decision that denied the Pebble Limited Partnership a permit to construct the mine (USACE 2020b). The Pebble Limited Partnership filed an appeal of USACE's decision in January 2021 (Pebble Limited Partnership 2021). The U.S. Environmental Protection Agency blocked the project under the Clean Water Act in January 2023, and the future of the project is unknown.

No other current or future marine or shore-based mining projects are known for this area. Therefore, no cumulative effects from this stressor are anticipated at this time.

4.8.11 Marine Mammal Research

Many important aspects of marine mammal biology remain unknown or are incompletely studied. Additionally, management of these species and stocks requires knowledge of their distribution, abundance, migration, population, ecology, physiology, genetics, behavior, and health. Therefore, free-ranging marine mammal species are frequently the subjects of scientific research and studies.

Research activities frequently include one or more of the following methods: close approach by vessel and aircraft for line-transect surveys; behavioral observation; photo-identification and photo-video-grammetry; passive acoustic recording; attachment of scientific instruments (tagging) by both implantable and suction cup tags; biopsy sampling, including skin and blubber biopsy and swabbing; land-based surveys; and live capture for health assessments, blood and tissue sampling, pinniped tooth extraction, and related pinniped anesthesia procedures. All researchers using methods that may disturb, harm, injure, or kill a marine mammal are required to obtain scientific research permits from NMFS OPR under the MMPA and/or ESA (if an ESA-listed species is involved). Permits authorizing research in Cook Inlet on beluga whales, harbor seals, harbor porpoises, Steller sea lions, humpback whales, and killer whales may have cumulative effects on these species and stocks, but they are expected to be negligible to minor at a population level, based on the specific research methodology. NMFS anticipates that scientific research on marine mammals in Cook Inlet will continue, and possibly expand, due to the increasing need to better understand distribution and abundance relative to temporal (e.g., seasonal, diel, or tidal) and spatial (e.g., geographic, bathymetric) parameters. The acoustic research currently conducted on beluga whales in Cook Inlet is non-invasive and passive in nature (hydrophone-based) and has no impact on marine mammals.

Currently, there are seven active scientific research and/or enhancement permits that authorize take of Cook Inlet beluga whales. Two of those permits are for research on one captive individual Cook Inlet beluga whale that was not releasable to the wild after rehabilitation efforts. This means there are five scientific research permits that authorize take of free-ranging Cook Inlet beluga whales. One study, led by the Cook Inlet Beluga Whale Photo-ID Project, is using photo-identification methods to identify individual whales and to provide information about movement patterns, habitat use, survivorship, reproduction, and Cook Inlet beluga whale population size. Other studies, led by the Marine Mammal Laboratory at the NOAA Fisheries Alaska Fisheries Science Center and NMFS Office of Protected Resources, Marine Mammal Health and Stranding Response Program, are designed to monitor cetacean population trends, abundance, distribution, and health in the North Pacific Ocean, Bering, Beaufort, and Chukchi Seas, and Gulf of Alaska (including adjoining bays and inlets) through the following techniques: crewed and uncrewed aerial surveys for counts, observations, photo-id, photogrammetry, and video of cetaceans; vessel surveys for counts, collection (prey remains, sloughed skin, and eDNA), observation, photo-id, video, sampling (exhaled air, feces, skin and blubber), instrumenting (invasive [dart/barb, dorsal fin/ridge, deep-implant] and non-invasive [suction cup] tags), and acoustic playbacks. Similar methods are used by another permit-holder (the Marine Ecology and Telemetry Research group and HDR) to assess the biology and ecology of cetaceans in the North Pacific, including in Alaska, particularly within and around Navy training ranges.

Migura and Bollini (2022), assert that an increase in the authorized number of takes of Cook Inlet belugas when projected to occur through 2025 is statistically correlated with the decreasing population size of this population. However, the authors did not evaluate the severity of the potential impacts from the authorized take. For instance, the vast majority of the authorized research takes (which comprise over 99% of the total authorized take in any year) are for remote, non-invasive methods such as photo-identification during aerial and vessel surveys that have the potential to result in only a minor degree of Level B harassment under the MMPA. For example, permitted researchers conducting aerial or vessel based surveys are directed to count each sighting that is closer than the distances of NMFS wildlife viewing guidelines as a take because the activities have the potential to harass animals, regardless of the likely severity of those takes. Given this difference, it is unlikely that the correlation Migura and Bollini (2022) strive to make (between projected future authorized take numbers and the CIBW population decline) exists. In addition, long-term trend analysis of authorized take levels is not advisable because there have been changes in how take is interpreted and characterized in research permits. This means that, in some cases, take numbers across permits and across years are not directly comparable and at face value may seem like an increase in authorized take numbers. In recent years, managers have simplified how take numbers in research permits are determined to provide a more consistent approach to counting take across incidental and directed take permitting programs. NMFS will continue to closely analyze the number of takes requested and used by researchers each year.

4.8.12 Climate Change

Climate change is a reasonably foreseeable condition that may result in cumulative effects to marine mammals in Cook Inlet (BOEM 2016). The 2023 Intergovernmental Panel on Climate Change synthesis report concluded that "human activities, principally through emissions of greenhouse gases have unequivocally caused global warming" (IPCC 2023). A recent special report indicates that human activities are estimated to have caused approximately 1.1 degree Celsius (°C) of global warming above pre-industrial levels, with a likely range of 0.95°C to 1.2°C with larger temperature increases over land than over the ocean. Global warming is likely to reach 1.5°C between 2030 and 2052 if it continues to increase at the current rate (IPCC 2023). This study involved numerous models to predict changes in temperature, sea level, ice pack dynamics, and other parameters under a variety of future conditions, including different scenarios for how human populations respond to the implications of the study.

Evidence of climate change in the past few decades has accumulated from a variety of geophysical, biological, oceanographic, and atmospheric sources. The scientific evidence indicates that average air, land, and sea temperatures are increasing at an accelerating rate. Although climate changes have been documented over large areas of the world, the changes are not uniform, and they affect different areas in different ways and at differing intensities. Arctic regions have experienced some of the greatest changes, with major implications for the marine environment as well as for coastal communities.

Marine mammals are classified as sentinel species because they are good indicators of environmental change. Arctic marine mammals are ideal indicator species for climate change, due to their circumpolar distribution and close association with ice formation. NMFS recognizes that warming of the Arctic, which results in diminishing ice thickness and spatial extent, could be a cause for concern for marine mammals. In Cook Inlet, marine mammal distribution is dependent upon ice formation and prey availability, among other factors. For example, belugas often travel just along the ice pack and feed on prey beneath it (Richardson *et al.* 1990, 1991). Any loss of ice and environmental conditions such as rising water temperature could result in prey distribution changes or loss for belugas or other marine mammals. Ice, however, is not directly used in Cook Inlet for resting, reproduction, or rearing of young, as is the case for ice-dependent pinnipeds.

Models predict that the climate changes observed in the past 30 years will continue at the same or increasing rates for at least 20 years. Although NMFS recognizes that concern for climate change in the Project area is warranted, the full extent to which climate change would affect marine mammals in Knik Arm is unclear. The CTR Project is planned to occur during a 6-year period, during which time the impacts of climate change on marine mammals in Cook Inlet are likely to increase.

4.8.13 Conclusion

Based on the summation of past, present, and reasonably foreseeable future actions provided in this section, we believe that the incremental impacts to marine mammals and their habitat from issuance of the LOA and a potential subsequent IHA to the POA for the CTR Project would result in no cumulatively significant impacts to the human environment when added to other past, present, or reasonably foreseeable future activities. Other relevant actions to be considered in evaluating potentially cumulatively significant impacts include subsistence hunting, pollution, commercial and recreational fishing, vessel traffic, coastal construction at the POA and elsewhere, oil and gas development activities, mining, marine mammal scientific research, and climate change. While consideration of these activities in sum suggests an increase in industrialization of Cook Inlet, many of these activities are spatially and temporally limited and do not permanently reduce or degrade the habitat available to marine mammals or their prey species. Cook Inlet is also a geographically vast area, and many activities, including the activities proposed by the POA, are geographically distinct to various portions of the inlet, which prevents the continued or permanent disruption of one particular portion of the inlet for extended durations.

The CTR Project would add an incremental contribution to the combined environmental impacts of other past, present, and reasonably foreseeable future actions; however, those direct and indirect adverse impacts are expected to be mainly short-term, localized, and minor, as described in this EA. None of the harassment authorized by NMFS in other ITAs would overlap in space with impacts from the CTR Project; however, overlap in time is possible with expansion in artillery firing activities at JBER, and it is possible that marine mammals could swim past the POA and into Eagle Bay and experience noise exposure from authorized activities in both locations. While impacts from construction of the CTR are permanent, any auditory injury would likely be a slight threshold shift (*e.g.,* a sound might have to be minimally louder to be perceived) and would be limited to low-frequency ranges (as described in this EA). Therefore, overall, the potential for auditory injury is minor and, if it occurs, it would be only slight. Further, the amount of Level A harassment authorized in the form of auditory injury is for a small number of animals with respect to large population sizes. Therefore, any cumulative impacts would affect so few individuals that the impact on the population would likely not be realized. In summary, incremental impacts of NMFS' Proposed Action on the populations of species analyzed, in combination with other actions, may be moderate or major at an individual level, but negligible at a population level.

Chapter 5. List of Preparers and Agencies Consulted

Agencies Consulted

NOAA/National Marine Fisheries Service, Office of Protected Resources

NOAA/National Marine Fisheries Service, Alaska Region

Prepared By

Cara Hotchkin, MMPA Incidental Take Program

NOAA/National Marine Fisheries Service, Office of Protected Resources

Chapter 6. Literature Cited

61 North (61N) Environmental

2021 *Petroleum and Cement Terminal Construction Marine Mammal Monitoring Final Report.* Prepared for Pacific Pile and Marine, Port of Alaska, and NMFS by 61N Environmental. February 2021.

2022a *2021 Petroleum and Cement Terminal Construction Marine Mammal Monitoring Final Report.* Prepared for Pacific Pile and Marine, Port of Alaska, and NMFS by 61N Environmental. February 2022.

2022b *2022 Port of Alaska South Float Dock Construction Marine Mammal Monitoring.* Prepared for Pacific Pile and Marine, Port of Alaska, and NMFS by 61N Environmental. October 2022.

2022c *2022 Port of Alaska PCT/SFD Dredging Marine Mammal Monitoring Final Report.* Prepared for Pacific Pile and Marine, Port of Alaska, and NMFS by 61N Environmental. October 2022.

ABR, Inc.

2017 *Protected Species Monitoring Report – 2017 Ship Creek Boat Launch Repairs Project, Anchorage AK*. Prepared for R&M Consultants, Inc., and Municipality of Anchorage, Port of Anchorage.

Aerts, L.A.M., and W.J. Richardson (eds.)

2008 *Monitoring of industrial sounds, seals, and bowhead whales near BP's Northstar Oil Development, Alaskan Beaufort Sea, 2007: Annual Summary Report*. LGL Rep. 1005b. Prepared by LGL Alaska Research Associates, Inc. (Anchorage, AK), Greenridge Sciences Inc. (Santa Barbara, CA), and Applied Sociocultural Research (Anchorage, AK) for BP Exploration (Alaska) Inc., Anchorage AK.

ADF&G (Alaska Department of Fish & Game)

2022 Gray Whale (*Eschrichtius robustus*) Species Profile. Available online at https://www.adfg.alaska.gov/index.cfm?adfg=graywhale.main.

Alaska Department of Transportation and Public Facilities

2015 AIAS 101. Powerpoint presentation https://dot.alaska.gov/anc/about/docs/AIAS_101_Feb_2015.pptx

Alaska International Airport System

2023 Activity Summary Report 2020 - 2029. https://dot.alaska.gov/aias/assets/Activity_Summary_Report_FY_20-29.pdf. Accessed September 2024.

Allen, B.M., and R.P. Angliss

2010 *Alaska Marine Mammal Stock Assessments, 2009*. NOAA Technical Memorandum NMFS-AFSC-233. National Marine Fisheries Service, Seattle, WA.

2011 *Alaska Marine Mammal Stock Assessments, 2010*. NOAA Technical Memorandum NMFS-AFSC-234. National Marine Fisheries Service, Seattle, WA.

Archer, F.I., S.L. Mesnick, A.C. Allen

2010 *Variation and predictors of vessel-response behavior in a tropical dolphin community. NOAA technical memorandum* NMFS. NOAA-TMNMFS-SWFSC-457. Available online at https://repository.library.noaa.gov/view/noaa/3747.

Atwood T.C., E. Peacock, M.A. McKinney, K. Lillie, R. Wilson, D.C. Douglas, S. Miller, and P. Terletzky

2016 Rapid Environmental Change Drives Increased Land Use by an Arctic Marine Predator. *PLoS ONE* 11(6):e0155932. Available online at https://doi.org/10.1371/journal.pone.0155932.

Au, W.W.L., and P.W.B. Moore

1988 Detection of complex echoes in noise by an echolocating dolphin. *Journal of the Acoustical Society of America* 83:662–668.

1990 Critical ration and critical bandwidth for the Atlantic bottlenose dolphin. *Journal of the Acoustical Society of Americ*a 88:1635–1638.

Au, W.W.L., and M.C. Hastings

2008 Principles of Marine Bioacoustics. New York: Springer.

Austin, M., S. Denes, J. MacDonnell, and G. Warner

2016 *Hydroacoustic Monitoring Report, Anchorage Port Modernization Project Test Pile Program*. Prepared by JASCO under contract of Kiewit Infrastructure West Co. for the Port of Anchorage.

Bain, D.E., and R. Williams

2006 *Long-range effects of airgun noise on marine mammals: Response as a function of received sound level and distance*. SC/58/E35.

Barlow, J.

2003 *Preliminary Estimates of the Abundance of Cetaceans along the U.S. West Coast: 1991–2001*. Southwest Fisheries Science Center Administrative Report LJ_03_03. Available from SWFSC, La Jolla, CA.

Blackwell, S.B.

2005 *Underwater measurements of pile-driving sounds during the Port MacKenzie dock modifications, 13–16 August 2004*. Prepared by Greeneridge Sciences, Inc. (Goleta, CA) and LGL Alaska Research Associates, Inc. (Anchorage, AK), in association with HDR Alaska, Inc. (Anchorage, AK) for Knik Arm Bridge and Toll Authority (Anchorage, AK), Alaska Department of Transportation and Public Facilities (Anchorage, AK), and Federal Highway Administration (Juneau, AK). Anchorage, AK.

Blackwell, S.B., and C.R. Greene

2002 *Acoustic measurements in Cook Inlet, Alaska, during August 2001.* Greeneridge Report 271-2. Prepared by Greeneridge Sciences, Inc. (Santa Barbara, CA), for National Marine Fisheries Service, Anchorage, AK.

BOEM (Bureau of Ocean Energy Management)

2016 *Cook Inlet Planning Area, Oil and Gas Lease Sale 244: Final Environmental Impact Statement*. Prepared by U.S. Department of the Interior Bureau of Ocean Energy Management, Alaska OCS Region. OCS EIS/EA BOEM 2016-069.

2021 *Draft Environmental Impact Statement Cook Inlet Planning Area Oil and Gas Lease Sale 258 In Cook Inlet, Alaska*. Bureau of Ocean Energy Management OCS EIS/EA BOEM 2020-063.

2022 *Alaska Outer Continental Shelf. Cook Inlet Planning Area. Oil and Gas Lease Sale 258 in Cook Inlet, Alaska. Final Environmental Impact Statement.*

Boyd, C., R.C. Hobbs, A.E. Punt, K.E.W. Shelden, C.L. Sims, and P.R. Wade

2019 Bayesian estimation of group sizes for a coastal cetacean using aerial survey data. *Marine Mammal Science* 35(4):1322–1346. doi:10/1111/mms.12592.

Boveng, P.L., J.M. London, and J.M. Ver Hoef

2012 *Distribution and abundance of harbor seals in Cook Inlet, Alaska. Task III: Movements, marine habitat use, diving behavior, and population structure, 2004- 2006*. BOEM Report 2012-065. Bureau of Ocean Energy Management, Anchorage, AK.

Brueggeman, J.J., M. Smultea, H. Goldstein, S. McFarland, and D.J. Blatchford

2007 *Spring marine mammal monitoring program for the ConocoPhillips Beluga River seismic operations in Cook Inlet Alaska: 90-day report*. Prepared by Canyon Creek Consulting (Seattle, WA) for ConocoPhillips Alaska, Inc., Anchorage, AK.

Brueggeman, J.J., M. Smultea, K. Lomac-MacNair, D.J. Blatchford, and R. Dimmick

2008a *2007 fall marine mammal monitoring program for the Union Oil Company of California Granite Point seismic operations in Cook Inlet Alaska: 90-day report*. Prepared by Canyon Creek Consulting (Seattle, WA) for Union Oil Company of California.

2008b *2007 fall marine mammal monitoring program for the Marathon Oil Company North Ninilchik seismic operations in Cook Inlet Alaska: 90-day report*. Prepared by Canyon Creek Consulting (Seattle, WA) for Marathon Oil Company.

Brueggeman, J.J., D. Lenz, and M. Wahl

2013 *Beluga and Other Marine Mammal Occurrence in Upper Cook Inlet between Point Campbell and Fire Island, Alaska August–November 2011 and April–July 2012*. Prepared by Jay Brueggeman of Canyon Creek Consulting LLC and Drew Lenz and Melanie Wahl of 61 North Consulting LLC for Cook Inlet Regional Corporation, Anchorage, AK.

Calkins, D.G.

1989 Status of belugas in Cook Inlet. Pages 109-112 in L.E. Jarvela, and L.K. Thorsteinson, eds. *Gulf of Alaska, Cook Inlet, and North Aleutian Basin Information Update Meeting. Anchorage, Alaska, Feb. 7–8, 1989*. USDOC, NOAA, OCSEAP, Anchorage, AK.

CALTRANS (California Department of Transportation)

2020 Technical Guidance for Assessment of the Hydroacoustic Effects of Pile Driving on Fish: Appendix I – Compendium of Pile Driving Sound Data. Updated October 2020.

Carlson, T.J., D.L. Woodruff, G.E. Johnson, N.P. Kohn, G.R. Ploskey, M.A. Weiland, J.A. Southard, and S.L. Southard

2005 *Hydroacoustic measurements during pile driving at the Hood Canal Bridge, September through November 2004*. PNWD-3621, Prepared by Battelle Marine Sciences Laboratory for the Washington State Department of Transportation.

Carretta, J.V., K.A. Forney, E.M. Oleson, D.W. Weller, A.R. Lang, J. Baker, M.M. Muto, B. Hanson, A.J. Orr, H. Huber, M.S. Lowry, Jay Barlow, J.E. Moore, D. Lynch, L. Carswell, and R.L. Brownell, Jr.

2019 *U.S. Pacific Marine Mammal Stock Assessments: 2018*. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-SWFSC-617.

Carretta, J.V., E.M. Oleson, K.A. Forney, D.W. Weller, A.R. Lang, J. Baker, A.J. Orr, B. Hanson, J. Barlow, J.E. Moore, M. Wallen, and R.L. Brownell, Jr.

2023 U.S. Pacific marine mammal stock assessments: 2022. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-SWFSC-684. https://doi.org/10.25923/5ysf-gt95.

Castellote, M., R.J. Small, M.O. Lammers, J. Jenniges, J. Mondragon, C.D. Garner, S. Atkinson, J.M.S. Delevaux, R. Graham, and D. Westerholt

2020 Seasonal distribution and foraging occurrence of Cook Inlet belugas based on passive acoustic monitoring. *Endangered Species Research* 41:225–243.

Chenoweth, E.M., J.M. Straley, M.V. McPhee, S. Atkinson, and S. Reifenstuhl

2017 Humpback whales feed on hatchery-released juvenile salmon. *Royal Society Open Science* 4(7):170–180.

Clark, C.W., W.T. Ellison, B.L. Southall, L. Hatch, S.M. Van Parijs, A. Frankel, and D. Ponirakis

2009 Acoustic masking in marine ecosystems: Intuitions, analysis, and implication. *Marine Ecology Progress Series* 395:201–222.

Coleman, J.

2011 Columbia River Crossing Test Pile Project Hydroacoustic Monitoring Final Report. David Evans and Associates, Inc. July 2011.

Conant, T.A., and A.T. Lohe

2023 Gray Whale, Western North Pacific Distinct Population Segment (*Eschrichtius robustus*) 5-Year Review: Summary and Evaluation. NMFS Office of Protected Resources, Silver Spring, MD.

Cornick, L.A., and L. Pinney

2011 *Distribution, habitat use and behavior of Cook Inlet belugas and other marine mammals at the Port of Anchorage Marine Terminal Redevelopment Project June – November 2010: Scientific Marine Mammal Monitoring Program 2010 Annual Report.* Prepared by Alaska Pacific University (Anchorage, AK) for U.S. Department of Transportation, Maritime Administration (Washington, DC); Port of Anchorage (Anchorage, AK); and Integrated Concepts & Research Corporation (Anchorage, AK). Anchorage, AK.

Cornick, L.A., and L. Saxon-Kendall

2008 *Distribution, habitat use, and behavior of Cook Inlet belugas in Knik Arm, Fall 2007.* Final annual report for 2007. Prepared by Alaska Pacific University (Anchorage, AK) for Integrated Concepts & Research Corporation, Anchorage, AK.

2009 *Distribution, habitat use, and behavior of Cook Inlet belugas and other marine mammals at the Port of Anchorage Marine Terminal Redevelopment Project, June– November, 2008*. Scientific Marine Mammal Monitoring Report for 2008. Report from Alaska Pacific University, Department of Environmental Science. Prepared for U.S. Department of Transportation Maritime Administration, Washington, DC; Port of Anchorage, Anchorage; and Integrated Concepts and Research Corporation, Anchorage, AK.

Cornick, L., and D.J. Seagars
2016 *Final Report: Anchorage Port Modernization Project Test Pile Program*. Technical Report by AECOM for Kiewit.

Cornick, L.A., L. Saxon-Kendall, and L. Pinney
2010 *Distribution, habitat use and behavior of Cook Inlet belugas and other marine mammals at the Port of Anchorage Marine Terminal Redevelopment Project May – November, 2009: Scientific Marine Mammal Monitoring Program 2009 annual report*. Prepared by Alaska Pacific University (Anchorage, AK) for U.S. Department of Transportation, Maritime Administration (Washington, DC); Port of Anchorage (Anchorage, AK); and Integrated Concepts & Research Corporation (Anchorage, AK). Anchorage, AK.

Cornick, L., S. Love, L. Pinney, C. Smith, and Z. Zartler
2011 *Distribution, habitat use and behavior of Cook Inlet belugas and other marine mammals at the Port of Anchorage Marine Terminal Redevelopment Project June - November 2011: Scientific Marine Mammal Monitoring Program 2011 Annual Report.* Prepared by Alaska Pacific University (Anchorage, AK) for U.S. Department of Transportation, Maritime Administration (Washington, DC); Port of Anchorage (Anchorage, AK); and Integrated Concepts & Research Corporation (Anchorage, AK). Anchorage, AK.

DAF (Department of the Air Force)
2022 *JBER Proposed Mortar and Artillery Training at Richardson Training Area Environmental Impact Statement*. Available online at https://jber-pmart-eis.com/#!/home, accessed 02 December 2022.

Dahlheim, M., A. York, R. Towell, J. Waite, and J. Breiwick
2000 Harbor porpoise (*Phocoena phocoena*) abundance in Alaska: Bristol Bay to Southeast Alaska, 1991–1993. *Marine Mammal Science* 16:28–45.

Discovery of Sound in the Sea
2019 What are common underwater sounds? Website. Accessed April 2019. https://dosits.org/science/sounds-in-the-sea/what-are-common-underwater-sounds/

Eagleton, M.
2016 Personal communication between Matt Eagleton (NMFS) and Erin Cunningham (HDR) regarding EFH designations in the SBS Project area and throughout Cook Inlet, 01 September 2016.

Easley-Appleyard, B. and K. E. Leonard
2022 NMFS Port of Alaska visual monitoring project report. U.S. Dept. of Commerce, NOAA, NMFS, Alaska Region, Protected Resources Division, Anchorage, AK, December 2022.

Ellison, W.T., B.L. Southall, C.W. Clark, and A.S. Frankel
2012 A new context-based approach to assess marine mammal behavioral responses to anthropogenic sounds. *Conservation Biology* 26:21–28.

Everitt, R.D., C.H. Fiscus, and R.L. DeLong
1980 *Northern Puget Sound Marine Mam*mals.EPA-600/7-80-139. NOAA, NMFS, National Marine Mammal Laboratory, Seattle, WA.

Finneran, J.J., C.E. Schlundt, D.A. Carder, J.A. Clark, J.A. Young, J.B. Gaspin, and S.H. Ridgway
2000 Auditory and behavioral responses of bottlenose dolphins (*Tursiops truncatus*) and a beluga (*Delphinapterus leucas*) to impulsive sounds resembling distant signatures of underwater explosions. *Journal of the Acoustical Society of America* 108:417–431.

Finneran, J.J., C.E. Schlundt, R. Dear, D.A. Carder, and S.H. Ridgway
2002 Temporary shift in masked hearing thresholds in odontocetes after exposure to single underwater impulses from a seismic watergun. *Journal of the Acoustical Society of America* 111(6):2929–2940.

Funk, D.W., T.M. Markowitz, and R. Rodrigues (eds.)
2005 *Baseline studies of beluga habitat use in Knik Arm, Upper Cook Inlet, Alaska, July 2004-July 2005.* Prepared by LGL Alaska Research Associates, Inc. (Anchorage, AK) in association with HDR Alaska, Inc. (Anchorage, AK) for Knik Arm Bridge and Toll Authority (Anchorage, AK), Department of Transportation and Public Facilities (Anchorage, AK), and Federal Highway Administration (Juneau, AK). Anchorage, AK.

George, K.
2020 Another gray whale found dead in Cook Inlet, scientists still aren't sure what's causing the die-off. *Alaska Public Media*. 09 July 2020. Accessed Available online at https://alaskapublic.org/2020/07/09/another-gray-whale-found-dead-in-cook-inlet-scientists-still-arent-sure-whats-causing-the-die-off/.

Giefer, J., and B. Blossom
2020 *Catalog of waters important for spawning, rearing, or migration of anadromous fishes – Southcentral Region, effective June 1, 2020*. Alaska Department of Fish and Game, Special Publication No. 20-03, Anchorage.

Goetz, K.T., R.A. Montgomery, J.M. Ver Hoef, R.C. Hobbs, and D.S. Johnson
2012 Identifying essential summer habitat of the endangered beluga *Delphinapterus leucas* in Cook Inlet, Alaska. *Endangered Species Research* 16:135–147.

Goetz, K.T., K.E.W. Shelden, C.L. Sims, J.M. Waite, and P.R. Wade
2023 *Abundance of belugas (*Delphinapterus leucas*) in Cook Inlet, Alaska, June 2021 and June 2022*. AFSC Processed Report 2023-03, 47 p. Alaska Fisheries Science Center, NOAA, National Marine Fisheries Service, Seattle, WA.

Hart Crowser Incorporated, Pentec Environmental, and Illingworth & Rodkin, Inc.
2009 *Acoustic Monitoring and In-situ Exposures of Juvenile Coho Salmon to Pile-driving Noise at the Port of Anchorage Marine Terminal Redevelopment Project, Knik Arm, Anchorage, Alaska*. Report Number 12684-03. Prepared for URS Corporation, Integrated Concepts & Research Corporation (ICRC), and Port of Anchorage.

Hastings, M.C., and A.N. Popper
2005 *Effects of sound on fish*. Technical report for Jones and Stokes to California Department of Transportation.

Hazen, E.L., A.S. Friedlaender, M.A. Thompson, C.R. Ware, M.T. Weinrich, P.N. Halpin, and D.N. Wiley
2009 Fine-scale prey aggregations and foraging ecology of humpback whales *Megaptera novaeangliae*. *Marine Ecology Progress Series* 395:75–89.

HDR (HDR Engineering, Inc.)

2015 *Biological Assessment*. Seward Highway Milepost 75 to 90 Road and Bridge Rehabilitation Project. Prepared for the State of Alaska Department of Transportation and Public Facilities by HDR.

Hobbs, R.C.

2013 Detecting Changes in Population Trends for Cook Inlet Belugas (*Delphinapterus leucas*) Using Alternative Schedules for Aerial Surveys. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-AFSC-252.

Hobbs, R.C., and K.E.W. Shelden

2008 *Supplemental Status Review and Extinction Assessment of Cook Inlet Belugas (*Delphinapterus leucas*)*. AFSC Processed Report 2008-08. Alaska Fisheries Science Center, National Marine Fisheries Service, Seattle, WA.

Hobbs, R.C., and J.M. Waite

2010 Abundance of harbor porpoise (*Phocoena phocoena*) in three Alaskan regions, corrected for observer errors due to perception bias and species misidentification, and corrected for animals submerged from view. *Fishery Bulletin* 108:251–267.

Hobbs, R.C., D.J. Rugh, and D.P. DeMaster

2000 Abundance of belugas, *Delphinapterus leucas*, in Cook Inlet, Alaska, 1994–2000. *Marine Fisheries Review* 62(3):37–45.

Hobbs, R.C., K.L. Laidre, D.J. Vos, B.A. Mahoney, and M. Eagleton

2005 Movements and area use of belugas, *Delphinapterus leucas*, in a subarctic Alaskan estuary. *Arctic* 58(4):331–340.

Hobbs, R.C., K.E.W. Shelden, D.J. Rugh, and S.A. Norman

2008 *2008 Status Review and Extinction Risk Assessment of Cook Inlet Belugas (*Delphinapterus leucas*)*. AFSC Processed Report 2008-02. National Marine Fisheries Service, Alaska Fisheries Science Center, Seattle, WA. Available online at https://apps-afsc.fisheries.noaa.gov/Publications/ProcRpt/PR%202008-02.pdf.

Hobbs, R.C., C.L. Sims, and K.E.W. Shelden

2011 *Estimated abundance of belugas in Cook Inlet, Alaska, from aerial surveys conducted in June 2011.* NMFS, NMML Unpublished Report.

2012 *Estimated abundance of belugas in Cook Inlet, Alaska, from aerial surveys conducted in June 2012.* NMFS, NMML Unpublished Report.

Houghton, J., J. Starkes, M. Chambers, and D. Ormerod

2005 *Marine fish and benthos studies in Knik Arm, Anchorage, Alaska.* Prepared by Pentec Environmental (Edmonds, WA) for Knik Arm Bridge and Toll Authority and HDR Alaska, Inc., Anchorage, AK.

Houghton, J.P., J.E. Starkes, J.P. Stutes, M.A. Havey, J.A. Reyff, and D.E. Erikson.
2010. *Acoustic monitoring and in-situ exposures of juvenile coho salmon to pile driving noise at the Port of Anchorage Marine Terminal Redevelopment Project, Knik Arm, Alaska*. Page 63 in Abstracts, Alaska Marine Science Symposium, 18–22 January 2010, Anchorage, AK.

I&R (Illingworth & Rodkin, LLC)
2017 *Pile Driving Noise Measurements at Atlantic Fleet Naval Installations: 28 May 2013-28 April 2016*. Prepared for Naval Facilities Engineering Command Atlantic under HDR Environmental, Operations and Construction, Inc. Contract No. N62470-10-D-3011, by Illingworth & Rodkin, Cotati, CA. January 2017.
2021a *Port of Alaska Modernization Program, Petroleum and Cement Terminal Hydroacoustic Monitoring Report*. Prepared for the Port of Alaska, Anchorage, AK, by Illingworth & Rodkin, Cotati, CA. March 2021.
2021b *Port of Alaska Modernization Program, Petroleum and Cement Terminal Phase 2 Hydroacoustic Monitoring Report*. Prepared for the Port of Alaska, Anchorage, AK, by Illingworth & Rodkin, Cotati, CA. November 2021.
2023 Memo: Vibratory Pile Removal Sound Source Levels and Air Bubble Curtain Performance. Submitted to Suzann Speckman. March 22, 2023.

ICRC (Integrated Concepts & Research Corporation)
2009 *Marine mammal monitoring final report 15 July 2008 through 14 July 2009.* Construction and scientific marine mammal monitoring Associated with the Port of Anchorage Marine Terminal Redevelopment Project, in accordance with the 15 July 2008 National Marine Fisheries Service Incidental Harassment Authorization. Prepared by Integrated Concepts & Research Corporation (Anchorage, AK) for Maritime Administration (Washington, DC) and Port of Anchorage (Anchorage, AK). Anchorage, AK.
2010 *2009 Annual marine mammal monitoring report.* Construction and scientific marine mammal monitoring Associated with the Port of Anchorage Marine Terminal Redevelopment Project, in accordance with the USACE 404/10 Permit and the NMFS 2009 Letter of Authorization. Prepared by Integrated Concepts & Research Corporation (Anchorage, AK) for U.S. Department of Transportation, Maritime Administration (Washington, DC) and Port of Anchorage (Anchorage, AK). Anchorage, AK.
2011 *2010 Annual marine mammal monitoring report.* Construction and Scientific Marine Mammal Monitoring Associated with the Port of Anchorage Marine Terminal Redevelopment Project, in accordance with the USACE 404/10 Permit and the NMFS 2010-2011 Letter of Authorization. Prepared by Integrated Concepts & Research Corporation (Anchorage, AK) for U.S. Department of Transportation, Maritime Administration (Washington, DC) and Port of Anchorage (Anchorage, AK). Anchorage, AK.
2012 *2011 Annual marine mammal monitoring report*. Construction and Scientific Marine Mammal Monitoring Associated with the Port of Anchorage Marine Terminal Redevelopment Project, in accordance with the Letter of Authorization issued by the National Marine Fisheries for July 15, 2011 through July 14, 2012. Prepared by Integrated Concepts & Research Corporation (Anchorage, AK) for U.S. Department of Transportation, Maritime Administration (Washington, DC) and Port of Anchorage (Anchorage, AK). Anchorage, AK.

IPCC (Intergovernmental Panel on Climate Change)
2023 *Summary for Policymakers. In: Climate Change 2023: Synthesis Report. A report of the Intergovernmental Panel on Climate Change.* Contribution of Working Groups I, II, and III

to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland (in press).

Ireland, D.S., D.W. Funk, T.M. Markowitz, and C.C. Kaplan
2005 *Beluga distribution and behavior in Eagle Bay and the Sixmile area of upper Cook Inlet, Alaska, in September and October 2005.* Prepared by LGL Alaska Research Associates, Inc. (Anchorage, AK) in association with HDR Alaska, Inc. (Anchorage, AK) for Knik Arm Bridge and Toll Authority (Anchorage, AK), Alaska Department of Transportation and Public Facilities (Anchorage, AK), and Federal Highway Administration (Juneau, AK). Anchorage, AK.

Jacobs.
2022 Cargo Terminals – Terminal 1 and Terminal 2: Report on Analyses of Marine Construction Alternatives. Prepared for the Port of Alaska. June 2022.

Kendall, L.S., and L.A. Cornick
2015 Behavior and distribution of Cook Inlet belugas, *Delphinapterus leucas*, before and during pile driving activity. *Marine Fisheries Review* 77(2):106–114.

Kenai Peninsula Borough
2003 *Kenai Peninsula Borough Transportation Plan*. Final Plan. Prepared by HDR Alaska, Inc. (Anchorage, AK) in association with Kittelson & Associates, Inc. (Portland, OR) for the Kenai Peninsula Borough.

Krieger, K.J., and B.L. Wing
1984 *Hydroacoustic Surveys and Identification of Humpback Whale Forage in Glacier Bay, Stephens Passage, and Frederick Sound, Southeastern Alaska, Summer 1983*. U.S. Department of Commerce, NOAA Technical Memo NMFS/NWC-66.

Laidre, K.L., K.E.W. Shelden, D.J. Rugh, and B.A. Mahoney
2000 Beluga, *Delphinapterus leucas*, distribution and survey effort in the Gulf of Alaska. *Marine Fisheries Review* 62:27–36.

Laist, D.W., A.R. Knowlton, J.G. Mead, A.S. Collet, and M. Podesta
2001 Collisions between ships and whales. *Marine Mammal Science* 17:35–75.

LGL Alaska Research Associates, Inc., and DOWL
2015 *Biological Assessment of the Cook Inlet Beluga (*Delphinapterus leucas*) for the Seward Highway MP 105-107 Windy Corner Project, Municipality of Anchorage, Upper Cook Inlet, Alaska.* Prepared for State of Alaska Department of Transportation and Public Facilities, Central Region.

Lomac-MacNair, K., M.A. Smultea, and G. Campbell
2014 *Draft NMFS 90-Day Report for Marine Mammal Monitoring and Mitigation during Apache's Cook Inlet 2014 Seismic Survey, 2 April – 27 June 2014*. Prepared for Apache Alaska Corporation, Anchorage AK. Prepared by Smultea Environmental Sciences (SES), Preston, WA.

Lopez, J.W., T.B. Parr, D.C. Allen, and C.C. Vaughn
2020. Animal aggregations promote emergent aquatic plant production at the aquatic-terrestrial interface. *Ecology* 101(10). Available online at https://doi.org/10.1002/ecy.3126.

Markowitz, T.M., and T.L. McGuire (eds.)
2007 *Temporal-spatial distribution, movements and behavior of belugas near the Port of Anchorage, Alaska*. Prepared by LGL Alaska Research Associates, Inc. (Anchorage, AK) for Integrated Concepts & Research Corporation, Anchorage, AK.

Martien, Karen K., Barbara L. Taylor, Frederick I. Archer, Katherina Audley, John Calambokidis, Ted Cheeseman, Joëlle De Weerdt, Astrid Frisch Jordán, Pamela Martínez-Loustalot, Christian D. Ortega-

Martinez-Aguilar, S.
2011 Abundancia y tasa de incremento de la ballena jorobada Megaptera novaeangliae en el Pacífico Mexicano. M.Sc. Thesis, Universidad Autónoma de Baja California Sur, La Paz, Baja California Sur, Mexico.

McDowell
2020 *The Logistical Advantages of Alaska's Primary Inbound Port.* October 2020.

McGuire, T., A. Stephens, and B. Goetz
2016 The Susitna river delta as a calving ground: Evidence from observation of a Cook Inlet beluga birth and the 2005-2015 seasonal and geographic patterns of neonate occurrence in upper Cook Inlet. Poster presented at Alaska Marine Science Symposium.

McGuire, T., G. Himes Boor, J. McClung, A.D. Stephens, C. Garner. K.E.W. Shelden, and B Wright
2020 Distribution and habitat use by endangered Cook Inlet belugas: Patterns observed during a photo-identification study, 2005-2017. *Aquatic Conservation: Marine Freshwater Ecosystem* 30(12):2402–2427.

McPherson, R., and R. Beebee
2023 *Concept-level offshore sediment disposal assessment of NES1 material*. Technical Memorandum. HDR. May 2023.

Miller, G.W., V.D. Moulton, R.A. Davis, M. Holst, P. Millman, A. MacGillivray, and D. Hannay
2005 Monitoring seismic effects on marine mammals – southeastern Beaufort Sea, 2001-2002. In: *Offshore oil and gas environmental effects monitoring: approaches and technologies.* S.L. Armsworthy, P.J. Crandfor, and K. Lee (eds.). Battelle Press, Columbus, OH.

Montgomery, R.A., J.M. Ver Hoef, and P.L Boveng
2007 Spatial modeling of haul-out site use by harbor seals in Cook Inlet, Alaska. *Marine Ecology Progress Series* 341:257–264.

Moore, S.E., K.E.W. Shelden, L.L. Litzky, B.A. Mahoney, and D.J. Rugh
2000 Beluga, *Delphinapterus leucas*, habitat associations in Cook Inlet, Alaska. *Marine Fisheries Review* 62:60–80.

Moore, S.E., J.M. Grebmeier, and J.R. Davies
2003 Gray whale distribution relative to forage habitat in the northern Bering Sea: current conditions and retrospective summary. *Canadian Journal of Zoology* 81(4):734–742.

Moulton, L.L.
1997 Marine residence, growth, and feeding by juvenile salmon in northern Cook Inlet, Alaska. *Alaska Fishery Research Bulletin* 4(2):154–177.

Muto, M.M., V.T. Helker, B.J. Delean, N.C. Young, J.C. Freed, R.P. Angliss, N A. Friday, P.L. Boveng, J.M. Breiwick, B.M. Brost, M.F. Cameron, P.J. Clapham, J.L. Crance, S.P. Dahle, M.E. Dahlheim, B.S. Fadely, M.C. Ferguson, L.W. Fritz, K.T. Goetz, R.C. Hobbs, Y.V. Ivashchenko, A.S. Kennedy, J.M. London, S.A. Mizroch, R.R. Ream, E.L. Richmond, K.E.W. Shelden, K.L. Sweeney, R.G. Towell, P.R. Wade, J.M. Waite, and A.N. Zerbini

2022 *Alaska Marine Mammal Stock Assessments, 2021*. U.S. Department of Commerce, NOAA Technical Memorandum NMFSAFSC-441.

NAVFAC SW.

2020. Compendium of Underwater and Airborne Sound Data During Pile Installation and In-Water Demolition Activitites in San Diego Bay, California

Nedwell, J., and B. Edwards

2002 *Measurements of underwater noise in the Arun River during piling at County Wharf, Littlehampton*.

Neilson, J.L., C.M. Gabriele, A.L. Jensen, K. Jackson, and J.M. Straley

2012 Summary of reported whale-vessel collisions in Alaskan waters. *Journal of Marine Biology* 2012:106282.

Nemoto, T.

1957 Foods of the baleen whales of the northern Pacific. *Scientific Reports of the Whale Research Institute* 12(1957):33–89.

NMFS (National Marine Fisheries Service)

2003 *Subsistence Harvest Management of Cook Inlet Belugas - Final Environmental Impact Statement.* Available online at https://repository.library.noaa.gov/view/noaa/19217

2016a Nearshore Fish Atlas of Alaska. Available online at https://alaskafisheries.noaa.gov/mapping/szflex/index.html?T=FA@L=B. Accessed 15 February 2021.

2016b *Recovery Plan for the Cook Inlet Beluga (*Delphinapterus leucas*).* National Marine Fisheries Service, Alaska Regional Office, Protected Resources Division, Juneau, AK.

2018a *2018 Revisions to: Technical guidance for assessing the effects of anthropogenic sound on marine mammal hearing (Version 2.0): Underwater thresholds for onset of permanent and temporary threshold shifts*. U.S. Department of Commerce, NOAA. NOAA Technical Memorandum NMFS-OPR-59.

2018b *Port of Alaska, 2018 Fender Pile Replacement and Repair, Knik Arm, Anchorage, Alaska*. NMFS PCTS Number: AKR-2018-9778. National Marine Fisheries Service, Alaska Regional Office, Protected Resources Division, Juneau, AK.

2019 Reviewing and designating stocks and issuing Stock Assessment Reports under the Marine Mammal Protection Act. Protected Resources Policy 02-204-03. Available online: https://media.fisheries.noaa.gov/dam-migration/02-204-03.pdf.

2020a Biological Opinion for the Port of Alaska's Petroleum and Cement Terminal, Anchorage, Alaska. National Marine Fisheries Service, Alaska Region. 13 March 2021.

2020b Incidental Harassment Authorization for the Port of Alaska's Petroleum and Cement Terminal Phase 1, Anchorage, Alaska. National Marine Fisheries Service, Office of Protected Resources, Silver Spring, Maryland. 31 March 2020.

2020c Incidental Harassment Authorization for the Port of Alaska's Petroleum and Cement Terminal Phase 2, Anchorage, Alaska. National Marine Fisheries Service, Office of Protected Resources, Silver Spring, Maryland. 31 March 2020.

2020d *User Spreadsheet Tool (Version 2.1) for: 2018 Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0): Underwater Thresholds for Onset of Permanent and Temporary Threshold Shifts*. Silver Spring, Maryland: Office of Protected Resources, National Marine Fisheries Service.

2022a *Beluga – Cook Inlet DPS (*Delphinapterus leucas*) 5-Year Review: Summary and Evaluation*. NOAA Fisheries, Alaska Region, Anchorage, AK, and National Marine Fisheries Service Alaska Fisheries Science Center, Seattle, WA. August 2022.

2022b Essential Fish Habitat Mapper for Alaska. Available online at https://www.habitat.noaa.gov/apps/efhmapper/.

2022c Evaluation of MMPA Stock Designation for the Hawai'i Distinct Population Segment of humpback whales (Megaptera novaeangliae), currently a part of the Central North Pacific humpback whale stock. Memorandum for the Record: Management Considerations in Designating Demographically Independent Populations as Stocks under the Marine Mammal Protection Act.

2022d Evaluation of MMPA Stock Designation for the Mexico Distinct Population Segment of humpback whales (Megaptera novaeangliae), currently a part of the California/Oregon/Washington and Central North Pacific (CNP) humpback whale stocks. National Marine Fisheries Service Memorandum for the Record: Management Considerations in Designating Demographically Independent Populations as Stocks under the Marine Mammal Protection Act.

2022e 2019-2023 Gray Whale Unusual Mortality Event along the West Coast and Alaska. National Oceanic and Atmospheric Administration. Accessed 29 September 2023. Available online at https://www.fisheries.noaa.gov/national/marine-life-distress/2019-2023-gray-whale-unusual-mortality-event-along-west-coast-and

2023 Guidelines for Preparing Stock Assessment Reports Pursuant to the Marine Mammal Protection Act. Protected Resources Policy Directive 02-204-01. Available online:https://www.fisheries.noaa.gov/s3/2023-05/02-204-01-Final-GAMMS-IV-Revisions-clean-1- kdr.pdf.

2024 2019-2023 Eastern North Pacific Gray Whale UME (CLOSED). Office of Protected Resources updated 05/01/2024. Available online: https://www.fisheries.noaa.gov/national/marine-life-distress/2019-2023-eastern-north-pacific-gray-whale-ume-closed. Accessed 05/10/2024.

NPFMC (North Pacific Fishery Management Council)

2016 *Fishery Management Plan for Groundfish of the Gulf of Alaska*. National Marine Fisheries Service Alaska Region, State of Alaska Department of Fish and Game. November 2016.

2020 *Fishery Management Plan for Groundfish of the Gulf of Alaska*. North Pacific Fishery Management Council, Anchorage, Alaska. November 2020.

2021 Fishery Management Plan for the Salmon Fisheries in the EEZ off Alaska. North Pacific Management Council, National Marine Fisheries Service Alaska Region, State of Alaska Department of Fish and Game. North Pacific Fishery Management Council, Anchorage, AK. November 2021.

Ortiz, Eric M. Patterson, Nicola Ransome, Penny Ruvelas, Jorge Urbán Ramírez, and Francisco Villegas-Zurita

2021 *Evaluation of Mexico Distinct Population Segment of Humpback Whales as units under the Marine Mammal Protection Act*. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-SWFSC-658.

Parks, S.E., C.W. Clark, and P.L. Tyack

2007 Short- and long-term changes in right whale calling behavior: the potential effects of noise on acoustic communication. *Journal of the Acoustical Society of America* 122(6):3725–3731.

Pebble Limited Partnership

2021 *PLP Files Request for Appeal on USACE Record of Decision for the Pebble Project.* Press release, 21 January 2021.

POA (Port of Anchorage)

2008 Marine Mammal Monitoring Final Report 15 July 2008 – 14 July 2009. Prepared By the United States Department of Transportation Maritime Administration, Port of Anchorage, and Integrated Concepts & Research Corporation. October 2009.

2009 *Biological Assessment of the Beluga Delphinapterus leucas in Cook Inlet for the Port of Anchorage Expansion Project and Associated Dredging at the Port of Anchorage, Alaska.* Prepared by the Port of Anchorage; U.S. Department of Transportation, Maritime Administration; and U.S. Army Corps of Engineers, Anchorage, AK.

2014 Port of Anchorage. Alaska's Port. Alaska's Future.

2017 Anchorage Port Modernization Program, Petroleum and Cement Terminal: Application for a Marine Mammal Protection Act Incidental Harassment Authorization. Prepared by HDR, Inc., Anchorage, AK; and Illingworth & Rodkin, Petaluma, CA; for the Port of Anchorage under contract to CH2M.

2019a Port Infrastructure Development Program Fiscal Year 2019, Port of Alaska-Petroleum Cement Terminal. Port Infrastructure Development Grant Application. 16 September 2019.

2019b Port of Alaska, Final Marine Mammal Observation Report, POA-2003-0502 M-13 Knik Arm. Prepared for USACE Alaska District and NMFS.

2020 Port of Alaska Letter to U.S. Army Corps of Engineers Re: Support of Initiation of Informal Consultation under Section 7(a)(2) of the Endangered Species Act (ESA). POA-1977-00144. Dated 25 September 2020.

2021 Port of Alaska Modernization Program, South Floating Dock: Application for a Marine Mammal Protection Act Incidental Harassment Authorization. Submitted to NMFS 05 March 2021. Prepared by HDR, Inc., Anchorage, AK; and Illingworth & Rodkin, Petaluma, CA; for the Port of Anchorage under contract to Jacobs.

2022a Port of Alaska Modernization Program, North Extension Stabilization (Step 1) Project: Application for a Marine Mammal Protection Act Incidental Harassment Authorization. Prepared by HDR, Inc., Anchorage, AK; and Illingworth & Rodkin, Petaluma, CA; for the Port of Alaska under contract to CH2M HILL now Jacobs.

2022b Port of Alaska Modernization Program, North Extension Stabilization 1: Marine Mammal Monitoring and Mitigation Plan. Prepared by HDR, Inc., Anchorage, AK; for the Port of Alaska under contract to Jacobs.

2024a Port of Alaska Modernization Program, Cargo Terminals Replacement (CTR) Project: Application for a Marine Mammal Protection Act Letter of Authorization. Prepared by

HDR, Inc., Anchorage, AK; and Illingworth & Rodkin, Petaluma, CA for the Port of Alaska under contract to Jacobs.

2024b Port of Alaska Modernization Program, Cargo Terminals Replacement (CTR): Marine Mammal Monitoring and Mitigation Plan. Prepared by HDR, Inc., Anchorage, AK; for the Port of Alaska under contract to Jacobs.

2024c *Port of Alaska Modernization Program Essential Fish Habitat Technical Report – Cargo Terminals Replacement (CTR) Project*. Prepared by HDR, Inc., Anchorage, AK, for the Port of Alaska under contract to Jacobs.

Poux, Sabine

2022 Another tidal energy project planned for Cook Inlet. KDLL. May 23, 2022. Available online at https://www.kdll.org/local-news/2022-05-23/another-tidal-energy-project-planned-for-cook-inlet. Accessed 12 September 2022.

Prevel-Ramos, A.P., T.M. Markowitz, D.W. Funk, and M.R. Link

2006 *Monitoring belugas at the Port of Anchorage: Pre-expansion observations, August-November 2005*. Prepared by LGL Alaska Research Associates, Inc. (Anchorage, AK) for Integrated Concepts & Research Corporation; Port of Anchorage; and U.S. Department of Transportation, Maritime Administration. Anchorage, AK.

Quakenbush, L.T., R.S. Suydam, A.L. Bryan, L.F. Lowry, K.J. Frost, and B.A. Mahoney

2015 Diet of belugas *Delphinapterus leucas,* in Alaska from Stomach Contacts, March–November. *Marine Fisheries Review* 77(1):70–84.

Richardson, W.J., C.R. Greene Jr., W.R. Koski, C.I. Malme, G.W. Miller, M.A. Smultea, and B. Würsig

1990 *Acoustic Effects of Oil Production Activities on Bowhead and White Whales Visible During Spring Migration Near Pt. Barrow, Alaska – 1989 Phase: Sound Propagation and Whale Responses to Playbacks of Continuous Drilling Noise from an Ice Platform, as Studied in Pack Ice Conditions.* OCS Study MMS 90-0017. Prepared by LGL Ltd., King City, ON for U.S. Mineral Management Service, Herndon, VA. Available online at http://www.arlis.org/docs/vol1/A/22570440.pdf.

Richardson, W.J., C.R. Greene, Jr., W.R. Koski, M.A. Smultea, G. Cameron, C. Holdsworth, G. Miller, T. Woodley, and B. Würsig

1991 *Acoustic Effects of Oil Production Activities on Bowhead and White Whales Visible During Spring Migration Near Pt. Barrow, Alaska – 1990 Phase: Sound Propagation and Whale Responses to Playbacks of Continuous Drilling Noise from an Ice Platform, as Studied in Pack Ice Conditions.* OCS Study MMS 91-0037. Prepared by LGL Ltd., King City, ON for U.S. Mineral Management Service, Herndon, VA. Available online at http://www.arlis.org/docs/vol1/A/25156606.pdf.

Richardson, W.J., C.R. Greene, C.I. Malme, and D.H. Thomson

1995a *Marine Mammals and Noise.* Academic Press, Inc., San Diego, CA.

Richardson, W.J., C.R. Greene Jr., J.S. Hanna, W.R. Koski, G.W. Miller, N.J. Patenaude and M.A. Smultea, with R. Blaylock, R. Elliott, and B. Würsig

1995b *Acoustic effects of oil production activities on bowhead and white whales visible during spring migration near Pt. Barrow, Alaska – 1991 and 1994 phases.* OCS Study MMS 95-0051; NTIS PB98-107667. LGL Rep. TA954. Prepared by LGL Ltd., King City, Ont., for U.S. Minerals Management Service, Herndon, VA.

Rugh, D.J., K.E.W. Shelden, and B.A. Mahoney
2000 Distribution of belugas, *Delphinapterus leucas*, in Cook Inlet, Alaska, during June/July, 1993-2000. *Marine Fisheries Review* 62:6–21.

Rugh, D.J., B.A. Mahoney, C.L. Sims, B.K. Smith, and R.C. Hobbs
2003 Aerial Surveys of Belugas in Cook Inlet, Alaska, June 2003. Unpublished NMFS report.

Rugh, D.J., B.A. Mahoney, and B.K. Smith
2004a *Aerial Surveys of Belugas in Cook Inlet, Alaska, between June 2001 and June 2002*. NOAA Technical Memorandum NMFS-AFSC-145. National Marine Fisheries Service, Seattle, WA.

Rugh, D.J., B.A. Mahoney, C.L. Sims, B.A. Mahoney, B.K. Smith, and R.C. Hobbs
2004b Aerial Surveys of Belugas in Cook Inlet, Alaska, June 2004. Unpublished NMFS report.

Rugh, D.J., K.E.W. Shelden, C.L. Sims, B.A. Mahoney, B.K. Smith, L.K. Litzky, and R.C. Hobbs
2005a *Aerial Surveys of Belugas in Cook Inlet, Alaska, June 2001, 2002, 2003, and 2004*. NOAA Technical Memorandum NMFS-AFSC-149. National Marine Fisheries Service, Seattle, WA.

Rugh, D. J., K.T. Goetz, and B.A. Mahoney
2005b Aerial Surveys of Belugas in Cook Inlet, Alaska, August 2005. Unpublished NMFS report.

Rugh, D. J., K.T. Goetz, B.A. Mahoney, B.K. Smith, and T.A. Ruszkowski
2005c Aerial Surveys of Belugas in Cook Inlet, Alaska, June 2005. Unpublished NMFS report.

Rugh, D.J., K.T. Goetz, C.L. Sims, and B.K. Smith
2006a Aerial Surveys of Belugas in Cook Inlet, Alaska, August 2006. Unpublished NMFS report.

Rugh, D.J., K.T. Goetz, C.L. Sims, K.E.W. Shelden, O.V. Shpak, B.A. Mahoney, and B.K. Smith
2006b Aerial Surveys of Belugas in Cook Inlet, Alaska, June 2006. Unpublished NMFS report.

Rugh, D.J., K.T. Goetz, J.A. Mocklin, B.A. Mahoney, and B.K. Smith
2007 Aerial Surveys of Belugas in Cook Inlet, Alaska, June 2007. Unpublished NMFS report.

Saxon-Kendall, L., A. Širović, and E.H. Roth
2013 Effects of construction noise on the Cook Inlet beluga (*Delphinapterus leucas*) vocal behavior. *Canadian Acoustics* 41(3):3–13.

Schlundt, C.E., J.J. Finneran, D.A. Carder, and S.H. Ridgway
2000 Temporary shift in masked hearing thresholds (MTTS) of bottlenose dolphins and white whales after exposure to intense tones. *Journal of the Acoustical Society of America* 107:3496–3508.

Scientific Fishery Systems, Inc.
2009 *2008 Underwater Noise Survey During Construction Pile Driving*. Prepared by SFS under contract to Integrated Concepts and Research Corporation (ICRC), Anchorage, Alaska, for the Port of Anchorage, Marine Terminal Development Project.

Shelden, K., and P. Wade (eds.)
2019 *Aerial surveys, distribution, abundance, and trend of belugas* (Delphinapterus leucas) *in Cook Inlet, Alaska, June 2018*. AFSC Processed Rep. 2019-09, Alaska Fisheries Science Center, NOAA, NMFS, Seattle, WA.

Shelden, K.E.W., D.J. Rugh, B.A. Mahoney, and M.E. Dahlheim
2003 Killer whale predation on belugas in Cook Inlet, Alaska: Implications for a depleted population. *Marine Mammal Science* 19(3):529–544.

Shelden, K.E.W., D.J. Rugh, K.T. Goetz, C.L. Sims, L. Vate Brattström, J.A. Mocklin, B.A. Mahoney, B.K. Smith, and R.C. Hobbs
2013 *Aerial surveys of belugas*, Delphinapterus leucas, *in Cook Inlet, Alaska, June 2005 to 2012*. NOAA Technical Memorandum NMFS-AFSC-263. National Marine Fisheries Service, Seattle, WA.

Shelden, K.E.W., B.A. Agler, J.J. Brueggeman, L.A. Cornick, S.G. Speckman, and A. Prevel-Ramos
2014 Harbor porpoise, *Phocoena phocoena vomerina*, in Cook Inlet, Alaska. *Marine Fisheries Review* 76:22–50.

Shelden, K.E.W., C.L. Sims, L.V. Brattstrom, K.T. Goetz, and R.C. Hobbs
2015 *Aerial Surveys of Belugas (*Delphinapterus leucas*) in Cook Inlet, Alaska, June 2014*. AFSC Processed Rep. 2015-03. Alaska Fisheries Science Center, NOAA, NMFS, Seattle, WA.

Shelden, K.E.W., R.C. Hobbs, C.L. Sims, L. Vate Brattström, J.A. Mocklin, C. Boyd, and B.A. Mahoney
2017 *Aerial surveys, abundance, and distribution of belugas* (Delphinapterus leucas) *in Cook Inlet, Alaska, June 2016*. AFSC Processed Rep. 2017-09, Alaska Fisheries Science Center, NOAA, NMFS, 7600 Sand Point Way NE, Seattle WA 98115.

Shelden, K.E.W., K.T. Goetz, A.A. Brower, A.L. Willoughby, and C.L. Sims
2022 *Distribution of belugas (*Delphinapterus leucas*) in Cook Inlet, Alaska, June 2021 and June 2022*. AFSC Processed Rep. 2022-04, 80 p. Alaska Fish. Sci. Cent., NOAA, NMFS, Seattle, WA.

Shields, P., and A. Dupuis
2017 Upper Cook Inlet commercial fisheries annual management report, 2016. Alaska Department of Fish and Game, Fishery Management Report No. 17-05, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/FMR17-05.pdf

Silber, G.K., D.W. Weller, R.R. Reeves, J.D. Adams, and T.J. Moore
2021 Co-occurrence of gray whales and vessel traffic in the North Pacific Ocean. *Endangered Species Research* 44:177–201.

Širović, A., and L.S. Kendall
2009 *Passive acoustic monitoring of Cook Inlet belugas: Analysis report, Port of Anchorage Marine Terminal Redevelopment Project.* Prepared for U.S. Department of Transportation, Maritime Administration (Washington, DC); Port of Anchorage (Anchorage, AK); and Integrated Concepts & Research Corporation (Anchorage, AK). Anchorage, AK.

Southall, B.L., A.E. Bowles, W.T. Ellison, J.J. Finneran, R.L. Gentry, C.R. Greene Jr., D. Kastak, D.R. Ketten, J.H. Miller, P.E. Nachtigall, W.J. Richardson, J.A. Thomas, and P.L. Tyack

2007 Marine mammal noise exposure criteria: Initial scientific recommendations. *Aquatic Mammals*, Special Issue 33.

Southall, B., L., J.J. Finneran, C. Reichmuth, P.E. Nachtigall, D.R. Ketten, A.E. Bowles, W.T. Ellison, D.P. Nowacek, and P.L. Tyack

2019 Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects. *Aquatic Mammals* 45(2):125–232.

Swartz, S.L.

2018 Gray whale: Eschrichtius robustus. In: Würsig, B., Thewissen, J.G.M., Kovacs, K. (eds.). *Encyclopedia of Marine Mammals*, 3rd edition, pp. 422−428. Academic Press, Cambridge, MA.

Sweeney, K., B. Birkemeier, K. Luxa, and T. Gelatt

2022 Results of Steller sea lion surveys in Alaska, June–July 2021. Memorandum to The Record. February 2022. Available online at https://media.fisheries.noaa.gov/2022-02/ssl_aerial_survey_2021_final.pdf.

Thorson, P., and J. Reyff

2006 San Francisco-Oakland Bay bridge east span seismic safety project marine mammals and acoustic monitoring for the marine foundations at piers E2 and T1.

URS (URS Corporation)

2007 *Port of Anchorage Marine Terminal Development Project underwater noise survey test pile driving program, Anchorage, Alaska*. Prepared for Integrated Concepts & Research Corporation, Anchorage, AK.

2008 Application for 2008 Incidental Harassment Authorization for construction activities associated with the Port of Anchorage Marine Terminal Redevelopment Project. Prepared for U.S. Department of Transportation, Maritime Administration (Washington, DC); Port of Anchorage (Anchorage, AK); and Integrated Concepts & Research Corporation (Anchorage, AK). Anchorage, AK.

U.S. Army Garrison Fort Richardson

2009 *Biological Assessment of the Cook Inlet beluga (Delphinapterus leucas) for the resumption of year-round firing in Eagle River Flats Impact Area*. U.S. Department of Army, Fort Richardson, AK.

U.S. Navy

2012 Naval Base Kitsap at Bangor Test Pile Program: Acoustic Monitoring Report. Bangor, Washington. 17 April, 2012. Prepared by: Illingworth and Rodkin, Inc.

2015 *Proxy source sound levels and potential bubble curtain attenuation for acoustic modeling of nearshore marine pile driving at Navy installations in Puget Sound*. Prepared by Michael Slater, Naval Surface Warfare Center, Carderock Division, and Sharon Rainsberry, Naval Facilities Engineering Command Northwest. Revised January 2015.

USACE (U.S. Army Corps of Engineers)

2008 *Environmental Assessment and Findings of No Significant Impact*. Anchorage Harbor Dredging and Disposal, Anchorage, AK.

2020a *Pebble Project Final Environmental Impact Statement*. Department of the Army.

2020b Letter from David Hobbie, Chief, Regional Regulatory Division, to James Fueg, Pebble Limited Partnership, 25 November 2020. Available online at https://pebblewatch.com/wp-content/uploads/2020/12/POA-2017-00271_Denial_LetterAppeal_Form.pdf.

2021 Dredged Material Management Office, Seattle District. Dredged Material Evaluation and Disposal Procedures User Manual. Available online at https://www.nws.usace.army.mil/Missions/Civil-Works/Dredging/User-Manual/.

2023 Maintenance Dredging, Anchorage Harbor, Anchorage, Alaska. Environmental Assessment and Finding of No Significant Impact. April 2023.

Vanderlaan, A.S.M., and C.T. Taggart

2007 Vessel collisions with whales: the probability of lethal injury based on vessel speed. *Marine Mammal Science* 23:144–156.

Wade, P.R.

2021 Estimates of abundance and migratory destination for North Pacific humpback whales in both summer feeding areas and winter mating and calving areas. International Whaling Commission. SC/68c/IA/03.

Wade, P.R., E.M. Oleson, and N.C. Young

2021 Evaluation of Hawaiʻi distinct population segment of humpback whales as units under the Marine Mammal Protection Act. U.S. Department of Commerce, NOAA Technical Memorandum NMFSAFSC-430.

Wartzok, D., and D.R. Ketten

1999 Marine mammal sensory systems. Pages 117-175 in J.E. Reynolds III and S.A. Rommel, eds. *Biology of Marine Mammals*. Washington, DC: Smithsonian Institution Press.

Wartzok, D., A.N. Popper, J. Gordon, and J. Merrill

2003 Factors affecting the responses of marine mammals to acoustic disturbance. *Marine Technology Society Journal 37*(4):6–15.

Weilgart, L.S.

2007 A brief review of known effects of noise on marine mammals. *International Journal of Comparative Psychology* 20 (2–3):159–168.

Weller, D.W., R. Anderson, B. Easley-Appleyard, G. Ferrara, A.R. Lang, J. Moore, P.E. Rosel, B. Taylor, and N.C. Young

2023 Distinct population segment analysis of western North Pacific gray whales (Eschrichtius robustus) under the Endangered Species Act. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-SWFSC-679. https://doi.org/10.25923/7ggf-9817.

Whitehead, H.

2016 Consensus movements by groups of sperm whales. *Marine Mammal Science*. doi:10.1111/mms.12338.

Witteveen, B.H., R.J. Foy, K.M. Wynne, and Y. Tremblay

2008 Investigation of foraging habits and prey preference of humpback whales (*Megaptera novaeangliae*) near Kodiak Island, Alaska using acoustic tags and concurrent fish surveys. *Marine Mammal Science* 24(3):516–534.

Witteveen, B.H., G.A. Worthy, K.M. Wynne, and R.J. Foy
2011 Modeling the diet of humpback whales: An approach using stable carbon and nitrogen isotope ratios in a Bayesian mixing model. *Marine Mammal Science* 28(3):233–250.

Womble, J.N., and M.F. Sigler
2006 Temporal variation in Steller sea lion diet at a seasonal haul-out in southeast Alaska. A.W. Trites, S.K. Atkinson, D.P. DeMaster, L.W. Fritz, T.S. Gelatt, L.D. Rea, and K.M. Wynne (eds.), *Sea Lions of the World*, pp. 141–154. Alaska Sea Grant College Program, Fairbanks, AK.

Womble, J.N., M.F. Sigler, and M.F. Willson
2009 Linking seasonal distribution patterns with prey availability in a central-place forager, the SSL. *Journal of Biogeography* 36(3):439–451.

Young, N. C., A. A. Brower, M. M. Muto, J. C. Freed, R. P. Angliss, N. A. Friday, P. L. Boveng, B. M. Brost, M. F. Cameron, J. L. Crance, S. P. Dahle, B. S. Fadely, M. C. Ferguson, K. T. Goetz, J. M. London, E. M. Oleson, R. R. Ream, E. L. Richmond, K. E. W. Shelden, K. L. Sweeney, R. G. Towell, P. R. Wade, J. M. Waite, and A. N. Zerbini
2023 Alaska marine mammal stock assessments, 2022. U.S. Department of Commerce, NOAA Technical Memorandum NMFSAFSC-474.

Zerbini, A.N., K.M. Parsons, K.T. Goetz, R.P. Angliss, and N.C. Young
2022 *Identification of demographically independent populations within the currently designated Southeast Alaska harbor porpoise stock*. U.S. Department of Commerce, NOAA Technical Memo NMFS-AFS448.