APPLICATION FOR 2008 INCIDENTAL HARASSMENT AUTHORIZATION

for
Construction Activities Associated with the Port of Anchorage Marine Terminal Redevelopment Project

Prepared for

United States Department of Transportation
Maritime Administration
400 Seventh Street, S.W.
Washington, D.C. 20590

and

Port of Anchorage
2000 Anchorage Port Road
Anchorage, Alaska 99501

and

Integrated Concepts & Research Corporation
421 West First Avenue, Suite 200
Anchorage, AK 99501

Prepared by

URS Corporation
2700 Gambell Street, Suite 200
Anchorage, Alaska 99503

JANUARY 2008

This Incidental Harassment Authorization Permit Application is a revision of the following document by Integrated Concepts and Research Corporation (ICRC) (September 2007): *Revised Petition for Regulations Pursuant to section 101(a)(5) of the Marine Mammal Protection Act Covering Taking of Marine Mammals Incidental to Phase II Construction Activities Associated with the Port of Anchorage Marine Terminal Redevelopment Project. April 2008-December 2012.* Figures 1 through 11 in this application are reprints from the ICRC document.

TABLE OF CONTENTS

Page

INTRODUCTION 1

PURPOSE OF THE MARINE TERMINAL REDEVELOPMENT PROJECT 3
SPECIFIC DESIGN CRITERIA 4

1.0 A DETAILED DESCRIPTION OF THE SPECIFIC ACTIVITY OR CLASS OF ACTIVITIES THAT CAN BE EXPECTED TO RESULT IN INCIDENTAL TAKING OF MARINE MAMMALS 1-1

1.1 OVERVIEW OF PHASE II OPERATIONS - 2007 TO 2012 1-1
1.2 2008 PROJECT ELEMENTS 1-1
1.2.1 Summary of Project Activities for 2008 1-4

2.0 THE DATES AND DURATION OF SUCH ACTIVITY AND THE SPECIFIC GEOGRAPHICAL REGION WHERE IT WILL OCCUR 2-1

3.0 THE SPECIES AND NUMBERS OF MARINE MAMMALS LIKELY TO BE FOUND WITHIN THE ACTIVITY AREA 3-1

3.1 SPECIES AND NUMBER IN THE PROJECT AREA 3-1

4.0 A DESCRIPTION OF THE STATUS, DISTRIBUTION, AND SEASONAL DISTRIBUTION OF THE AFFECTED SPECIES OR STOCKS OF MARINE MAMMALS LIKELY TO BE AFFECTED BY SUCH ACTIVITIES 4-1

4.1 HARBOR SEAL 4-1
4.2 KILLER WHALE 4-2
4.3 HARBOR PORPOISE 4-3
4.4 BELUGA WHALE 4-3
4.4.1 NMFS Aerial Surveys 4-5
4.4.2 NMFS Satellite Tag Data 4-6
4.4.3 Opportunistic Sightings 4-7
4.4.4 Knik Arm Bridge and Toll Authority 2004-2005 Baseline Study 4-8
4.4.5 Port of Anchorage 2005 through 2007 Marine Mammal Monitoring Program 4-8

5.0 THE TYPE OF INCIDENTAL TAKING AUTHORIZATION THAT IS BEING REQUESTED AND THE METHOD OF INCIDENTAL TAKING 5-9

5.1 INCIDENTAL HARASSMENT AUTHORIZATION REQUEST FOR 2008 PROJECT CONSTRUCTION SEASON 5-9

6.0 BY AGE, SEX, AND REPRODUCTIVE CONDITION, THE NUMBER OF MARINE MAMMALS (BY SPECIES) THAT MAY BE TAKEN BY EACH TYPE OF TAKING, AND THE NUMBER OF TIMES SUCH TAKINGS BY EACH TYPE OF TAKING ARE LIKELY TO OCCUR 6-1

6.1 UNDERWATER SOUND DESCRIPTORS 6-1
6.1.1 Description of Noise Sources 6-3
6.1.2 Applicable Noise Criteria 6-4
6.2 BASIS FOR ESTIMATING TAKE BY HARASSMENT 6-5

6.3 DESCRIPTION OF TAKE CALCULATION 6-13

7.0 THE ANTICIPATED IMPACT OF THE ACTIVITY UPON THE SPECIES OR STOCK 7-1

7.1 GENERAL EFFECTS OF NOISE ON MARINE MAMMALS..... 7-1
7.2 ASSESSMENT OF ACOUSTIC IMPACTS..... 7-1

8.0 THE ANTICIPATED IMPACT OF THE ACTIVITY ON THE AVAILABILITY OF THE SPECIES OR STOCKS OF MARINE MAMMALS FOR SUBSISTENCE USES8-1

9.0 THE ANTICIPATED IMPACT OF THE ACTIVITY UPON THE HABITAT OF THE MARINE MAMMAL POPULATIONS, AND THE LIKELIHOOD OF RESTORATION OF THE AFFECTED HABITAT..... 9-1

9.1 EFFECTS OF PROJECT ACTIVITIES ON MARINE MAMMAL HABITAT 9-1
9.2 EFFECTS OF PROJECT ACTIVITIES ON MARINE MAMMAL PREY 9-2
9.3 CONCLUSIONS REGARDING IMPACTS TO HABITAT..... 9-3

10.0 THE ANTICIPATED IMPACT OF THE LOSS OR MODIFICATION OF HABITAT ON THE MARINE MAMMAL POPULATIONS INVOLVED 10-1

11.0 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 AFFECTD SPECIES OR STOCKS, THEIR HABITAT, AND ON THEIR AVAILABILITY FOR SUBSISTENCE USES, PAYING PARTICULAR ATTENTION TO ROOKERIES, MATING GROUNDS, AND AREAS OF SIMILAR SIGNIFICANCE 11-1

11.1 MITIGATION MEASURES 11-1

12.0 WHERE THE PROPOSED ACTIVITY WOULD TAKE PLACE IN OR NEAR A TRADITIONAL ARCTIC SUBSISTENCE HUNTING AREA AND/OR MAY AFFECT THE AVAILABILITY OF A SPECIES OR STOCK OF MARINE MAMMAL FOR ARCTIC SUBSISTENCE USES, THE APPLICANT MUST SUBMIT EITHER A PLAN OF COOPERATION OR INFORMATION THAT IDENTIFIES WHAT MEASURES HAVE BEEN TAKEN AND/OR WILL BE TAKEN TO MINIMIZE ANY ADVERSE EFFECTS ON THE AVAILABILITY OF MARINE MAMMALS FOR SUBSISTENCE USES 12-1

13.0 THE SUGGESTED MEANS OF ACCOMPLISHING THE NECESSARY MONITORING AND REPORTING THAT WILL RESULT IN INCREASED KNOWLEDGE OF THE SPECIES, THE LEVEL OF TAKING OR IMPACTS ON POPULATIONS OF MARINE MAMMALS THAT ARE EXPECTED TO BE PRESENT WHILE CONDUCTING ACTIVITIES AND SUGGESTED MEANS OF MINIMIZING BURDENS BY COORDINATING SUCH REPORTING REQUIREMENTS WITH OTHER SCHEMES ALREADY APPLICABLE TO PERSONS CONDUCTING SUCH ACTIVITY. MONITORING PLANS SHOULD INCLUDE A DESCRIPTION OF THE SURVEY TECHNIQUES THAT WOULD BE USED TO DETERMINE THE MOVEMENT AND ACTIVITY OF MARINE MAMMALS NEAR THE ACTIVITY SITE(S) INCLUDING MIGRATION AND

OTHER HABITAT USES, SUCH AS FEEDING. GUIDELINES FOR DEVELOPING A SITE-SPECIFIC MONITORING PLAN MAY BE OBTAINED BY WRITING TO THE DIRECTOR, OFFICE OF PROTECTED RESOURCES; AND 13-1

13.1 PORT OF ANCHORAGE MARINE MAMMAL MONITORING PROGRAM 13-1

14.0 SUGGESTED MEANS OF LEARNING OF, ENCOURAGING, AND COORDINATING RESEARCH OPPORTUNITIES, PLANS, AND ACTIVITIES RELATING TO REDUCING SUCH INCIDENTAL TAKING AND EVALUATING ITS EFFECTS. 14-1

15.0 REFERENCES 15-1

LIST OF TABLES

Table 1-1 Open Cell Sheet Pile Quantity
Table 1-2 Fender Pilings
Table 2-1 Estimated Hours Necessary for Out-of-Water Pile Driving
Table 2-2 In-water Pile Driving Work Duration
Table 2-3 Estimated Hours Necessary for In-Water Vibratory and Impact Pile Driving
Table 2-4 Dredging Work Duration
Table 3-1 Marine Mammal Species in Cook Inlet
Table 6-1 Definition of Acoustical Terms
Table 6-2 Representative Noise Levels of Sources
Table 6-3 Beluga Whale Level B Take Calculations for Impact and Vibratory Pile Driving for the 2008 Construction Season at the 160 dB re 1 µPa rms Threshold, Based on 2005 to 2007 Beluga Monitoring Data.
Table 6-4 Estimated Beluga Whale Level B Take Calculations for In-water Vibratory Pile Driving for the 2008 Construction Season for the 120 dB re 1 µPa rms Threshold, Based on 2005 to 2007 Beluga Monitoring Data at the POA.
Table 6-5 Estimated Take for Marine Mammals – Port of Anchorage 2008 Phase II Construction.

LIST OF FIGURES

Figure 1 Marine Terminal Redevelopment Project Vicinity Map
Figure 2 Port of Anchorage Intermodal Expansion Project Phasing Plan
Figure 3 Non-Contaminated Dredged Material Disposal Site
Figure 4 USACE and Marine Terminal Redevelopment Project Dredge Areas
Figure 5 Open-Cell Sheet-Pile Construction
Figure 6 Example of Open Cell Sheet Pile Dock
Figure 7 Fill Material Being Place During Construction of an Open Cell Sheet Pile Dock
Figure 8 Marine Terminal Redevelopment Before and After
Figure 9 Beluga Sightings in the Vicinity of Anchorage Based on Opportunistic Observations: November to April (1999-2002)
Figure 10 Beluga Sightings in the Vicinity of Anchorage Based on NOAA Fisheries Aerial Surveys: May to October (1993-2004)
Figure 11 Beluga Sightings in the Vicinity of Anchorage Based on Opportunistic Observations: May to October (1999-2002)
Figure 12 Beluga Whale Estimated Noise Exposure – Vibratory
Figure 13 Beluga Whale Estimated Noise Exposure - Impact

APPENDICES

Appendix A Department of Army Permit, POA-2003-502-N
Appendix B 2008 Tides and Work Windows
Appendix C Beluga Whale Satellite Tag Data

Appendix D Beluga Sighting Notification Procedures and Reporting Forms

ACRONYMS AND ABBREVIATIONS

µPa	microPascal
ADF&G	Alaska Department of Fish and Game
APU	Alaska Pacific University
BMPs	Best Management Practices
CFR	Code of Federal Regulations
CIMMC	Cook Inlet Marine Mammal Commission
cy	cubic yard
dB	decibel
dBa	A-weighted decibel
dB PEAK	Instantaneous peak sound pressure level
EA	Environmental Assessment
EAFB	Elmendorf Air Force Base
ESA	Endangered Species Act
ft	feet
FR	Federal Register
Hz	Hertz
ICRC	Integrated Concepts & Research Corporation
IHA	Incidental Harassment Authorization
KABATA	Knik Arm Bridge and Toll Authority
kHz	kiloHertz
km	kilometer
LGL	LGL Alaska Research Associates, Inc.
LO-LO	Load on/load off
LOA	Letter of Authorization
m	meter
MLLW	mean lower low water
MMPA	Marine Mammal Protection Act
MOA	Municipality of Anchorage
ms	millisecond
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NMML	National Marine Mammal Laboratory
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
OCSP	open cell sheet pile
PA	Pascal

ACRONYMS AND ABBREVIATIONS *Continued*

POA	Port of Anchorage, the Municipal Agency
POL	petroleum, oils, and lubricants
POC	Plan of Cooperation
Port	Port of Anchorage facilities
Project	Marine Terminal Redevelopment Project
PTS	permanent threshold shift
re 1 µPa	referenced to one micropascal
rms	root-mean-squared
RO-RO	roll on/roll off
SEL	sound energy level
SPLs	sound pressure levels
sq km	square kilometer
TL	Transmission Loss
TTS	temporary threshold shift
URS	URS Corporation
USACE	United States Army Corps of Engineers
USC	United States Code
USCG	United States Coast Guard
USDOT	United Stated Department of Transportation

INTRODUCTION

The National Oceanographic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) regulations governing the issuance of Incidental Harassment Authorizations (IHAs) permitting the incidental, but not intentional, take of marine mammals under certain circumstances are codified in 50 Code of Federal Regulations (CFR) Part 216, Subpart I (Sections 216.101-216.108). The Marine Mammal Protection Act (MMPA) defines **take** to mean to *"harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal"* (16 United States Code [USC] Chapter 31, Section 1362 (13)). Section 216.104 sets out 14 specific items that must be addressed in requests for rulemaking and renewal of regulations pursuant to Section 101(a)(5) of the MMPA. The 14 items are addressed in Sections 1 through 14 of this IHA application.

The Port of Anchorage (POA) and the Department of Transportation Maritime Administration request an authorization for the incidental, but not the intentional, take (Level B) of marine mammals during Phase II construction activities associated with the Marine Terminal Redevelopment Project (Project) from April through December 2008. A Letter of Authorization (LOA) request will be submitted at a later date for 2009 through 2012 construction activities.

The Project is designed to upgrade and expand the Port of Anchorage facilities (Port) by replacing aging and obsolete structures and providing additional dock and backland areas with ensuing benefits to the Municipality of Anchorage (MOA) and the State of Alaska. Approximately 75 percent of goods used in the State of Alaska, including fuel products, flow through the Port. The Project is also critical to improving national defense capabilities and providing additional land and facilities necessary to support military deployments, consistent with the Port being identified as one of sixteen Strategic Commercial Ports in the nation. The Project will add 135 acres of surface area to the existing Port facilities with a footprint of 138 acres on sub-tidal, intertidal, and other lands. Earth materials for the Project will be obtained from two material sources (Cherry Hill and North End borrow sites) being developed on Elmendorf Air Force Base (EAFB) adjacent to the Port or from existing commercial sources.

In accordance with the National Environmental Policy Act (NEPA), an Environmental Assessment (EA) was prepared for the Project in March 2005, with a subsequent Finding of No Significant Impact (Anchorage Port Expansion Team 2005). On August 24, 2005, the U.S. Army Corps of Engineers (USACE) issued a Section 404/10 Permit to the POA for Phase 1 Project activities. This permit authorized "*discharge [of] approximately 1,075,500 yd^3 of dredged and/or fill material within a 27-acre intertidal area north of existing Port facilities, for construction of a transit/staging area for Department of Defense cargo deployment*" (POA-2003-502-2, Ship Creek) (August 24, 2005 – August 24, 2008).

On August 10, 2007, USACE issued a second Section 404/10 Permit to the POA, for Phase II Project activities, which authorizes "*discharge [of] dredged and fill material in waters of the U.S., including wetlands, necessary for the expansion of the Port of Anchorage within Knik Arm*

at and adjacent to the Port of Anchorage and within wetlands located northeast of the Port on Elmendorf Air Force Base, Alaska" (POA-2003-502-N) (August 10, 2007 – August 10, 2014) (Appendix A).

The Project is divided into two phases. The recently completed first phase (Phase I – 2006) entailed expansion of the north backlands area and filling 27-acres of intertidal footprint to provide approximately 21 acres of usable land that is now a transit/staging area for military deployments. Phase I activities were initially included under an IHA application submitted in November 2005; however, since Phase I construction did not involve any significant in-water noise-producing activities, the IHA application was withdrawn in March 2006. NMFS concurred in a letter dated May 9, 2006, that incidental take of marine mammals was not likely to occur, and an IHA was not necessary if operations ceased when animals were seen within 50 meters (m) of in-water fill activities.

In June of 2006, the POA and the Maritime Administration requested an LOA for the incidental take of marine mammals during in-water pile driving activities to be conducted from April 1, 2007 through October 31, 2012. In January 2007, the POA, Maritime Administration, and Integrated Concepts and Research Corporation (ICRC), program manager for the project, in consultation with the NOAA/NMFS, submitted a revised IHA/LOA application, which updated construction sequencing for the Project. The revised application requested a partitioning of the incidental take permit for the balance of Phase II activities. Specifically, the revised IHA/LOA requested an IHA for 2007 Project work and an LOA for the Project activities to be conducted between 2008 and 2012.

However, the majority of the 2007 construction work did not involve the in-water noise-producing activities (sheet pile driving) previously anticipated. Therefore, the POA and the Maritime Administration withdrew their revised 2007 IHA/LOA request. In-water fill placement activities in 2007 were conducted with an enforced construction shut-down criteria of 50 m when marine mammals were observed within or near the established safety zone radius; similar to the shut-down criteria for the in-water activities conducted in 2006.

In October 2007, NMFS, Office of Protected Resources, concurred with the POA and the Maritime Administration that an IHA was not required for land-based Project activities, or for a test pile driving program. During the subsequent 2007 test pile driving program; NMFS stipulated that in-water construction activities be shut-down if marine mammals were sighted within or near a 650 m safety zone. Because there will be no potential for serious injury or mortality to marine mammals during Phase II Project activities, this application requests an IHA for the specific in-water activities planned for the April 2008 through December 2008 construction season. An LOA application will be submitted in the near future for Project activities planned from 2009 through 2012, including deep-water pile driving. This 2008 IHA application provides information and evaluation necessary to meet the requirements mandated by Section 7 of the Endangered Species Act (ESA), NEPA and MMPA.

PURPOSE OF THE MARINE TERMINAL REDEVELOPMENT PROJECT

The construction activity addressed in this IHA application pertains to a critical intermodal facility expansion necessary to accommodate commerce within the State of Alaska. Figure 1 shows the vicinity map. Located within the MOA on Knik Arm in Upper Cook Inlet, the 129-acre Port facility is currently operating at or above sustainable practicable capacity for the various types of cargo handled at the facility. In addition, the existing facilities are substantially past their design life, have degraded to levels of marginal safety and are in many cases functionally obsolete. The Project will expand and upgrade the current Port facility to address existing needs and projected future needs, allowing the Port to adequately support the economic growth of Anchorage and the State of Alaska through 2025. Operations at the Port would improve and increase with the expansion, construction, and reorganization. Port expansion is also critical to national defense, providing the additional land and facilities necessary to support military deployments at this strategic site. The Project will address the following needs.

- **Necessary replacement of obsolete infrastructure:** Certain elements of the existing Port infrastructure are functionally obsolete and are near or below design safety standards for seismic events. These infrastructure elements will be replaced, warehouse storage developed, and code-compliant support structures relocated.
- **Additional capacity to accommodate growth in current customers:** Current and near-future cargo-handling capacity will continue to exceed maintainable, safe, and efficient levels. Operational analyses and the projected population growth for the MOA and the State of Alaska have identified a need for approximately 135 additional acres of land and additional berth space to support existing and future Port operations.
- **Additional berths to provide service to new and existing customers**: Expected growth of operations coupled with existing customer demand will result in at least a 40 percent growth in ship calls, causing berthing conflicts, increased waiting times for berths, and increased transportation costs to the public. The expanded and upgraded Port will be capable of safely and efficiently handling commerce and military needs until 2025 and possibly beyond.
- **Deeper drafts, longer berths, larger cranes for offloading, and more streamlined intermodal transportation to efficiently handle new ships with the ability to move the increasing amount of cargo out to the public:** Current trends in maritime transportation have produced larger, longer ships that cannot be supported by the current Port facilities. The deeper drafts and wider beams of these large ships require longer, deeper berths and cranes with a wider reach capacity for unloading. Failure to expand would result in increasing inefficiencies and cost for shipping goods to Alaskan customers. Operational limitations of the existing Port infrastructure require that loading procedures at ports of origin be restricted to accommodate the limited crane reach at the Port.
- **Lighting, gates, and other features to meet new security requirements under the new Maritime Security mandates**: The Port like all U.S. ports, must construct facilities and implement measures to comply with the Maritime Transportation Security Act of 2002,

and with the associated waterfront U.S. Coast Guard (USCG) maritime security regulations, which were designed to protect the nation's ports and waterways from terrorist attack.

- **Additional space and improved berthing to support military rapid deployments without conflicting with commercial customers**: As a critical conduit for military deployment, the Port will need to maintain a sustained commitment that embodies a long-term plan, integrating intermodal efficiency with that of heightened security and positive cargo control. Current berthing facilities at the Port are insufficient to accommodate both military and commercial ships supporting Alaska-based combat and support units. Expansion of facilities and increase in efficiencies are also critical for the Port to maintain its designation as a Strategic Commercial Seaport.

SPECIFIC DESIGN CRITERIA

In addition, the Project will address specific design criteria to address specific needs for the area such as:

- **Ability to withstand harsh environmental conditions:** The waters of the Upper Cook Inlet present challenges in the form of strong currents, the second most widely fluctuating tidal range in the world, ice buildup, and scour from ice and silt.
- **Ability to withstand seismic events**: The Project is located in an area of high seismic activity. The critical role of the facility in commerce for the State of Alaska mandates that the Port survive a major seismic event with the ability to continue operations. MOA's Geotechnical Advisory Commission and a mayoral-appointed Blue Ribbon Committee have imposed stringent seismic design standards for the Port with the intention of providing appropriate stability during major seismic events.

1.0 A DETAILED DESCRIPTION OF THE SPECIFIC ACTIVITY OR CLASS OF ACTIVITIES THAT CAN BE EXPECTED TO RESULT IN INCIDENTAL TAKING OF MARINE MAMMALS

1.1 OVERVIEW OF PHASE II OPERATIONS - 2007 TO 2012

Construction of Phase II of the Project began in September 2007 and will continue to December 2012. Construction activities will be conducted primarily between the spring and fall of each year. Port operations and commerce will continue uninterrupted during construction. Phase II of the Project will be accomplished by constructing approximately 7,900 linear feet (ft) of dock parallel to and approximately 400 ft west of the face of the existing dock structure, and backfilling behind the new dock structure to the existing shoreline. The new dock face will include 7,430 ft of vertical sheet-pile wharf and 470 ft for a dry barge berth. The completed marine terminal (Figure 2) will include: seven modern dedicated ship berths; two dedicated barge berths; rail access; modern shore-side facilities; equipment to accommodate cruise passengers; cement bulk, roll on/roll off (RO-RO) and load on/load off (LO-LO) cargo; containers; general cargo; military deployments, general cargo on barges; petroleum, oils, and lubricants (POL); and additional land area to support expanding military and commercial operations.

Implementing Phase II of the proposed Project will involve four components:

1. Expansion onto contiguous tidelands, installation of new cranes, and the construction of marine structures for berths to accommodate barges and additional vessels, a cement offload berth, two improved POL terminals, three longer berths to accommodate larger container ships and cruise ships, an expanded staging area for military or industrial equipment, and land for new or expanded operations.
2. Reorganization of the Port system and support structures for loading, unloading, and storage of cargo, and more efficient intermodal freight transfer facilities for commercial and military use. As part of the reorganization, the Port will provide enhanced security measures and improved equipment for loading and unloading containers.
3. Excavation and transport of fill material from EAFB at Cherry Hill and the North End borrow sites by use of improved haul roads to the Port.
4. Construction dredging in the dock footprint to provide a stable surface for the future dock.

1.2 2008 PROJECT ELEMENTS

Construction activities will take place both in-water and above the water surface. This IHA application addresses potential impacts from Port expansion activities to marine mammals.

Dredging. Phase II construction dredging activities will employ methods similar to those currently used by USACE for ongoing harbor maintenance dredging. Dredge equipment will likely be one standard-size clamshell dredger on a barge, with a tugboat and another barge and

tugboat to transport dredged material to the disposal site and/or one standard-size cutterhead hopper dredger on a barge with a tugboat. The typical operation schedule for this equipment is seven days a week from approximately 6:00 a.m. to 10:00 p.m. Dredging to support construction will remove fine silts and clays to facilitate pile driving (see Figures 3 and 4). Once construction of the expanded facilities begins, additional USACE dredging will also be necessary for creating the appropriate operational bathymetry at the Port. Dredging in the North Extension area construction footprint will be conducted in 2008. USACE dredging to deepen the harbor adjacent to the North Extension area is anticipated to occur in 2009.

Open Cell Sheet Pile Construction. Construction of the waterfront bulkhead structure will entail installation of conjoining face and tail sheet-pile cells, forming a row of U-shaped, open cell sheet pile (OCSP) structures to retain backfill. Typical OCSP construction is shown in Figures 5 and 6. Individual face sheets will be approximately 20 inches wide, 0.5-inch thick, and up to a maximum of 90 ft in length. The cells will serve to retain the fill material and provide the vertical bulkhead docking structure for berthing barges and ships. Approximately 17 face sheets and one tail wall per 27.5 linear ft of dock face will be used. Each tail wall will extend up to 183 ft landward from the dock face and include up to 110 tail sheets. Table 1-1 depicts the number of face and tail sheets to be placed during the 2008 construction season.

Table 1-1. Open Cell Sheet Pile Quantity[1]

Face Length (ft)	*Number of Face Sheets*	*Number of Tail Sheets*	*Weight (Tons)*
2,923	1,807	8,175	13,412

Note: [1]The length of face exceeds the length of berthing due to the indent at the dry barge berth.

It is anticipated that mostly land-based methods will be used to install the OCSP; however, individual contractors may choose to use barge-mounted equipment for some of the work. A temporary template will be used to guide the adjacent and jointed sheet piles to their proper position. The template will be positioned in the correct location with the help of survey instruments.

A pile-driving hammer will be used to install sheet piles to the desired tip elevation. For the future dredge depth elevation of -35 ft mean lower low water (MLLW), the tip elevation is -50 MLLW. For the future dredge depth of -45 ft MLLW, the tip elevation is -60 ft MLLW. Tip elevation does not influence pile driving time as the naturally shallower areas on the north and south ends are planned to have shallower dredge depths. Because of the hard substrate in the North Extension and Barge Berths areas, we anticipate a vibratory pile driver will be used for approximately 40 percent of the time, and the remaining length will be driven with an impact hammer. The substrate is clay with lenses of dense sands and gravels. Use of impact hammers will be limited to situations where vibratory methods are not sufficient to achieve final tip elevation of the pile. An estimated 60 percent of the pile driving time associated with OCSP construction will involve the use of impact hammers. On average, approximately 30 linear ft of

OCSP wall will be constructed in a 10-hour period, which equates to 4.7 ft of waterfront per 10 hour shift (see Section 2).

Fill Material. To complete the 2008 Project tasks, approximately 1,792,000 cubic yards (cy) of suitable engineered and common fill material will be placed behind vertical steel or rock retaining features at the South Backlands, Barge Berths, and North Extension areas.

Engineered fill material, consisting of clean sand, gravel, or stone, will be placed immediately behind the sheet-pile face; common fill may be used between the engineered fill and the existing shore to complete the backlands portion of each phase under dewatered conditions where and when possible. Off-road trucks and bulldozers will deposit and spread the fill material behind the OCSP face wall (up to an elevation of +30 ft). A vibratory probe and a vibratory pile-driving hammer will be used at evenly spaced locations to consolidate this fill. Fill material placed above elevation +30 ft will be compacted using conventional sheepsfoot or vibratory equipment. Figure 7 shows OCSP filling operations. Work hours for pile driving and mass filling of the OCSP are anticipated to be 6:00 a.m. to 10:00 p.m., up to seven days a week. This is the same daily work period incorporated into the evaluation of takes for this 2008 IHA application.

The POA and the Maritime Administration in cooperation with EAFB, are obtaining the majority of the fill material from two borrow sites on EAFB. The location of the haul roads and borrow sites are depicted on Figure 1. Contractors will adhere to Best Management Practices (BMPs) and special procedures set forth in the bid package, in addition to complying with the laws and regulations governing placement of fill material and the protocol to be followed when contamination is encountered at source sites.

ICRC requires construction contractors to identify and implement BMPs to prevent erosion and sedimentation during construction and operation; control specific on-site erosion and sedimentation; protect adjacent properties and watercourses from effects related to erosion, sedimentation, and flooding; control spills; and handle potentially hazardous materials and waste in accordance with federal, state, and local requirements.

ICRC will monitor 2008 construction activities to verify proper implementation of BMPs. Construction contractors will be required to provide certification that fill materials imported from commercial sources have been tested to document that the materials are free of contamination prior to being used on the Project.

Fendering System. Pipe piles will be driven for attaching fenders in front of the dock. Installation will be accomplished using vibratory (40 percent of the time) and impact pile drivers (60 percent of the time). Impact hammers will be used only when vibratory methods are not sufficient to complete the designed installation. One fender pile will be placed approximately every 55 ft along the entire face of the newly constructed 723 ft of OCSP dock to be constructed in 2008 at the Barge Berth location. These piles will be approximately 2 ft in diameter and 40 ft long. The fender piles will be driven in the open water in front of the OCSP face using a land-based crane with vibratory and impact-unit attachments. Fifteen feet of fender piles will be

embedded, with the remaining portion left freestanding for attachment of fenders. Table 1-2 provides approximate numbers and lengths of fender pile to be installed in 2008. The sound levels emitted from the hollow round piles used for the fendering system are treated the same acoustically as the H piles, since they are few in number and their relatively shallow installation will allow for short pile driving time.

Table 1-2. Fender Pilings

Year	*Face Length (ft)*	*Number of Piles*	*Length of Pile (ft)*	*Pile Weight (Tons)*
2008	723	14	560	66

Note: The length of face exceeds the length of berthing due to the indent at the dry barge berth.

1.2.1 Summary of Project Activities for 2008

General Project activities are divided by the summer (ice free) and winter construction seasons. Typically, the summer season is expected to begin April 15 and end October 31; and the winter season is expected to begin November 1 and extend through April 14, 2009. The length of the summer and winter seasons varies depending upon weather conditions, such as the ice-break-up period in the spring and freezing conditions in the fall. It may be possible to extend some activities beyond the end date, or begin earlier than anticipated due to the location of the activities and the overall Project schedule. An outline and construction sequence of the activities expected to be conducted during the summer and winter seasons in 2008 is presented below. A conceptual drawing showing the appearance of the Port before (2003) and after (2012) construction activities is presented in Figure 8.

2008 Port of Anchorage Intermodal Expansion Project
Construction Sequence

Spring 2008

- South Backlands: settling of fill material
- Barge Berth: settling of fill material

Summer 2008

- South Backlands (in-water footprint completed in 2007)
  - placement of 60,000 cy fill material (no in-water work)
  - standard layer compaction during placement of fill material
- Barge Berths (in-water footprint completed in 2007)
  - 1,123 linear ft sheet pile bulkhead
  - vibracompaction of deep fill material
  - 723 linear ft of dock face/fendering and mooring preparation of dry barge berth landing
  - placement of 94,000 cy fill material (no in-water work)
- North Extension (18.4 acres)
  - 1,800 linear ft sheet pile bulkhead
  - placement of 1,616,000 cy of fill material

- construction dredging 125,000 cy
- placement of 22,000 tons riprap
- vibracompaction of deep fill material

Winter 2008/2009

- South Backlands: settling of fill material
- Barge Berths: settling of fill material
- North Extension: settling of fill material

This page intentionally left blank.

2.0 THE DATES AND DURATION OF SUCH ACTIVITY AND THE SPECIFIC GEOGRAPHICAL REGION WHERE IT WILL OCCUR

The Project area is within Knik Arm in Upper Cook Inlet, extending from existing Port facilities north to Cairn Point and south towards Ship Creek within Sections 6, 7, and 31, Townships 13 and 14 North, Range 3 West; Anchorage, Alaska (refer to Figure 1). In-water pile driving activities will be conducted in the Barge Berths and North Extension areas. Dredging will also be conducted in the North Extension area.

In-water construction, including pile driving, for the 2008 season is scheduled to begin April 2008 and continue through December 2008. Dredging activities will proceed as necessary during the scheduled 2008 construction season.

Table 2-1 shows the estimated hours necessary for out-of-water pile driving. Table 2-2 shows the estimated hours necessary for in-water pile driving, including the additional hours needed to install and remove temporary support pipe piles, the work crew hours necessary to accomplish the in-water pile driving task, the available hours of daylight, and the total hours necessary to complete in-water pile driving for the 2008 construction season. Table 2-3 shows the estimated hours necessary for in-water vibratory and impact pile driving. Table 2-4 shows the estimated hours necessary for dredging.

Safety Zone: The USACE Section 404/10 permit established a safety radius of 650 m and shut down standards around in-water pile driving activities. The USACE permit states the POA shall conduct on-site underwater noise surveys to verify the 190,180, and 160 dB re 1 µPa rms isopleths from in-water pile driving activities. Safety zones appropriate to the Project site conditions and equipment will be empirically determined and implemented with the dB 1 µPa rms safety zone enforced. The POA may obtain authorization under section 101 (a)(5) of the Marine Mammal Protection Act for the incidental and unintentional taking of marine mammals and safety zones provided within the authorization will be enforced. During in-water pile driving, the safety zone will be monitored for the presence of marine mammals before, during, and after any pile driving activity. If the safety zone is not visible because of fog or poor lighting conditions, activities will cease until the area is visible. In October 2007, NMFS, Office of Protected Resources, stipulated a 3,000 m safety zone for vibratory test pile driving and 3,490 m safety zone for impact test pile driving. The initial 650 m shut down criterion will be adjusted based on stipulations by NMFS.

Daylight Restrictions. Civil twilight was used to estimate the available daylight hours for pile driving and marine mammal monitoring. Pile driving will only be conducted when the stipulated safety radius is visible. Available daylight hours are further reduced by USACE Section 404/10 permit stipulations for a shut down of in-water pile driving activity for one week following the release of juvenile salmon smolt from the Ship Creek Hatchery.

Tidal Restrictions. Except when the entire pile is out of the water due to shoreline elevation or tidal stage, impact pile driving will not take place within two hours on either side of low slack tide. There are no stipulations regarding the shut down of vibratory pile driving in the USACE permit.

This tidal stage restriction reduces the number of hours per day for in-water impact pile driving by eight hours since there are two low tides in a 24-hour cycle. However, low tide will not always occur during daylight work hours. Knik Arm's diurnal (two high and two low) tides are generally separated by approximately six hours. Therefore, low tides are generally separated by approximately 12 hours.

Pile driving will occur in both the submerged and tidally influenced zones. The submerged zone is defined as seaward of the dike fill at or below the elevation 0.0 ft MLLW. Therefore, whether the pile is physically touching the water or not has no bearing on its identification as a submerged zone piling. Impact pile driving will not occur in the submerged zone for two hours on either side of low tide.

Piles can be placed within the tidally influenced zone when they are not in direct contact with the water column, i.e., dewatered during the ebb tide. The tidally influenced zone encompasses the area above 0.0 ft MLLW to the point where the dike intersects the top of the fill slope, and about 50 percent of the pile driving is estimated to occur in-water within this zone. Any piles driven outside of the submerged or tidally influenced zones are considered out-of-water pile driving and are not subject to the timing restrictions of the permit conditions.

During the four-hour low tide restrictions during impact pile driving, pile driving crews will focus on out-of-water pile driving activities or vibratory pile driving. The estimated time required for out-of-water pile driving activities is shown in Table 2-1. Appendix B shows the tides and available work windows for the project area.

Table 2-1: Estimated Hours Necessary for Out-of-Water Pile Driving

Estimated Total to Complete Pile Driving	*Estimated Total Hours Necessary for 2 Work Crews to Complete Pile Driving*	*Pile Face (ft)*
2,940 [1]	1,470 [2]	6,073 [3]

Notes: [1] 6,073 wall-ft x (1 shift/30 wall-ft) x (10 hrs/shift) = 2,024 hours. Add to this the following: 50 percent of 5,496 ft (half of 5,496 is the tidally influenced wall length that is considered out of water) and multiply by (1 shift/30 wall-ft) x (10 hrs/shift) = 916 hours. 2,024 + 916 = 2,940 hours.
[2] Divide hours in half to account for two work crews working concurrently (2940 x 0.50 = 1470)
[3] 30 ft wall completed in a 10-hour shift

Other Restrictions. Fog and poor lighting conditions will cause a shut down of pile driving activities during periods when the stipulated safety radius is not fully visible. Available work hours are further reduced during and immediately following the release of juvenile salmon smolt from the Ship Creek Hatchery. As stipulated in the USACE permit, no in-water pile driving will be conducted within one week following smolt releases. The release of smolt is currently scheduled for the weeks of approximately May 12, 2008 and June 23, 2008. However, the exact dates are unknown.

Table 2-2: In-Water Pile Driving Work Duration						
Zone	***Wall Length (ft)*** [1]	***Estimated Hours Pile Driving***	***Daylight Hours Available for Work*** [3]	***Hours to Complete Sheet & Hollow Pile Driving (2 Crews)*** [4]	***Hours to Complete Temporary Pipe Pile (2 Crews)*** [6]	***Estimated Total Hours to Complete Pile Driving (2 Crews)*** [7]
Submerged	4,397	1,466	-	550	43	572
Tidally influenced	5,496	916 [2]	-	344		344
Total	9,893	2,382	2,368	894 [5]	22	**916**

Notes: [1] Estimated 30 ft of wall completed in a 10-hour period.
[2] Tidally influenced pile driving (includes sheet piles and hollow piles for fendering) is estimated to take 1,832 hours. Our estimate is reduced by 50 percent to account for the portion of time that would actually be in-water (1,832 x 0.50 = 916).
[3] Available daylight hours are reduced by two weeks or 173 hours of available work time due to smolt release from the Ship Creek Hatchery (2,541 – 173 = 2,368)
[4] Two pile driving crews will be working concurrent 10-hour shifts from April 1, 2008 to October 31, 2008. We assume each crew will spend 50 percent of their 10-hour work day pile driving and the other 50 percent performing support tasks. The crews pile driving tasks will not be synchronized.
[5] 2,382 hours total estimated for in-water pile driving is divided by 50 percent for two crews (2,382 x 0.50 = 1,191) for a total 1,191 hours estimated for in-water pile driving. For estimation purposes, we also assume 75 percent (1,191 x .75 = 894) of the total available hours will be spent in-water pile driving equaling 894 hours of in-water pile driving.
[6] Four temporary pipe piles will be driven to support each of the 64 sheet pile templates (cells) (4 pipe piles x 64 templates = 256 piles). An estimated 10 minutes is required to install and later remove each temporary pipe pile (4 pipe piles x 10 minutes = 40 minutes per template) (64 templates x 40 minutes = 43 hours) 43 is divided by 50 percent for two crews (43 x.0.50=21.5, rounded up to 22)
[7] Total hours available for in-water pile driving is 2,368. The total number of hours necessary to accomplish in-water pile driving for the 2008 construction season is 916 (894 + 22 = 916)

Table 2-3 shows the estimated number of hours necessary to complete in-water vibratory and impact pile driving for the 2008 Construction Season

Table 2-3: Estimated Hours Necessary for In-Water Vibratory and Impact Pile Driving		
Estimated Total Hours Necessary for 2 Work Crews to Complete Pile Driving	***Total Hours Estimated for Vibratory Pile Driving (40%)***	***Total Hours Estimated for Impact Pile Driving (60%)***
916	366	550

Dredging: Dredging will be required prior to pile driving in the North Extension area. Table 2-4 shows the estimated amount of material to be removed, the estimated production rate based on USACE estimates, and the number of days and hours required to complete planned dredging activities.

Table 2-4: Dredging Work Duration			
Estimated Removal (cy)	***Estimated Production Rate (cy/day)*** [1]	***Required Dredging Days***	***Required Dredging Hours*** [2]
125,000	4,000	31	310

Notes: [1] Based on USACE estimated production rates (Meeting between USACE, POA, and ICRC, September 2005)
[2] 31 days x 10 hours per shift = 310 hours

This page intentionally left blank.

3.0 THE SPECIES AND NUMBERS OF MARINE MAMMALS LIKELY TO BE FOUND WITHIN THE ACTIVITY AREA

3.1 SPECIES AND NUMBER IN THE PROJECT AREA

Of the 15 species of marine mammals that are residents or occur seasonally in Cook Inlet, only harbor seals (*Phoca vitulina richardsi*) and beluga whales (*Delphinapterus leucas*) are commonly observed in Upper Cook Inlet (Shelden et al. 2003; National Marine Mammal Laboratory [NMML] 2004). Killer whales (*Orcinus orca*) and harbor porpoises (*Phocoena phocoena*) are infrequently to rarely observed in the Port area (Table 3-1). There are no estimates for these species in Cook Inlet, except for the beluga whale, so estimates are for the entire stocks. The population estimate for the harbor porpoise and harbor seal are for the Gulf of Alaska stocks, which include Cook Inlet. The population estimate for resident killer whales is for the Eastern North Pacific stock, whereas the estimate for the transient population is for the Gulf of Alaska, Aleutian Islands, and Bering Sea stock, both of which overlap the Cook Inlet. Only the population estimate for the beluga whale stock is exclusively for Cook Inlet, since the stock is assumed to reside in the inlet year-round. Except for the beluga whale, very small proportions of the populations for the other species occur in Cook Inlet, and even fewer in Upper Cook Inlet near the project site. This IHA application assesses the potential impacts of the Project on these four species. Each species is discussed more fully in Section 4.

Table 3-1: Marine Mammal Species in Cook Inlet

Species	***Abundance***	***Comments***
Harbor seal *(Phoca vitulina richardsi)*	29,175 [1]	Occurs in the project area. No special status or ESA listing
Beluga whale (*Delphinapterus leucas*)	302 [2]	Occurs in the project area. Listed as Depleted under the MMPA.
Killer (Orca) whale *(Orcinus orca)*	1,123 Resident 314 Transient [3]	Occurs rarely in the project area. No special status or ESA listing.
Harbor porpoise *(Phocoena phocoena)*	249 [4]	Occurs infrequently in the project area. No special status or ESA listing.

Notes: [1] Abundance estimate for the Gulf of Alaska stock (Angliss and Outlaw 2005)
Sources: Angliss and Outlaw 2005, NMFS 2006a, b
[2] Rugh et al. 2007
[3] Angliss and Outlaw 2005
[4] Waite and Hobbs, In Review

This page intentionally left blank.

4.0 A DESCRIPTION OF THE STATUS, DISTRIBUTION, AND SEASONAL DISTRIBUTION OF THE AFFECTED SPECIES OR STOCKS OF MARINE MAMMALS LIKELY TO BE AFFECTED BY SUCH ACTIVITIES

4.1 HARBOR SEAL

Harbor seals range from Baja California, north along the west coasts of the Washington, Oregon, and California, British Columbia, and Southeast Alaska; west through the Gulf of Alaska, Prince William Sound, and the Aleutian Islands; and north in the Bering Sea to Cape Newenham and the Pribilof Islands. There are three stocks in Alaska: Southeast Alaska, Gulf of Alaska (including Cook Inlet), and Bering Sea. The Gulf of Alaska stock was estimated to have 29,175 individuals. Harbor seals are taken incidentally during commercial fishery operations at an estimated annual mortality of 36 individuals (Angliss and Outlaw 2005).

Harbor seals inhabit the coastal and estuarine waters of Cook Inlet. A relatively small but unknown proportion of the population occurs in Cook Inlet. Harbor seals are more abundant in Lower Cook Inlet than in the upper inlet, but they occur in the upper inlet throughout most of the year (Rugh et al. 2005). They haul out on rocks, reefs, beaches, and drifting glacial ice, and feed on capelin, eulachon, cod, pollock, flatfish, shrimp, octopus, and squid in marine, estuarine, and occasionally fresh waters. Harbor seals are non-migratory; their local movements are associated with tides, weather, season, food availability, and reproduction.

The major haul-out sites for harbor seals are located in Lower Cook Inlet. The closest identified harbor seal haul-out site to the Port is approximately 25 miles south along Chickaloon Bay in the southern portion of Turnagain Arm (Alaska Department of Natural Resources 1999; NMFS 2003). The presence of harbor seals in Upper Cook Inlet is seasonal. They are commonly observed along the Susitna River and other tributaries within Upper Cook Inlet during eulachon and salmon migrations (NMFS 2003). During aerial surveys of Upper Cook Inlet in 2001, 2002, and 2003, harbor seals were observed 15 to 60 miles south-southwest of Anchorage at the Chickaloon, Little Susitna, Susitna, Ivan, McArthur, and Beluga Rivers (Rugh et al. 2004a; 2004b). Harbor seals are sometimes observed in Knik Arm and in the vicinity of the Port, primarily near the mouth of Ship Creek (NMML 2004; Rugh et al. 2004a; 2004b; LGL Unpublished Data).

Harbor seals respond underwater to sounds from 1 to 180 kiloHertz (kHz) with a peak sensitivity of 32 kHz (Kastak and Schusterman 1995). Hearing ability in the air is greatly reduced; harbor seals respond to sounds from 1 to 22.5 kHz, with a peak sensitivity of 12 kHz. A general audiogram for odontocetes and pinnipeds (e.g., harbor seal) from the University of Rhode Islands' Discovery of Sound in the Sea website (http://www.dosits.org/index.htm) is provided in Chart 4-1.

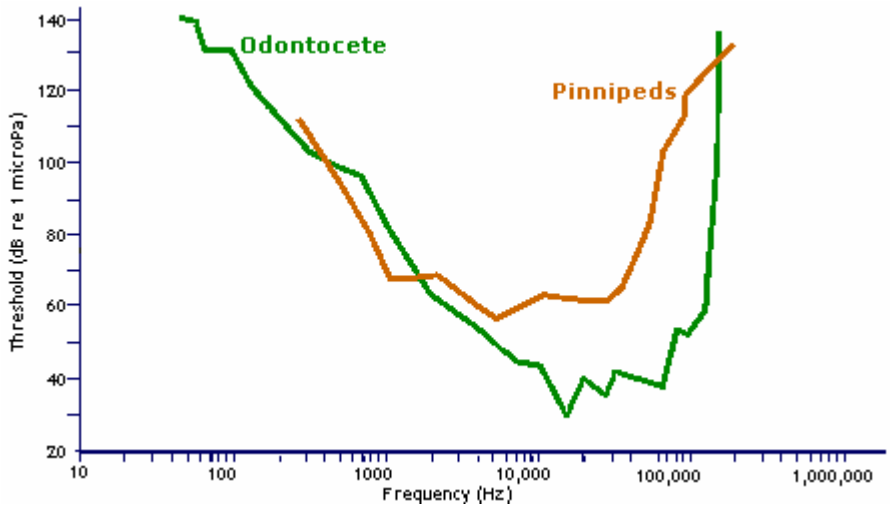


Chart 4-1: Odontocete and Pinniped Audiogram*
Notes: dB re 1 microPa – decibels referenced to 1 microPascal
Hz – Hertz
* - Odontocete = killer whale and harbor porpoise, pinniped = harbor seal
Source: University of Rhode Islands' Discovery of Sound in the Sea website (http://www.dosits.org/index.htm)

4.2 KILLER WHALE

The population of the North Pacific Stock of killer whales (*Orcinus orca)* contains an estimated 1,123 animals in the resident group and 314 animals in the transient group (Angliss and Outlaw 2005). Numbers of killer whales in Cook Inlet are small compared to the overall population and most are recorded in the Lower Cook Inlet. In Upper Cook Inlet, transient killer whales are known to feed on beluga whales, and resident killer whales are known to feed on anadromous fish (Shelden et al. 2003). The availability of these prey species largely determines the likeliest times for killer whales to be in the area. Twenty-three killer whales were reported in the upper inlet between 1993 and 2004 in aerial surveys by Rugh et al. (2005). Surveys over 20 years by Sheldon et al. (2003) reported 11 sightings in Upper Cook Inlet between Turnagain Arm, Susitna Flats, and Knik Arm. No killer whales were spotted during recent surveys by Funk et al. (2005) and Ireland et al. (2005). Eleven killer whale strandings have been reported in Turnagain Arm; six in May 1991, and five in August 1993. Few killer whales, if any, are expected to approach the Project area.

The hearing of killer whales is well developed. Szymanski et al. (1999) found that they responded to tones between 1 and 100 kHz, with the most sensitive range of 18 to 42 kHz. Their greatest sensitivity was found to be at 20 kHz, which is lower than many other odontocetes, but it matches peak spectral energy reported for killer whale echolocation clicks. A general audiogram for odontocetes (e.g., killer whale) and pinnipeds from the University of Rhode Islands' Discovery of Sound in the Sea website (http://www.dosits.org/index.htm) is provided in Chart 4-1 in Section 4.1.

4.3 HARBOR PORPOISE

Harbor porpoise *(Phocoena phocoena)* stocks in Alaska are divided into three stocks: the Bering Sea stock, the Southeast Alaska stock, and the Gulf of Alaska stock. The Gulf of Alaska stock is currently estimated at 30,506 individuals (Angliss and Outlaw 2005). Surveys completed by Waite and Hobbs (in review) estimated the population of harbor porpoises in Cook Inlet to number 249 individuals in 1998. The estimated density of animals in Cook Inlet is 7.2 per 1,000 square kilometers (sq km) (386 square miles) (Dahlheim et al. 2000). Harbor porpoise have been reported in Lower Cook Inlet from Cape Douglas to the West Foreland, Kachemak Bay, and offshore (Rugh et al. 2005). Small numbers of harbor porpoises have been consistently reported in the Upper Cook Inlet between April and October. Highest monthly counts include 18 harbor porpoises reported by LGL (2006), 14 by Brueggeman (2007), and 17 by Brueggeman (personal communication, December 2007) between Granite Point and the Susitna River during 2006 and 2007.

The harbor porpoise has the highest upper-frequency limit of all odontocetes investigated. Kastelein et al. (2002) found that the range of best hearing was from 16 to 140 kHz, with a reduced sensitivity around 64 kHz. Maximum sensitivity (about 33 decibels [dB] referenced to 1 microPascal [re 1 µPa]) occurred between 100 and 140 kHz. This maximum sensitivity range corresponds with the peak frequency of echolocation pulses produced by harbor porpoises (120–130 kHz). A general audiogram for odontocetes (e.g., harbor porpoise) and pinnipeds from the University of Rhode Islands' Discovery of Sound in the Sea website (http://www.dosits.org/index.htm) is provided in Chart 4-1 in Section 4.1.

4.4 BELUGA WHALE

Although not listed under the ESA as threatened or endangered, the Cook Inlet beluga whale population has been designated as depleted under the MMPA (65 Federal Register [FR] 34590, 5-31-2000). NMFS received petitions to list the Cook Inlet beluga whale stock as an endangered species under the ESA (64 FR 17347, 4-9-1999). However, NMFS determined that listing this stock under the ESA was not warranted at the time (65 FR 38778, 6-22-2000). This decision was upheld in court. NMFS announced initiation of another Cook Inlet beluga whale status review under the ESA (71 FR 14836, 3-24-2006) and received another petition to list the Cook Inlet beluga whale under the ESA (71 FR 44614, 8-7-2006). NMFS issued a decision on the status review concluding that the Cook Inlet beluga whale is a distinct population segment that is in danger of extinction throughout its range; NMFS issued a proposed rule to list the Cook Inlet beluga whale as an endangered species. Public hearings were conducted in July 2007, and the comment period extended to August 3, 2007. A final decision has not been made to list the population at this time.

Beluga whales appear seasonally throughout much of Alaska, except in the Southeast region and the Aleutian Islands. Five stocks are recognized in Alaska: Beaufort Sea, eastern Chukchi Sea, eastern Bering Sea, Bristol Bay, and Cook Inlet (Angliss and Outlaw 2005). The 2006

population estimate for the Cook Inlet stock is 302 individuals (Rugh et al. 2007). Based on available data and estimates, beluga whales are not taken incidentally during commercial fishery operations (Angliss and Outlaw 2005). For the proposed project, only the Cook Inlet stock could occur in the project area. The Cook Inlet stock is the most isolated of the five stocks, since it is separated from the others by the Alaska Peninsula (Laidre et al. 2000).

The following discussion of the distribution of beluga whales in Upper Cook Inlet is based upon NMML data including NMFS aerial surveys; NMFS data from satellite-tagged belugas and opportunistic sightings (NMML 2004); baseline studies of beluga whale occurrence in Knik Arm conducted for the Knik Arm Bridge and Toll Authority (KABATA) (Funk et al. 2005); and a pre-construction monitoring program at the Port (Ramos et al., 2006). These data have provided a relatively good picture of the distribution and occurrence of beluga whales in Upper Cook Inlet, particularly in the Lower Knik Arm and the Port Project area.

In terms of hearing abilities, beluga whales are one of the most studied odontocetes. Although they are known to hear a wide range of frequencies, their greatest sensitivity is around 10 to 100 kHz (Richardson et al. 1995), well above sounds produced by most industrial activities (<100 Hertz [Hz] or 0.1 Hz) recorded in Cook Inlet. Average hearing thresholds for captive beluga whales have been measured at 65 and 120.6 dB re 1 µPa at frequencies of 8 kHz and 125 Hz, respectively (Awbrey et al. 1988). Masked hearing thresholds were measured at approximately 120 dB re 1 µPa for a captive beluga whale at three frequencies between 1.2 and 2.4 kHz (Finneran et al. 2002). Beluga whales do have some limited hearing ability down to ~35 Hz, where their hearing threshold is about 140 dB re 1 µPa (Richardson et al. 1995). Thresholds for pulsed sounds will be higher, depending on the specific durations and other characteristics of the pulses (Johnson 1991). An audiogram from White et al. (1978) of the beluga whale is provided in Chart 4-2.

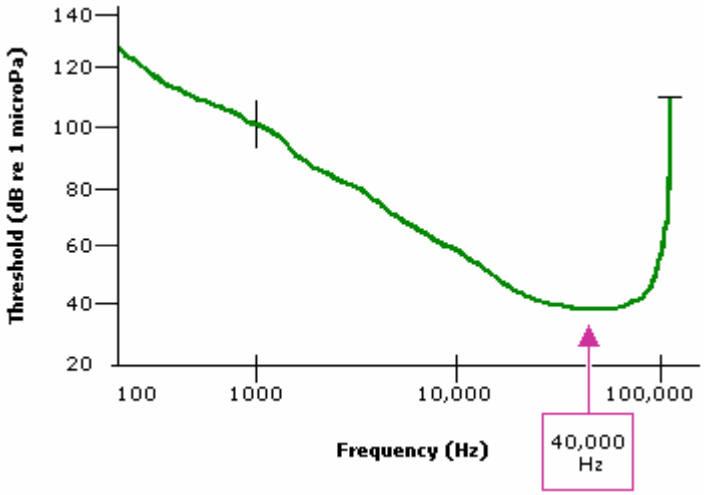


Chart 4-2: Beluga Whale Audiogram

Notes: dB re 1 µPa – decibels referenced to 1 microPascal
Hz – Hertz Source: White et al. (1978)

4.4.1 NMFS Aerial Surveys

Since 1993, NMFS has conducted annual aerial surveys in June or July to document the distribution and abundance of beluga whales in Cook Inlet. In addition, to help establish beluga whale distribution in Cook Inlet throughout the year, aerial surveys were conducted every one to two months between June 2001 and June 2002 (NMFS 2004b). These annual aerial surveys for beluga whales in Cook Inlet have provided systematic coverage of 13 to 33 percent of the entire Inlet each June or July since 1993 including a 3 km (1.9 miles) wide strip along the shore and approximately 1,000 km (621 miles) of off-shore transects (Rugh et al. 2000; 2005a; 2005b). Surveys designed to coincide with known seasonal feeding aggregations (Table 1.3 in Rugh et al. 2000) were generally flown on two to four days per year in June or July at or near low tide in order to reduce the search area (Rugh et al. 2000). However from June 2001 to June 2002, surveys were flown during most months in an effort to assess seasonal variability in beluga whale distribution in Cook Inlet (Rugh et al. 2000; 2004; 2005a; 2005b).

The collective survey results show that beluga whales have been consistently found near or in river mouths along the northern shores of Upper Cook Inlet (i.e., north of East and West Foreland). In particular, beluga whale groups are seen in the Susitna River Delta, Knik Arm, and along the shores of Chickaloon Bay. Small groups had also been seen farther south in Kachemak Bay, Redoubt Bay (Big River), and Trading Bay (McArthur River) prior to 1996, but very rarely thereafter. Since the mid-1990s, most (96 to 100 percent) beluga whales in Upper Cook Inlet have been concentrated in shallow areas near river mouths, no longer occurring in the central or southern portions of Cook Inlet. Based on these aerial surveys, the concentration of beluga whales in the northernmost portion of Cook Inlet appears to be fairly consistent from June to October (Rugh et al. 2004; 2005a; 2005b).

Although the data compiled on beluga whale distribution and abundance during the past 13 years is limited to the month of June (and July 1995 and 2001), a relatively complete assessment of beluga whale distribution throughout the year is available using the information transmitted from 15 satellite-tagged whales. This information is useful particularly for the winter months, when aerial and opportunistic whale sightings are difficult to conduct because short daylight hours and the presence of ice.

Based on the aerial surveys of Cook Inlet conducted in June 2004 and 2005, the index count of 187 and 192 belugas, respectively, is lower than, but similar to, previous yearly index counts since 1998, generally around 200 whales. Index counts prior to 1998 were generally higher, accounting for approximately 300 whales. All of the beluga whales observed during the 2004 surveys were seen in the Susitna River Delta and Turnagain Arm/Chickaloon areas (Rugh et al. 2004a; 2004c).

Recent aerial surveys conducted in August 2005 reported a median aerial count of 236 beluga whales for August 11 and 277 belugas for August 12, numbers that represent a rough abundance index uncorrected for missed whales. The counts from August 2005 were higher than

uncorrected estimates from June during the past seven years. Further analysis of the survey data will determine if the number of beluga whales was actually higher in August than in June 2005 (Rugh et al. 2005).

The results of the 2006 aerial survey was an estimated 302 whales (Confidence Interval 222-410). Although this estimate is larger than the estimate of 278 for 2005, it is still below the average of 370 for the years 1999-2004 (Rugh et al 2006). In June 2007, the annual aerial survey for belugas found the highest daily median estimate (used an uncorrected index for relative abundance) was 224 belugas, lower than the 1998 counts, but higher than the last nine years (Rugh et al. 2007). The 2007 current population estimates are being revised and are not available at this time Abundance estimates from these surveys indicated the population declined an average of about 14% per year during the mid 1990s, but stabilized over the past eight years (NMFS 2005, Angliss and Outlaw 2005). From 1994 to 1998, the beluga whale abundance declined from an estimated 653 to 347 whales. From 1998 to 2006, abundance estimates ranged from an estimated 278 to 435 whales. The most current population estimate (302) places the population at about 40% of the Optimum Sustainable Populations (OSP) of 780 whales (60% of the estimated carrying capacity (k) of 1,300 whales). The estimate has remained below half of the OSP, which is the threshold NMFS is required to use to designate the population as depleted under the MMPA (Angliss and Outlaw 2006). The primary cause for the population decline was over-harvest by regional native subsistence communities.

4.4.2 NMFS Satellite Tag Data

In 1999, one beluga whale was tagged with a satellite transmitter, and its movements were recorded from June through September of that year. Since 1999, 18 beluga whales in Upper Cook Inlet have been captured and fitted with satellite tags to provide information on their movements during late summer, fall, winter, and spring. Hobbs et al. (2005) described: 1) the recorded movements of two beluga whales (tagged in 2000) from September 2000 through January 2001; 2) the recorded movements of seven beluga whales (tagged in 2001) from August 2001 through March 2002; and 3) the recorded movements of eight beluga whales (tagged in 2002) from August 2002 through May 2003 (NMFS 2004b). Beluga whale satellite-tag data from 2002 and 2003 are presented in Appendix C.

The concentration of beluga whales in the northernmost portion of Cook Inlet appears to be fairly consistent from June to October based on aerial surveys (Rugh et al. 2004; 2005a; 2005b). Studies for KABATA in 2004 and 2005 confirmed the use of Knik Arm by beluga whales from July to October (Funk et al. 2005). Data from tagged whales (14 tags between July and March 2000 through 2003) show beluga whales use Upper Cook Inlet intensively between summer and late autumn (Hobbs et al. 2005). As late as October, beluga whales tagged with satellite transmitters continued to use Knik and Turnagain Arm and Chickaloon Bay, but some ranged into Lower Cook Inlet south to Chinitna Bay, Tuxedni Bay, and Trading Bay (MacArthur River) in the fall (Hobbs et al. 2005). In November, beluga whales moved between Knik Arm, Turnagain Arm, and Chickaloon Bay, similar to patterns observed in September (Hobbs et al.

2005). By December, beluga whales were distributed throughout the upper to mid-Inlet. From January into March, they moved as far south as Kalgin Island and slightly beyond in central offshore waters. Beluga whales also made occasional excursions into Knik Arm and Turnagain Arm in February and March in spite of ice cover greater than 90 percent (Hobbs et al. 2005). While they moved widely around Cook Inlet there was no indication from the tagged whales (Hobbs et al. 2005) that belugas had a seasonal migration in and out of Cook Inlet.

4.4.3 Opportunistic Sightings

Opportunistic sightings of beluga whales in Cook Inlet have been reported to the NMFS since 1977. Beluga sighting reports are maintained in a database by NMML. Their high visibility and distinctive nature make them well-suited for opportunistic sightings along public access areas (e.g., the Seward Highway along Turnagain Arm, the public boat ramp at Ship Creek). Opportunistic sighting reports come from a variety of sources including: NMFS personnel conducting research in Cook Inlet, Alaska Department of Fish and Game (ADF&G), commercial fishermen, pilots, Port personnel, and the general public. Location data range from precise locations (e.g., Global Positioning System-determined latitude and longitude) to approximate distances from major landmarks. In addition to location data, most reports include date, time, approximate number of whales, and notable whale behavior (NMFS 2004b). Since opportunistic data is collected any time, and often multiple times a week, these data often provide an approximation of beluga whale locations and movements in those areas frequented by natural-resource agency personnel, fishermen, and others.

Depending on the season, beluga whales can occur in both offshore and coastal waters. Although they remain in the general Cook Inlet area during the winter, they disperse throughout the upper and mid-inlet areas. Data from NMFS aerial surveys, opportunistic sighting reports, and satellite-tagged beluga whales confirm they are more widely dispersed throughout Cook Inlet during the winter months (November-April), with animals found between Kalgin Island and Point Possession. Based on monthly surveys (Rugh et al. 2003), opportunistic sightings, and satellite-tag data, there are generally fewer observations of these whales in the Anchorage and Knik Arm area from November through April (Figure 9) (NMML 2004; NMFS 2004b).

During the spring and summer, beluga whales are generally concentrated near the warmer waters of river mouths where prey availability is high and predator occurrence is low (Moore et al. 2000). Most beluga whale calving in Cook Inlet occurs from mid-May to mid-July in the vicinity of the river mouths, although Native hunters have described calving as early as April and as late as August (Huntington 2000).

Beluga whale concentrations in Upper Cook Inlet during April and May correspond with eulachon migrations to rivers and streams in the northern portion of Upper Cook Inlet (NMFS 2003; Angliss and Outlaw 2005). Data from NMFS aerial surveys, opportunistic sightings, and satellite-tagged beluga whales confirm that they are concentrated along the rivers and nearshore areas of Upper Cook Inlet (Susitna River Delta, Knik Arm, and Turnagain Arm) from May

through October (Figures 10 and 11) (NMML 2004; NMFS 2004b). Beluga whales are commonly seen from early July to early October at the mouth of Ship Creek where they feed on salmon and other fish, and also in the vicinity of the Port (e.g., alongside docked ships and within 300 ft of the docks) (Great Land Trust 2000; Blackwell and Greene 2002; NMML 2004). Beluga whales have also been observed feeding immediately offshore of the tidelands north of the Port and south of Cairn Point (NMFS 2004c).

4.4.4 Knik Arm Bridge and Toll Authority 2004-2005 Baseline Study

To assist in the evaluation of the potential impact of a proposed bridge crossing of Knik Arm north of Cairn Point, KABATA initiated a study to collect baseline environmental data on beluga whale activity and the ecology of Knik Arm. Boat and land-based observations were conducted in Knik Arm from July 2004 through July 2005. Land-based observations were conducted from nine stations along the shore of Knik Arm. The three primary stations were located at Cairn Point, Point Woronzof, and Birchwood. The majority of the beluga whales were observed north of Cairn Point. Temporal use of Knik Arm by beluga whales was related to tide height. During the study period, most of the beluga whales using Knik Arm stayed in the upper portion of Knik Arm north of Cairn Point. Approximately 90 percent of observations occurred during the months of August through November, and only during this time were whales consistently sighted in Knik Arm. The relatively low number of sightings in Knik Arm throughout the rest of the year suggested the whales were using other portions of Cook Inlet. In addition, relatively few beluga whales were sighted in the spring and summer months. Beluga whales predominantly frequented Eagle Bay (mouth of Eagle River), Eklutna, and the stretch of coastline in between, particularly when they were present in greater numbers (Funk et al. 2005).

4.4.5 Port of Anchorage 2005 through 2007 Marine Mammal Monitoring Program

In 2005, the POA began conducting a NOAA/NMFS-approved monitoring program for beluga whales and other marine mammals. Report summaries are included in Section 13.

5.0 THE TYPE OF INCIDENTAL TAKING AUTHORIZATION THAT IS BEING REQUESTED AND THE METHOD OF INCIDENTAL TAKING

5.1 INCIDENTAL HARASSMENT AUTHORIZATION REQUEST FOR 2008 PROJECT CONSTRUCTION SEASON

The POA and the Maritime Administration requests an IHA from NMFS for incidental take by harassment (Level B as defined in 50 CFR 216.3) of small numbers of marine mammals during its planned construction at the Port, from April 2008 through approximately December 2008, when in-water work will be completed for the 2008 Project construction season.

The Project construction plans as outlined in Sections 1 and 2 have the potential to take marine mammals by harassment only, primarily through construction activities involving in-water pile driving. Sounds will be generated by operations relating to construction dredging, the placement of armor rock and fill materials, and the installation of OCSP and pipe pile with the use of both vibratory and impact pile drivers. Takes by harassment only will potentially result when marine mammals near the activities are exposed to the sounds generated by proposed construction activities and the operations of vessels and other equipment associated with the construction activities. The effects on beluga whales depend upon the behavior of the animal at the time of reception of the noise stimulus, as well as the distance and received level of sound (see Section 7). No more than temporary, short term disturbance reactions (Level B) are expected among a small number of marine mammals in the general vicinity of the project. No take by serious injury (Level A) is expected, given the nature of the planned activities and the mitigation measures that are in place (see Section 11). No lethal takes are expected, given the requirement for cessation of activities if beluga whales enter or approach the stipulated safety radius, and other mitigation measures implemented.

This page intentionally left blank.

6.0 BY AGE, SEX, AND REPRODUCTIVE CONDITION, THE NUMBER OF MARINE MAMMALS (BY SPECIES) THAT MAY BE TAKEN BY EACH TYPE OF TAKING, AND THE NUMBER OF TIMES SUCH TAKINGS BY EACH TYPE OF TAKING ARE LIKELY TO OCCUR

Project construction activities would involve increases in the local underwater noise environment in the vicinity of the Port. Research suggests that increased noise may impact marine mammals in several ways. The following text provides a background on underwater sound, description of noise sources in the Port area, applicable noise criteria, and the basis for calculation of take.

6.1 UNDERWATER SOUND DESCRIPTORS

Sound is a physical phenomenon consisting of minute vibrations that travel through a medium, such as air or water. Sound is generally characterized by several variables, including frequency and intensity. Frequency describes the sound's pitch and is measured in Hz, while intensity describes the sound's loudness and is measured in decibels (dB). Decibels are measured using a logarithmic scale.

The method commonly used to quantify airborne sounds consists of evaluating all frequencies of a sound according to a weighting system reflecting that human hearing is less sensitive at low frequencies and extremely high frequencies than at the mid-range frequencies. This is called A-weighting, and the decibel level measured is called the A-weighted sound level (dBA). A filtering method to reflect hearing of marine mammals such as whales has not been developed for regulatory purposes. Therefore, sound levels underwater are not weighted and measure the entire frequency range of interest. In the case of marine construction work, the frequency range of interest is 10 to 10,000 Hz.

Table 6-1 summarizes commonly used terms to describe underwater sounds. Two common descriptors are the instantaneous peak sound pressure level (dB PEAK) and the root-mean-square sound pressure level (dB RMS) during the pulse or over a defined averaging period. The peak pressure is the instantaneous maximum or minimum overpressure observed during each pulse or sound event and is presented in Pascals (Pa) or dB referenced to a pressure of 1 µPa. The RMS level is the square root of the energy divided by a defined time period.

Transmission loss (TL) underwater is the decrease in acoustic intensity as an acoustic pressure wave propagates out from a source. TL parameters vary with frequency, temperature, sea conditions, current, source and receiver depth, water chemistry, and bottom composition and topography.

Table 6-1: Definition of Acoustical Terms	
Term	**Definition**
Decibel, dB	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for water is 1 micro Pascal (µPa) and for air is 20 µPa (approximate threshold of human audibility).
Sound Pressure Level, SPL	Sound pressure is the force per unit area, usually expressed in micro Pascals (or 20 micro Newtons per square meter), where 1 Pascal is the pressure resulting from a force of 1 Newton exerted over an area of 1 m^2. The sound pressure level is expressed in decibels as 20 times the logarithm to the base 10 of the ratio between the pressure exerted by the sound to a reference sound pressure. Sound pressure level is the quantity that is directly measured by a sound level meter.
Frequency, Hz	Frequency is expressed in terms of oscillations, or cycles, per second. Cycles per second are commonly referred to as Hertz (Hz). Typical human hearing ranges from 20 Hz to 20,000 Hz.
Peak Sound Pressure (unweighted), dB re 1 µPa	Peak sound pressure level is based on the largest absolute value of the instantaneous sound pressure over the frequency range from 20 Hz to 20,000 Hz. This pressure is expressed in this report as dB re 1 µPa.
Root-Mean-Square (RMS), dB re 1 µPa	The RMS level is the square root of the energy divided by a defined time period. For pulses, the RMS has been defined as the average of the squared pressures over the time that comprise that portion of waveform containing 90% of the sound energy for one impact pile driving impulse.[1]
Total Acoustic Energy, dB re 1 μPa^2 sec	Proportionally equivalent to the time integral of the pressure squared, and described in this report in terms of μPa^2 sec over the duration of the impulse. Similar to the unweighted Sound Exposure Level (SEL) standardized in airborne acoustics to study noise from single events.
Waveforms, µPa over time	A graphical plot illustrating the time history of positive and negative sound pressure of individual pile strikes shown as a plot of µPa over time (i.e., seconds).
Frequency Spectra, dB over frequency range	A graphical plot illustrating the 6 to 12 Hz band center frequency sound pressure over a frequency range (e.g., 10 to 5,000 Hz in this report).
A-Weighting Sound Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A- or C-weighting filter network. The A-weighting filter de-emphasizes the low and high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective human reactions to noise.
Ambient Noise Level	The background sound level, which is a composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.

[1]Underwater sound measurement results obtained by Illingworth & Rodkin (2001) for the Pile Installation Demonstration Project in San Francisco Bay indicated that most impact pile driving impulses occurred over a 50 to 100 millisecond (ms) period. Most of the energy was contained in the first 30 to 50 ms. Analyses of that underwater acoustic data for various pile strikes at various distances demonstrated that the acoustic signal measured using the standard "impulse exponential time-weighting" on the sound level meter (35-ms rise time) correlated to the RMS level measured over the duration of the pulse.

6.1.1 Description of Noise Sources

Underwater sound levels in the Port area are comprised of multiple sources, including physical noise, biological noise, and man-made noise. Physical noise includes waves at the surface, earthquakes, ice, and atmospheric noise. Biological noise includes sounds produced by marine mammals, fish, and invertebrates. Man-made noise consists of vessels (small and large), oil and gas operations, dredging, aircraft overflights, and construction noise. Noise levels associated with these sources are summarized by Richardson et al. (1995) and have been measured in Cook Inlet by Blackwell and Greene (2002), for pile driving at Port MacKenzie by Blackwell (2005), and recently investigated for test pile driving at the Port of Anchorage by URS Corporation (2007). Table 6-2 summarizes the noise levels and frequency ranges of these sources.

Table 6-2: Representative Noise Levels of Sources

Noise Source	*Frequency Range (Hz)*	*Noise Level*	*Source*
Small vessels	250 – 1,000	151 dB re 1 µPa at 1 m	Richardson et al. 1995
Tug docking gravel barge	200 – 1,000	149 dB re 1 µPa at 100 m	Blackwell and Greene 2002
Container ship	100 – 500	180 dB re 1 µPa at 1 m	Richardson et al. 1995
Drilling platform	80	119 dB re 1 µPa at 1.2 km	Blackwell and Greene 2002
Dredging operations	50 – 3,000	120 – 140 dB re 1 µPa at 500 m	URS Corporation 2007
Impact pile driving of 36-inch piles	100 – 1,500	206 dB_{PEAK} re 1 µPa at 19 m at 62 m	Blackwell 2005
Vibratory pile driving of 36-inch piles	400 – 2,500	165 dB_{RMS} re 1 µPa at 19 m	Blackwell 2005
Impact pile driving of 14-inch H-piles	100 – 1,500	194 dB_{PEAK} re 1 µPa at 19 m	URS Corporation 2007
Vibratory pile driving of 14-inch H-piles	400 – 2,500	168 dB_{RMS} re 1 µPa at 10 m	URS Corporation 2007

For this application, sound levels measured for the October 2007 test pile probing program for the Port have been used to estimate noise exposure (URS 2007). For that study, received RMS SPLs during vibratory pile driving ranged from less than 120 dB re 1 µPa at 600 m to 168 dB re 1 µPa at 10 m. The greatest peak level measured was 179 dB re 1 µPa at 14 m. Most of the energy during vibratory installation of piles was between 400 and 2,500 Hz. Blackwell (2005) reported higher levels of vibratory pile driving (163-165 dB re 1 µPa at 56 m) at Port MacKenzie. However, the piles evaluated in that study were 150 ft tall, 36-inch steel piles that were vibratory-driven 40 to 50 feet into the substrate. The October 2007 study at the Port

measured the noise propagated from 90-feet tall, 14-inch H-piles that were driven to 60 feet below MLLW, these are smaller piles that produce less noise in the water column.

Peak SPLs during impact pile driving in the October 2007 study ranged from 173 dB re 1 µPa at 300 m, to 194 dB re 1 µPa at 19 m. Received RMS SPLs ranged from 160 dB re 1 µPa at 300 m to 177 dB re 1 µPa at 19 m. Most of the energy during the impact driving was between 100 and 1,500 Hz. Blackwell (2005) reported higher levels for impact pile driving (206 dB PEAK at 62 m, 189 dB RMS at 62 m) at Port MacKenzie. However, the piles evaluated in that study were 150-feet tall, 36-inch steel piles that were impact-driven 40 to 50 feet into the substrate. As mentioned in the previous paragraph the pile height, diameter, and depth driven into the ground for the Project produce less noise in the water column because the piles are considerably smaller than those measured at Port MacKenzie.

Illingworth & Rodkin, Inc. have previously measured comparable SPLs for similar H-type piles driven with an impact hammer near Fort Bragg (Noyo River) and Alameda, California. For the Noyo River project, SPLs were measured at 168 dB at 47 m, 156 dB at 70 m, and 158 dB at 90 m (Illingworth & Rodkin 2003). Based on the data collected in that referenced study, the radius of the 160 dB isopleth was approximated at 75 m from the pile. A short duration measurement of an H-pile being vibrated produced levels of 152 dB at 40 m. For the Alameda project, levels were 182 dB at 10 m and 166 dB at 40 m (Illingworth & Rodkin 2007). Sheet piles have been measured at Port of Oakland with SPLs of 165 dB at 10 m. The range was 160 to 170 dB, with most levels below 165 dB. Therefore, the use of acoustic data from the October 2007 test pile program for the Port is reasonably consistent with other research regarding vibratory and impact pile driving noise levels, and appropriate for evaluating 2008 Project construction noise levels in the marine environment of Knik Arm.

6.1.2 Applicable Noise Criteria

Under the MMPA, NMFS has defined levels of harassment for marine mammals. Level A harassment is defined as, “Any act of pursuit, torment, or annoyance which has the potential to injure a marine mammal or marine mammal stock in the wild.” Level B harassment is defined as, “Any act of pursuit, torment, or annoyance which has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including but not limited to migration, breathing, nursing, breeding, feeding or sheltering.”

Since 1997, NMFS has been using generic sound exposure thresholds to determine when an activity in the ocean that produces sound might result in impacts to a marine mammal such that a take by harassment might occur (70 FR 1871). NMFS is developing new science-based thresholds to improve and replace the current generic exposure level thresholds, but the criteria have not been finalized (Southall et al. 2007). The current Level A (injury) threshold level for impact noise (e.g., impact pile driving) is 180 dB rms for cetaceans (whales, dolphins, and porpoises) and 190 dB rms for pinnipeds (seals, sea lions). The current Level B (disturbance)

threshold level for impact noise is 160 dB rms for cetaceans and pinnipeds. The current Level B threshold level for continuous noise (e.g., vibratory pile driving) is 120 dB rms.

Level A harassment of marine mammals for this Project is not likely to occur due to mitigation measures required by NMFS and the conditional stipulations of the USACE Permit; therefore, Level A harassment is not discussed in this application.

6.2 BASIS FOR ESTIMATING TAKE BY HARASSMENT

The POA and the Maritime Administration seek authorization for the potential taking of small numbers of harbor seals, harbor porpoises, killer whales, and beluga whales in Knik Arm in Upper Cook Inlet during 2008 construction activities associated with continuing expansion of the Port. Any takes will most likely result from construction noise, in particular in-water pile driving. These takes may have no more than a minor effect on individual animals or no effect on the populations of these four species. The possible effects will be short-term disturbance of normal behavior or temporary displacement of animals farther from the source of the noise. Marine mammals would primarily be transiting through the waters of Knik Arm adjacent to the Project area. Belugas whales observed in the Port area indicate traveling was the most frequently recorded primary activity, followed by diving, then feeding. The most common secondary activity noted was diving, followed by traveling (Funk et al. 2005). Many of the marine mammals in the vicinity of the construction activities are expected to habituate to the construction sounds after repeated exposure (Richardson et al. 1995). Changes in the behavior or distribution patterns of these marine mammals are not expected to rise to the level of a take (Richardson et al. 2005). Estimates of the number of beluga whales that might be present and potentially disturbed by Project construction are low, based on available data regarding beluga distribution, movement, and densities in the area. Take estimates for belugas are derived from the following assumptions and data:

- In-water construction activities and potential disturbance are conservatively estimated to take place April 1 through October 31, 2008, for approximately 916 hours of in-water pile driving activity by two crews working concurrently, with 60 percent impact pile driving and 40 percent vibratory pile driving.
- Beluga whales along the southeast shoreline of Knik Arm generally occur within 1 km of the shoreline.
- The zone of greatest beluga use used for calculating beluga whale density is approximately 1 km by 6 km adjacent to the shoreline in the vicinity of the Port (6 sq km).
- The population estimate for the Cook Inlet beluga whale stock is 302 individuals (Rugh et al. 2007).
- No Level A Take (>180 dB threshold for odontocetes or >190 dB for pinnipeds) will occur because of required mitigation (i.e., stipulated safety zone, marine mammal observers, mandatory shut downs, soft starts, etc.).

The following are estimates of the number of potential exposures of marine mammals to sound levels resulting in Level B take by harassment. Based on recent measurements of underwater acoustic noise recorded in test pile study at the Port (URS 2007), the distance to the 190, 180, 160, and 120 dB dB rms re 1 μPa thresholds for vibratory in-water pile driving would be <10 m, <10m, 50 m, and 800 m, respectively. However, because the existing underwater noise levels in this area of Knik Arm are typically 120 dB or higher, sounds from vibratory pile driving may not be audible at that distance. The distance to the 190, 180, and 160 dB rms re 1 μPa thresholds for impact pile driving would be <10 m, 20 m, and 350 m, respectively. (see Figures 12 and 13).

Harbor Seals

Harbor seals occur in Upper Cook Inlet throughout the year, but are only occasionally seen in Knik Arm. Salmon runs in Fish Creek and Ship Creek would likely attract harbor seals. Harbor seal takes by harassment would be very low, if any at all, and likely will occur during the mid-summer and fall when anadromous prey fish return to Knik Arm, in particular near Ship Creek south of the Port and the Project area. All age and sex classes except newborn pups could occur in the Project area throughout the period of construction activity. Female harbor seals haul out at shoreline sites known as pupping sites and give birth from May to mid-July; and pups may be encountered at these haul out areas. However, since there are no known pupping sites in the vicinity of the Project, harbor seal pups are not expected to be present during construction activities at the Port. Harbor seals are not known to regularly reside in the Project area, so any takes would involve individuals that are transiting the area on foraging trips. Potential takes of harbor seals are most likely to result from construction noise (primarily in-water pile driving) or vessel activity. Harbor seals that are taken may change their behavior, and be temporarily displaced from the construction area. Since there are no haul-outs within the Project area, potential takes by disturbance will have a negligible short-term impact on individual harbor seals and no effect on the population of harbor seals.

During recent marine mammal surveys in the area of the proposed Knik Arm Crossing, 22 sightings of harbor seals were reported over a 13-month period and approximately 14,000 observer hours (LGL Unpublished Data 2004-2005). These sightings occurred during October and September 2004, and June through September 2005. Also, in annual marine mammal surveys performed by NMFS from 1994 to 2005, three harbor seals were observed in Knik Arm (Rugh et al. 2005). The likelihood of encountering harbor seals within the vicinity of the proposed Project is small and the likelihood of exposing harbor seals to 160 dB isopleth would be even smaller. The 190 dB isopleth is less than 10 m from the source; therefore, no exposure at this level would be anticipated.

Based on the available data from Knik Arm, the potential occurrence of harbor seals in Knik Arm is approximately 1.7 animals per month (LGL Unpublished Data 2004-2005). With in-water impact pile diving ranging from approximately 60 to 86 hours per month for the 2008 construction season, the potential for exposure within the 160 dB isopleth (0.2 sq km) is anticipated to be extremely low, substantially less than one animal per month. Level B take is

conservatively estimated at a total of two harbor seals over the course of the 2008 in-water construction season based on the low rate of occurrence of harbor seals in the Project area.

Killer Whale

Numbers of killer whales in Upper Cook Inlet are small compared to the overall population. Most killer whale sightings are recorded in Lower Cook Inlet. While very few, if any, are expected to approach the project area, killer whales occasionally are reported in Upper Cook Inlet. This is most likely to occur when their primary prey (anadromous fish for the resident killer whale group and beluga whales for the transient killer whale group) are also in the area (Shelden et al. 2003). Possible takes of killer whales in the Project area from anthropogenic noise including pile-driving, vessel traffic, and other construction noise, would be limited to take by harassment (Level B). Take by harassment is defined as resulting in temporary changes in the behavior or distribution of individuals. Although few killer whales are found in Upper Cook Inlet, they could potentially approach the project area; therefore, a take of one animal is requested. Any takes are expected to have no more than a negligible affect on individual whales. No impact on the Cook Inlet population of killer whales is expected.

Harbor Porpoise

During recent marine mammal surveys for the proposed Knik Arm Crossing Project, four sightings of harbor porpoises were reported over a 13-month period; these sightings occurred during April and May 2005. During test pile studies in October 2007, a single harbor porpoise was observed in the vicinity of the Port (URS 2007). Calculated occurrence of harbor porpoise in the general area of Knik Arm is approximately 0.3 animals per month. If takes occur, they would come from anthropogenic noise, including pile-driving, vessel traffic, and other construction noise and would be limited to Level B take by harassment (temporary alteration of behavior or distribution). The Level B take by harassment would be substantially less than one animal per month; therefore, a total take of one harbor porpoise is calculated for the 2008 construction season. Because few harbor porpoises are expected to approach the Project area, takes are expected to have no more than a negligible affect on individual animals, with no effect expected on the Cook Inlet population of harbor porpoises.

With an estimated Cook Inlet population of 249 animals and a frequency of occurrence of 0.3 animal per month in the Knik Arm region, any take of harbor porpoise is expected to be very low and have no effect on the population. Impact pile driving is estimated at approximately 39 to 86 hours per month. Considering the relatively small area of 0.3 sq km inside the 160 dB threshold, the calculated take by harassment would be substantially less than one animal per month; therefore, a total take of one harbor porpoise is estimated for the 2008 construction season.

Beluga Whales

The beluga whale is the most abundant and most frequently encountered species of marine mammal in Knik Arm. When beluga whales are present in Knik Arm and in the vicinity of the Port, some of the same individuals could potentially be taken by harassment on more than one occasion. Beluga whale takes could potentially occur from spring through fall during the period when fish prey are most abundant in Knik Arm. Although beluga whales use the area in the vicinity of the Port, they do not appear to remain for long periods in the Project area (Funk et. al. 2005; Markowitz and McGuire 2007).

Potential takes of beluga whales are expected to be from temporary, short-term changes in behavior or distribution caused by construction noise (primarily in-water pile driving). Beluga whales that are taken by harassment may be temporarily displaced from the immediate Project area by construction activities which will propagate pile-driving sounds a relatively short distance into adjacent marine waters. Some of the beluga whales that are repeatedly exposed to construction noise might habituate to the sounds and upon subsequent exposures may not alter their behavior and distribution (Richardson et al. 1995). However, it would be difficult to discern whether individuals are exposed multiple times and if multiple exposures would have any noticeable effect on these individuals once they became habituated to the sounds.

To minimize the exposure of animals to pile-driving sounds, noise-producing in-water pile driving activities will not be conducted when beluga whales are present in the Project area. During in-water pile driving activities, marine mammal observers will monitor for the presence of beluga whales within the construction safety zone to provide a timely mechanism for suspending noise-producing activities until they have departed the Project area. Any take of beluga whales is expected to be limited solely to take by harassment, which includes temporary changes in the behavior or distribution of individual animals.

Takes by harassment could potentially include marine mammals of all age and sex classes. Data on construction disturbance sensitivity of different age classes, including cow/calf pairs, are lacking. Calving occurs approximately mid-May through mid-July in the Cook Inlet region. Beluga whales using Knik Arm appear to calve primarily in the Susitna River Flats portion of Upper Cook Inlet (Funk et al. 2005; Markowitz and McGuire 2006). There is no evidence that calving occurs in Knik Arm, as relatively few beluga whales use the area during the calving period. In 2006, the year with the broadest seasonal coverage for beluga observation, calves were observed in beluga whale groups sighted near the Port on five occasions of the 95–day observation effort, all during the late August, early September (Markowitz and McGuire 2007). Calves are typically seen with the larger whale groups (Markowitz and McGuire 2007). Monitoring and mitigation measures implemented for the Project will be used to minimize the number of takes by disturbance caused by in-water pile driving by shutting down when beluga whales approach the Project area.

The estimates for numbers of takes are based on data from the Port beluga whale monitoring program conducted by LGL Alaska Research Associates, Inc. (Funk et al. 2005; Markowitz and McGuire 2007), and Alaska Pacific University (APU) (Unpublished Data, Kendall 2007), and on estimates of the size of the area where effects could potentially occur.

POA beluga whale observers recorded all whales they could see, including some whales sighted over 3 km from their observation stations (Cairn Point or the Port). It is difficult to define the precise area that whales would have been visible to the observers due to variable lighting, weather, sea conditions, and obstructions. However, approximately 20 percent of the whales groups observed in 2006 were first observed at over 3 km, suggesting that observers can detect whales at considerable distances (Markowitz and McGuire 2007). This area is referred to as the Knik Arm observation area in Table 6-3. LGL used a grid of cells 500 m by 500 m to sight whales. Using an average sighting distance of 4 km, this observation area is calculated to be 35.75 sq km.

Results of these multi-year beluga monitoring studies showed that beluga whale groups had a very strong association with the marine waters along the southeast shoreline of Knik Arm adjacent to the Port. Nearly all of the beluga whale groups observed on the east side of the Knik Arm during these studies were within 1 km of shore at some time during the period they were being observed. In 2006, 80 percent of all beluga whale groups were observed within 0.5 km of the Project footprint. This could be due, in part, to a large eddy that forms south of Cairn Point during the ebb tide which might concentrate prey (Ebersole and Raad 2004).

For the purpose of this analysis, this band of habitat is referred to as the nearshore area that encompasses and covers approximately 6 sq km (1 km offshore and approximately 6 km along the coastline) from just south of the mouth of Ship Creek to just north of Cairn Point (Figures 12 and 13). The southern boundary of this area is approximately 3 km southwest from the Port beluga observation station; and the northeastern boundary is the approximate northern visual extent from the beluga observation station at Cairn Point, extending out to 1 km from the shore. The density of whales (whales per hour per sq km) within the Knik Arm observation area and the nearshore observation area were compared in Table 6-3. Based on the results of the comparison, the highest density of whales occurs in the nearshore area; therefore, this area was used to calculate Level B take (Table 6-4). Table 6-5 summarizes the estimated number marine mammals that could be expected to be taken by harassment from noise generated by in-water pile driving activities planned for 2008.

Table 6-3. Beluga Whale Density Calculations for the Knik Arm Observation Area and the Nearshore Area										
Date and Observation Hours[1]			Number of Groups Per Month[2]		Number of Individuals Per Month[5]		Mean Number of Whales Per Group[6]		Density of Whales[7] (per hour per km^2)	
Month	Year	Observation Hours	Knik Arm Observation Area[3] (35.7 km^2)	Nearshore Area[4] (6 km^2)	Knik Arm Observation Area (35.7 km^2)	Nearshore Area (6 km^2)	Knik Arm Observation Area (35.7 km^2)	Nearshore Area (6 km^2)	Knik Arm Observation Area (35.7 km^2)	Nearshore Area (6 km^2)
April	2005	253	33	n/a	103	n/a	3.1	n/a	0.011	n/a
	2006	12	1	1	1	1	1.0	1.0	0.002	0.014
May	2005	304	5	n/a	31	n/a	6.2	n/a	0.003	n/a
	2006	60	3	2	7	2	2.3	1.0	0.003	0.006
June	2005	345	7	n/a	31	n/a	4.4	n/a	0.002	n/a
	2006	108	4	4	8	8	2.0	1.8	0.002	0.012
July	2004	96	2	n/a	2	n/a	1.0	n/a	0.001	n/a
	2005	339	3	n/a	56	n/a	18.7	n/a	0.004	n/a
	2006	84	2	1	2	2	1.0	2.0	0.001	0.004
August	2004	305	15	n/a	207	n/a	13.8	n/a	0.018	n/a
	2005	84	4	3	41	30	10.3	10.0	0.013	0.060
	2006	92	6	6	36	36	6.0	6.0	0.010	0.065
September	2004	584	80	n/a	537	n/a	6.7	n/a	0.024	n/a
	2005	96	10	5	51	27	5.1	5.4	0.014	0.047
	2006	96	7	6	26	23	3.7	3.8	0.007	0.040
October	2004	290	64	n/a	534	n/a	8.3	n/a	0.049	n/a
	2005	96	2	2	7	7	3.5	3.5	0.002	0.012
	2006	96	2	0	2	0	1.0	0.0	0.001	0.000
	2007	86	7	5	30	25	4.3	5.0	0.009	0.049

[1] Beluga whale monitoring data are from 2004 and 2005 monitoring for the Knik Arm Bridge and Toll Authority (Funk et al. 2005) and Port of Anchorage (Markowitz & McGuire 2007, Kendall 2007).

[2] The number of groups of whales per month observed in the monitoring studies.

[3] The size of Knik Arm observation area (35.75 km^2) is based on the average of 4 km sighting distance. There are 143 (500x500m) grid cells used by LGL (143/4=35.75).

[4] Nearshore observation area (6 km^2) is based on data showing 80% of whales are within 1 km of shore and can be seen for distance of 6 km along Knik Arm (1 km x 6 km).

[5] Number of individual whales per month observed in the monitoring studies.

[6] Mean number of whales per group calculated by number of individuals divided by number of groups per month.

[7] Density of whales (per hour per km^2) calculated by individuals per month divided by observation hours per month divided by nearshore area (6 km^2). The mean density of whales observed in the nearshore area (1 km X 6 km) was used for calculation of take (Table 6-4).

Table 6-4. Beluga Whale Level B Take Calculations for Impact and Vibratory Pile Driving for the 2008 Construction Season									
Month	**Hours of In-Water Pile Driving**		**Mean Density of Whales[1]**	**Level B Take From Impact Pile Driving**			**Level B Take From Vibratory Pile Driving**		
	Impact	**Vibratory**		**Area within 160 dB (km^2) [2]**	**Calculated Take[3]**	**Total Take[4]**	**Area within 120 dB (km^2)[5]**	**Calculated Take**	**Total Take**
April	86	58	0.014	0.921	0.230	1	1.005	0.809	1
May	60	39	0.006	0.921	0.064	1	1.005	0.218	1
June	60	39	0.012	0.921	0.142	1	1.005	0.484	1
July	86	58	0.004	0.921	0.066	1	1.005	0.231	1
August	86	58	0.062	0.921	1.031	2	1.005	3.633	4
September	86	58	0.043	0.921	0.718	1	1.005	2.529	3
October	86	58	0.020	0.921	0.335	1	1.005	1.179	2
Subtotal	**550**	**368**				**8**			**13**
				Low Tide Correction Factor[6]		**-6**			**-9**
				Total Level B Take		**2**			**4**

[1] The mean density of whales (per hour per km^2) per month in the nearshore area (from Table 6-3).
[2] Area within the 160 dB isopleth is based on a 350 meter radius semi-circle ($A= \pi r^2/2$).
[3] Calculated take is the number of hours of pile driving x mean density of whales x area within each specific isopleth.
[4] Total take is the calculated take rounded up to whole numbers to account for individual whales.
[5] Area within the 120 dB isopleth is based on an 800 meter radius semi-circle ($A= \pi r^2/2$).
[6] Low tide correction factor of 70% accounts for the density of whales that occur within the 2 hours on either side of low tide where in-water pile driving is prohibited.

Table 6-5. Estimated Harassment-Level B[1] for Marine Mammals 2008 Phase II Construction.						
Month	Combined Impact And Vibratory In-Water Pile Driving Hours	Beluga Whale		Killer Whale	Harbor Porpoise	Harbor Seal
		160 dB	120 dB[2]	160 dB	160 dB	160 dB
April	143	1	1	<1	<1	<1
May	99	1	1	<1	<1	<1
June	99	1	1	<1	<1	<1
July	144	1	1	<1	<1	<1
August	144	2	4	<1	<1	<1
September	144	1	3	<1	<1	<1
October	143	1	2	<1	<1	<1
Subtotal		**8**	**13**	**1**	**1**	**2**
Low tide correction factor[3]		-6	-9	n/a	n/a	n/a
Total	**916[4]**	**2**	**4**	**1[5]**	**1[5]**	**2[6]**

[1] No Level A take is expected (180 dB for cetaceans, 190 dB for pinnipeds).
[2] The take for the 120 dB threshold includes the take within the 160 dB threshold for vibratory pile driving.
[3] Low tide correction factor of 70% accounts for the density of whales that occur 2 hours on either side of low tide where in-water pile driving is prohibited.
[4] In-water impact pile driving = 60 percent of total hours. In-water vibratory pile driving = 40 percent of total hours.
[5] Take per animal each month is actually less than one. Total take requested is one animal.
[6] Take each month is actually less than one. Total take requested is two animals.

6.3 DESCRIPTION OF TAKE CALCULATION

The basic methodology developed to calculate takes requires information on four project-specific parameters:

1. The frequency of whale occurrence
2. The size of the observation area
3. The duration of in-water pile driving activities
4. The area affected at different NMFS noise exposure thresholds (i.e., 190 dB, 180 dB, 160 dB, 120 dB)

Take estimates are based on the mean monthly density of beluga whales that could potentially be expose to noise from in-water pile driving activity. The take calculation for each month is determined as follows:

1. Whale density (whales per hour per sq km) = number of individuals per month divided by the observer hours per month divided by the nearshore area (6 sq km)
2. Hours of exposure per sq km = duration (hours per month) of each type of pile driving (vibratory and impact) multiplied by the area of exposure for a given noise exposure threshold (i.e., 120 dB, 160 dB)
3. Estimated number of whales affected by the noise or take by harassment = whale density multiplied by the area of exposure within the threshold (the total 160 dB threshold was weighted by the amount of time and area of exposure for both vibratory and impact pile driving)
4. The number of whales taken was rounded up per month to account for individual whales (no partial animals)

For purposes of this analysis, it is assumed that in-water work will be spread throughout the seven months of the 2008 construction season (April through October), with one adjustment. There will be one week in May and one week in June that will not be available for in-water work due to the release of juvenile salmon smolt from the Ship Creek Hatchery. May and June will be assigned approximately 25 percent less hours for in-water pile driving than the other months. The analysis will therefore assume that April, July, August, September, and October will each include 143 or 144 hours of in-water pile driving activity and that May and June will each include 99 hours of in-water pile driving activity (916 hours total for the 2008 construction season).

To calculate take from exposure to noise, the whale density is multiplied by the affected area within the 160 dB or 120 dB isopleths, multiplied by the number of hours of in-water pile driving per month. The pile-driving activities for the 2008 construction season are described in Sections 1 and 2. Tidal stages and available work hours are included in Appendix B. The number of whales exposed to underwater noise levels of 120 dB or greater would be considered a Level B

take for only the vibratory pile driving. This method of calculating take is very conservative because it assumes that new whales (density) enter the exposure area for each hour of in-water pile driving, and there are no repeat sightings, which is highly unlikely.

With implementation of the mitigation measures described in this IHA application (Section 11) and implementation of the associated marine mammal monitoring program, beluga whales are not expected to be exposed to sound levels greater than or equal to 180 dB. Estimated Level B take for beluga whales at the 160 dB threshold for pile driving averages one animal per month (rounded up to the nearest single digit) with the highest takes occurring in August (two beluga whales). Spring and early summer have the lowest levels of take per month, which is consistent with the known distribution of beluga whales during these months.

Estimated Level B take for beluga whales at the 120 dB threshold for vibratory pile driving is approximately the same from April through July with one take per month, but increasing to four takes per month in August, three takes per month in September, and two takes per month in October.

These take levels would be prior to implementation of any mitigation efforts; therefore, they represent a worst case scenario. The observations used to calculate take also included all tide cycles, including low slack tide. Mitigation measures stipulated by the USACE Section 404/10 Permit prohibit in-water pile driving for two hours on either side of low tide. The potential for affecting beluga whales at low slack tide, the period of highest concentration, is therefore eliminated under this restriction. Sightings of beluga whales at low slack tide accounted for approximately 48 percent of all belugas observed in the project area for all months (49 of 99 whales seen in 2006) (Markowitz and McGuire 2007). Twenty-one percent of the whale observations in that study occurred at low ebb and less than one percent occurred at low flood, and these animals would also be avoided by the two-hour shut down on either side of low tide for in-water pile driving. It can be assumed the four-hour mandatory shut down of in-water pile driving activity around low tide would reduce the total number of beluga takes by approximately 70 percent. This factor was applied to the total take numbers for the season, reducing the total take at the 160 dB threshold to 2 and at the 120 dB threshold to 4 (see Tables 6-4 and 6-5).

The soft start technique for impact pile driving and the marine mammals observers monitoring the safety zone would also further reduce the probability of beluga whale takes during in-water pile driving. The actual number of beluga whales taken by harassment would be a very small portion (less than one percent) of the Cook Inlet population, and no population level effects are anticipated.

7.0 THE ANTICIPATED IMPACT OF THE ACTIVITY UPON THE SPECIES OR STOCK

7.1 GENERAL EFFECTS OF NOISE ON MARINE MAMMALS

Research suggests that increased noise may impact marine mammals in several ways. In assessing potential effects of noise, Richardson et al. (1995) has suggested four criteria for defining zones of influence. These zones are shown below from greatest influence to least:

- *Zone of hearing loss, discomfort, or injury* – the area within which the received sound level is potentially high enough to cause discomfort or tissue damage to auditory or other systems. Applicable NMFS criteria for this zone is 180 dB for cetaceans and 190 dB for pinnipeds.
- *Zone of masking* – the area within which the noise may interfere with detection of other sounds, including communication calls, prey sounds, or other environmental sounds. Applicable criteria for this zone is 160 dB for impact noise and 120 dB for continuous noise.
- *Zone of responsiveness* – the area within which the animal reacts behaviorally or physiologically. Applicable criteria for this zone is also 160 dB for impact noise and 120 dB for continuous noise.
- *Zone of audibility* – the area within which the marine mammal might hear the noise. There are no applicable criteria for this zone, as it is difficult to determine the audibility of a particular noise.

To understand the potential effects of noise on a marine mammal, it is important to also understand the hearing capabilities of the animal. Marine mammals as a group have functional hearing ranges of 10 Hz to 180 kHz, with best thresholds near 40 dB re 1 µPa (Ketten 1998; Kastak et al. 2005; Southall et al. 2007). These data show reasonably consistent patterns of hearing sensitivity within each of three groups: small odontocetes (such as the harbor porpoise), medium-sized odontocetes (such as the beluga and killer whales), and pinnipeds (such as the harbor seal). The hearing capabilities of the marine mammals potentially affected by the 2008 Project construction activities are discussed in Section 4.

7.2 ASSESSMENT OF ACOUSTIC IMPACTS

Underwater noise levels during Project construction 2008 would increase with the addition of dredges, tugboats, barges, and pile driving equipment. Although there would be an increase in vessel traffic during Project construction, it would not be expected to substantially increase noise levels due to the existing level of vessel traffic in the area. Vessel traffic is known to cause avoidance reactions by beluga whales at certain times and under certain conditions in the Arctic Ocean, but not in Upper Cook Inlet (Richardson et al. 1995). Beluga whales in Cook Inlet are regularly sighted in and around the Port (NMFS 2005a) passing near or under vessels (Blackwell

and Greene 2002), indicating that these animals appear to have a high tolerance to vessel traffic. Harbor seals, killer whales, and harbor porpoises are also infrequently sighted in upper Cook Inlet near industrial areas and therefore would not likely be affected by vessel traffic associated with the Project. Because effects from increased vessel traffic would be considered negligible, no further analysis was conducted.

The primary noise source of concern is pile driving. The effects of sounds from pile driving on marine mammals might include one or more of the following: tolerance, masking of natural sounds, behavioral disturbance, and temporary or permanent hearing impairment, or non-auditory physical effects (Richardson et al. 1995). The following discussion addresses impacts to the marine mammals based on the zones of influence discussed in Section 7.1.

Zone of Hearing Loss

Temporary or permanent auditory or non-auditory physical effects from pile driving on marine mammals are not likely to occur due to mitigation measures required by NMFS and the USACE permit and are therefore not discussed in this application. In addition, most of the nearshore area of Upper Cook Inlet is a poor acoustic environment because of its shallow depth, soft bottom, and high background noise from currents and glacial silt which greatly reduce the distance sound travels (Blackwell and Greene 2002).

Zone of Masking

Frequencies associated with vibratory pile driving potentially overlap with some frequencies of social calls of the marine mammals and could mask those calls. The echolocation clicks produced by these marine mammals are far above the frequency range of the sounds produced by vibratory pile driving and other sounds produced by proposed construction activities. Impact pile driving would not likely mask any natural sounds of marine mammals due to the intermittent nature of the entire event and the short duration of each pulse. Vibratory pile driving would be the most likely source of masking because the sound emitted is continuous. Also any minor masking would occur at extremely close proximity to the sound source, if it occurred at all. Blackwell (2005) and URS (2007) reported that most of the energy during vibratory activity was measured in the range of 400 to 2,500 Hz and that greater than 1,300 m from the source, ambient noise contributed more to received levels than did vibratory pile driving.

Beluga whale whistles have dominant frequencies in the 2 to 6 kHz range; other beluga whale call types include sounds at mean frequencies ranging upward from 1 kHz (Sjare and Smith 1986a; b). Beluga whales also have a very well-developed high-frequency echolocation system with peak frequencies from 40 to 120 kHz and broadband source levels of up to 219 dB re 1 µPa-m (zero-peak).

Killer whales produce whistles between 1.5 and 18 kHz, and pulsed calls between 500 Hz to 25 kHz (Ford and Fischer 1983). Harbor porpoises produce acoustic signals in a very broad frequency range, <100 Hz to 160 kHz (Verboom and Kastelein 2004). Harbor seals produce

social calls at 500 to 3,500 Hz and clicks from 8 to 150 kHz (reviewed in Richardson et al. 1995).

Zone of Responsiveness

In response to pile driving noise, avoidance would be the most common response of marine mammals. Avoidance responses may be strong if the marine mammals move rapidly away from the source or weak if animal movement is only slightly deflected away from the source. Noise from pile driving could potentially displace marine mammals from the immediate proximity of pile driving activity. However, marine mammals would likely return after completion of pile driving as demonstrated by a variety of studies about temporary displacement of marine mammals by industrial activity (reviewed in Richardson et al. 1995).

There have been no reports of beluga whale responses to pile driving. Beluga whales can detect a wide range of sound frequencies, including frequencies as low as 40-75 Hz (Awbrey et al. 1988; Johnson et al. 1989); their hearing is most sensitive in the 10 to 100 kHz range (Richardson et al. 1995). This range is well above the frequency of most industrial noise. In Knik Arm, ambient background noise from currents and glacial silt partly mask some noises, and rapid sound attenuation is likely due to shallow water depths and soft substrate (Blackwell and Greene 2002).

Blackwell et al. (2004) reported that ringed seals showed little response to pile driving associated with construction activities in the Beaufort Sea of Alaska. Similarly, harbor seals did not seem to be affected by pile-driving noise during construction activities in San Francisco Bay (Illingworth & Rodkin 2001).

There are no studies that have focused on the effects of pile driving noise on killer whales. However, because killer whales are rarely sighted near the Project area, it is unlikely that pile driving noise would affect killer whales.

There are few reports of the effects of pile driving on harbor porpoises, but none in Cook Inlet. The effects were studied by Tougaard et al. (2003) during the construction of the offshore wind farms at Horns Reef (North Sea) and Nysted (Baltic). At Horns Reef, the acoustic activity of porpoises decreased shortly after each pile driving event and went back to baseline conditions after three to four hours. However, it is important to note that harbor porpoises in Cook Inlet are exposed to a variety of industrial sounds and return to Upper Cook Inlet each year, suggesting a level of habituation. Furthermore, harbor porpoise hearing is best at very high frequencies, well above the range of pile driving.

This page intentionally left blank.

8.0 THE ANTICIPATED IMPACT OF THE ACTIVITY ON THE AVAILABILITY OF THE SPECIES OR STOCKS OF MARINE MAMMALS FOR SUBSISTENCE USES

The Cook Inlet beluga whale has traditionally been hunted by Alaska Natives for subsistence purposes. For several decades prior to the 1980s, the Native Village of Tyonek residents were the primary hunters harvesting Cook Inlet beluga whales. During the 1980s and 1990s, a larger number of new Alaska Native subsistence hunters became active in Cook Inlet, having moved or were visiting from communities in western, northwestern, and the North Slope of Alaska (Stanek 1994). From 1994 to 1998, NMFS estimated 65 whales per year (range 21-123) were taken in this harvest, including those successfully taken for food, and those struck and lost. NMFS has concluded that this number is high enough to account for the estimated 14 percent annual decline in population during this time (NMFS in preparation). Actual mortality may have been higher, given the difficulty of estimating the number of whales struck and lost during the hunts. In 1999 a moratorium was enacted (Public Law 106-31) prohibiting the subsistence take of Cook Inlet beluga whales except through a cooperative agreement between NMFS and the affected Alaska Native organizations. Under subsequent agreements, a harvest of one or two beluga whales per year was authorized. No agreement was in place for 2006, and hunters voluntarily agreed to forgo a harvest in 2007, in light of the continued decline in the beluga whale population. From the moratorium in 1999 through 2007, a total of five Cook Inlet beluga whales have been taken in subsistence hunts, or an average of just more that one beluga whale every other year (NMFS in preparation).

Residents of the Native Village of Tyonek are the primary subsistence users in the Knik Arm area. Project activities will take place within the immediate vicinity of the Port, and no activities will take place in or near traditional subsistence hunting areas. The Tyonek community may harvest beluga whales that pass through the Project footprint; however, no hunting will take place in or near the Project area. The disturbance and potential displacement of beluga whales by noise from 2008 construction activities are the principal concerns related to subsistence use. It is not expected that Project activities will affect the accessibility of beluga whales to subsistence hunters. Since all anticipated takes from implementation of the Project would be takes by harassment involving temporary changes in behavior, construction activities associated with the Project would not impact the availability of the species or of the beluga whale stock for subsistence uses.

This page intentionally left blank.

9.0 THE ANTICIPATED IMPACT OF THE ACTIVITY UPON THE HABITAT OF THE MARINE MAMMAL POPULATIONS, AND THE LIKELIHOOD OF RESTORATION OF THE AFFECTED HABITAT

9.1 EFFECTS OF PROJECT ACTIVITIES ON MARINE MAMMAL HABITAT

Construction activities would result in a decrease in marine habitat and temporary changes in the noise environment during the construction activities in the vicinity of the Port.

9.1.1 Intertidal/Subtidal Fill

The proposed Project would fill the North Extension footprint in submerged and tidally influenced areas. This loss of intertidal and subtidal habitat would be permanent. The permanent loss of habitat will be mitigated as agreed by the Maritime Administration and POA during the USACE Section 404/10 permitting process. Mitigation measures included in the USACE permit for beluga whales are presented in Section 11. The complete USACE permit is included in Appendix A.

9.1.2 Dredging

The USACE currently dredges 206 acres at the Port on an annual basis. Figure 4 shows the area dredged annually by the USACE and overall project construction dredging anticipated at the Port from 2008 through 2012. For 2008 construction, the Port plans to dredge approximately 125,000 cy from the project footprint at the North Extension area. Once construction of the expanded facilities begins, additional USACE dredging will also be necessary for creating the appropriate operational bathymetry at the Port. USACE dredging is not expected to take place in 2008. Upon completion of the proposed Project activities, annual dredging would be required at the face of the new Port waterfront facilities.

Based upon best available data and previous and on-going fish and invertebrate sampling efforts (U.S. Department of Transportation 1983; Pentec 2004a; b; c; d; e), the dredged areas have low fish diversity and abundance, and very low diversity and abundance of marine vegetation and invertebrates. This area is primarily dominated by algal mats and polychaetes.

Sea floor disruption will occur during some construction activities, resulting in disturbance to benthic communities in the Project footprint. However, the benthic communities have a naturally patchy distribution. In near-shore areas, the communities are subject to natural seasonal disruption by ice scour of exposed tideflats and shallow subtidal areas. This suggests that recovery of areas disturbed by construction activities will occur in a manner similar to recovery after natural disturbance. Anchoring of tugs and barges in the construction area is not expected to significantly disrupt benthic communities, and these disruptions will be temporary.

The waters of Knik Arm are naturally turbid during the summer months when glacial input is at its maximum level. Some construction activities will disturb the sea floor with a turbid plume.

Any incremental construction-induced turbidity would likely be masked by naturally-occurring conditions for suspended sediment. The effects of Project activities in 2008 will be localized, short-term, negligible, and indistinguishable from naturally occurring disturbances to the benthos.

9.2 EFFECTS OF PROJECT ACTIVITIES ON MARINE MAMMAL PREY

Proposed construction activities will increase sound levels in the local underwater noise environment in the immediate vicinity of the Port. Information is not currently available regarding the effect of noise on fish species present in the Project area. However, limited data regarding impacts of air gun noise on fish and invertebrates indicate these impacts are short-term and are most apparent after exposure at very close range to the sound source (McCauley et al. 2000 a; b; Dalen et al. 1996). The underwater sounds from the proposed project would be considerably less loud than those of seismic air guns.

Beluga whales feed on a variety of fish, shrimp, squid and octopus (Burns and Seaman 1988). Common prey species in Knik Arm include salmon, eulachon and cod. Harbor seals feed on fish such as pollock, cod, capelin, eulachon, herring and salmon as well as a variety of benthic species, including crabs, and shrimp and cephalopods. Harbor porpoises feed primarily on herring, cod, whiting (hake), pollock, squid and octopus (Leatherwood et al. 1982). Killer whales feed on either fish or other marine mammals depending on genetic type (resident vs. transient respectively). Killer whales in Knik Arm are the transient type (Shelden et al. 2003) and feed on beluga whales and other marine mammals.

In general, fish perceive underwater sounds in the frequency range of 50 to 2,000 Hz, with peak sensitivities below 800 Hz (Popper and Carlson 1998; Department of the Navy 2001). However, salmon are sensitive to underwater impulsive sounds due to swimbladder resonance. As the pressure wave passes through a fish, the swimbladder is rapidly squeezed as the high pressure wave, and then under pressure component of the wave, passes through the fish. The swimbladder may repeatedly expand and contract at the high SPLs, creating pressure on the internal organs surrounding the swimbladder (NMFS 2004d).

Permanent injury to fish from acoustic emissions has been shown for high-intensity sounds of long duration, on the order of several hours. In a review on the effects of low-frequency noise to fish (NMFS 2004d), a threshold of 180 dB peak sound level was used to define the potential injury to fish. Sound pressure levels greater than an average of 150 dB RMS are expected to cause temporary behavioral changes such as a startle response or behaviors associated with stress. Although these SPLs are not expected to cause direct injury to a fish, they may decrease the ability of a fish to avoid predators.

Juvenile Chinook salmon have been shown to exhibit avoidance responses to low-frequency sound up to 280 Hz, with no response to higher frequencies (Carlson 1994). The strongest response was found for sounds between 30 and 150 Hz. Rainbow trout (*O. mykiss*), a related species, have been found to be sensitive to sounds from 25 to 800 Hz (Abbott 1973). Salmon

were found to respond to low-frequency sounds, but only at very short ranges, within distances of 2 ft or less from the sound source, even though the sounds were at levels up to 156 dB.

Carlson (1994), in a review of 40 years of studies concerning the use of underwater sound to deter salmonids from hazardous areas at hydroelectric dams and other facilities, concluded that salmonids were able to respond to low-frequency sound and to react to sound sources within a few feet of the source. He speculated that the reason that underwater sound had no effect on salmonids at distances greater than a few feet is that they react to water particle motion/acceleration, not sound pressures. Detectable particle motion is produced within very short distances of a sound source, although sound pressure waves travel farther.

9.3 CONCLUSIONS REGARDING IMPACTS TO HABITAT

Project activities in 2008 are not expected to impose any unmitigated effects on marine mammal habitat or the presence and availability of prey species. Maintenance of water quality would be ensured by adherence to construction BMPs, NPDES permit requirements, and implementation of a pollution prevention plan during construction. Construction activities planned for 2008 are not expected to cause significant impacts on beluga whale and other marine mammal habitat. The project area represents a very small fraction (less than one percent) of the available habitat for beluga whales and other marine mammals in the upper Inlet. Furthermore, underwater sound has not been demonstrated to significantly affect fish or invertebrate populations, and where there are effects, they are typically temporary and limited to areas very close to the sound source.

This page intentionally left blank.

10.0 THE ANTICIPATED IMPACT OF THE LOSS OR MODIFICATION OF HABITAT ON THE MARINE MAMMAL POPULATIONS INVOLVED

The effects of the Port expansion on marine mammal habitats and food resources are expected to be minor, as described in Section 9. A small number of the marine mammals that are present near the proposed activity may be temporarily displaced as much as a few km by Project activities during 2008. During the proposed in-water construction activities, most marine mammals will generally be dispersed throughout Upper Cook Inlet in preferred habitats and feeding areas. The Project activities are not expected to have any habitat-related effects that could cause significant or long-term consequences for individual marine mammals or their populations.

This page intentionally left blank.

11.0 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 AFFECTD SPECIES OR STOCKS, THEIR HABITAT, AND ON THEIR AVAILABILITY FOR SUBSISTENCE USES, PAYING PARTICULAR ATTENTION TO ROOKERIES, MATING GROUNDS, AND AREAS OF SIMILAR SIGNIFICANCE

11.1 MITIGATION MEASURES

Mitigation measures are defined for the overall Project (2007 through 2012), and not just the 2008 construction season.

Since the EA was published, the Project design has been advanced and refined with a goal of reducing, avoiding, or minimizing potential impacts. For the overall project from 2007 to 2012, the total amount of usable land to be reclaimed has been reduced from 135 to 128.7 acres; however, the footprint of the Project has been slightly increased from 135 to 138 acres. This increase is associated with modifications to the Project layout to reduce potential impacts to sediment deposition patterns and tidal current flow. The reduction in useable land is a result of replacing vertical sheet-pile walls with rock-armored slopes, which also decreased the total volume of fill to be placed. Other changes from the EA include:

- The total amount of intertidal land within the Project footprint has been reduced from 66 to 59 acres. Of this total, a 27-acre footprint of intertidal land has previously been filled under Phase I of the Project. The remaining intertidal zones impacted are either adjacent to existing Port facilities and USACE dredging operations, or to the north of existing Port operations adjacent to an old military landfill regulated under the Comprehensive Environmental Response, Compensation, and Liability Act.
- Total material volume of fill has been reduced from 12.3 to 10 million cy.
- Total length of the sheet pile wall has been reduced from 8,800 ft to 7,900 ft (7,430 ft of vertical sheet pile wall and 470 ft of dry barge berth consisting of a rock-armored slope to elevation +10 ft with an offset sheet-pile wall to elevation +38 ft).
- On the remaining waterfront development, sheet pile has been replaced with riprap armored slopes.
- Construction joints between Project phases have been modified to provide a break in the sheet pile filled with rock.

The following mitigation measures are defined by the Special Conditions of the Department of the Army Permit (POA-2003-502-N) issued by the USACE in August 2007. Special Conditions of the permit regarding beluga whales are quoted in the next pages.

Permit POA-2003-502-N (August 10, 2007)

Special Condition:

IV. Beluga Whales

"The following conditions are to prevent and minimize adverse impacts to marine mammals and to ensure compliance with the Marine Mammal Protection Act (MMPA)."

1. *"The POA has submitted petitions for an Incidental Harassment Authorization (IHA) for the 2007 construction season and a Letter of Authorization (LOA) for construction seasons 2008-2012 (Anchorage Port Expansion Team, Final Petition; January 2007) for Small Take Authorizations from the NOAA/NMFS under the Marine Mammal Protection Act (MMPA) for the incidental and unintentional taking of marine mammals. The conditions of the IHA and LOA Small Take Authorizations under the MMPA will be carried as special conditions of this DA permit unless otherwise noted by the Corps. The POA shall comply with the interim mitigation measures listed below to minimize project related adverse impacts to beluga whales. Upon receipt of the IHA and/or LOA MMPA authorizations, the Corps will reevaluate the terms or conditions of this permit and modify any conflicting conditions, if necessary."*

   A. *"The POA shall measure and evaluate construction and operationally generated noise introduced in Knik Arm at the Port of Anchorage. The applicant shall develop a 'Sound Index' to accurately represent noise levels associated with Port of Anchorage operations and construction activities, which must specifically include noise levels generated from pile driving, dockside activities, vessel traffic in the channel, dredging, and docking activities. The evaluation shall characterize current baseline operational noise levels at the Port of Anchorage and develop an engineering report that identifies structural and/operational noise reduction measures, if necessary, to minimize the baseline operational noise levels at the expanded port to the maximum extent practicable. The final report will be provided to the NMFS two years prior to construction completion."*

      "The Port of Anchorage Sound Index will be collaborated with the concurrent beluga whale monitoring program to correlate construction and operationally generated noise exposures with beluga whale presence, absence, and any altered behavior observed during construction and operations (i.e., a dose-response analysis). An annual review of beluga observations and noise exposure data shall be provided to NMFS no later than 1 Feb annually. The annual review shall also identify relevant technological advances in sound attenuation. The POA shall employ practicable noise minimization measures identified in the annual reports in subsequent POA construction activities."

   B. *"In collaboration with the NMFS, the Port of Anchorage shall continue to develop and maintain a beluga monitoring program to estimate the frequency at which beluga whales are present in the project footprint; characterize habitat use and behavior of belugas near the Port during ice free months; map sound levels and distance attenuation related to POA background noise and expansion activity; and to characterize and assess the*

impacts of received noise from the POA on beluga whale behavior and movements. POA shall consult with NMFS to develop the program and shall include the following:"

a. *"Include visual observations (share-based and opportunistic vessel observations) to monitor beluga movements, timing, group size, locations, identifiable behaviors and patterns, and use the area in the vicinity of the Project during operations through the construction period. The POA will also provide one year of post-construction monitoring in continued consultation with NOAA/NMFS."*

b. *"Include a passive acoustic monitoring plan to correlate with visual observations. The POA shall install hydrophones (or employ other effective methodologies) necessary to detect and localize passing whales and to determine the proportion of belugas missed from visual surveys."*

c. *"The POA will employ a marine mammal observation team separate from the construction contractor observer activities, for the duration of all construction activities."*

C. *"The Port of Anchorage shall establish and enforce safety radii and shut down standards around the in-water pile driving areas. Initially, the safety radii requiring shut down shall be for any whale observed within 650 meters of pile driving. The Port of Anchorage shall conduct on-site underwater noise surveys to verify the 190, 180 and 160 dB re 1 µPa rms isopleths from in-water pile driving activities for the POA expansion. Safety zones appropriate to the POA site conditions and equipment will then be empirically determined and implemented. The dB re 1 µPa rms safety zone should be in force unless the POA obtains authorization under the section 101 (a) of the Marine Mammal Protection Act for the incidental and unintentional taking of marine mammals; in which case the safety zones should be those provided within the authorization. The safety zone around pile driving areas shall be monitored for the presence of marine mammals before, during, and after any pile driving activity. If the safety radius is obscured by fog or poor lighting conditions, pile driving will cease until the entire safety radius is visible."*

D. *"Prior to the start of seasonal pile driving activities, the POA will require construction supervisors and crews, the marine-mammal monitoring team, the acoustical monitoring team, and all project managers to attend a briefing. The purpose of the briefing will be to establish the responsibilities of each party, define the chains of command, discuss communication procedures, provide an overview of monitoring purposes, and review operational procedures."*

E. *"The Port of Anchorage shall formally notify the NMFS prior to the seasonal commencement of pile driving and provide weekly monitoring reports. A summary monitoring report will be submitted at the end of annual construction activities and a final report will be submitted at the end of the one year post construction monitoring season."*

F. *"The POA will establish daily "soft start" or "ramp up" procedures for pile-driving activities. The soft start technique will be used at the beginning of each piling installation to allow any marine mammal that may be in the area to leave before pile driving activities reach full energy. The soft start procedure will require contractors to initiate noise from vibratory hammers for 15 seconds at reduced energy followed by a 1-minute waiting period. This procedure will be repeated two additional times. If an impact hammer is used, contractors will be required to provide an initial start of 3 strikes at 40-percent energy, followed by a 1-minute waiting period, then two subsequent 3-strike sets. If marine mammals are sighted within the safety zone prior to the pile driving or during the soft start, the contractor will delay pile-driving continuation until the mammal has moved outside the safety zone. Pile installation will resume only after a qualified observer confirms that the marine mammal has moved outside the safety zone or after 15 minutes have elapsed since the marine mammal was last sighted."*

G. *"The POA will erect whale-notification signage in the waterfront viewing areas near the Ship Creek Public Boat Launch and within the secured Port entrance that is visible to all Port users. This signage will provide information on the beluga whale and notification procedures for reporting beluga whale sightings to the NMFS. The POA will consult with the NMFS to establish the signage criteria."*

H. *"During in-water construction activities, the POA shall ensure that construction contractors delegate supervisory responsibility to include on-site construction personnel to observe, record, and report marine mammal sightings and response actions taken, to include shut down or delay."*

I. *"The POA shall establish a long-term, formalized marine-mammal sighting and notification procedure for all Port users, visitors, tenants, or contractors during and after construction. The notification procedure shall clearly identify roles and responsibilities for reporting all marine mammal sightings. The POA will forward documentation of all reported marine mammal sightings to the NMFS."*

   a. *"In-water impact pile-driving, excluding work when the entire pile is out of the water due to shoreline elevation or tidal stage, shall not occur within two hours of either side of each low tide."*

   b. *"In-water sheet piles shall be driven with a vibratory hammer to the maximum extent possible (i.e., until desired depth is achieved and/or to refusal, prior to using an impact hammer."*

   c. *"The final design shall, wherever possible, incorporate end-of-phase construction joints that provide potential refuge habitat areas for salmonids in the non-structural voids. Although the spacing, size, and configuration of these structural joints will be dictated by stability and construction requirements, void spaces within these joints shall be developed to maximize the potential salmonid refuge value of the space. The design of the refuge area within the void space shall be approved by the Corps, in consultation with other federal resource agencies. The refuge area shall be*

monitored by the Port of Anchorage between 15 May and 15 August for a minimum of 2 years following construction to determine the extent and nature of use by salmonids. Based on the monitoring observations, this condition may be modified to improve the functional value of refuge areas if necessary."

This page intentionally left blank.

12.0 WHERE THE PROPOSED ACTIVITY WOULD TAKE PLACE IN OR NEAR A TRADITIONAL ARCTIC SUBSISTENCE HUNTING AREA AND/OR MAY AFFECT THE AVAILABILITY OF A SPECIES OR STOCK OF MARINE MAMMAL FOR ARCTIC SUBSISTENCE USES, THE APPLICANT MUST SUBMIT EITHER A PLAN OF COOPERATION OR INFORMATION THAT IDENTIFIES WHAT MEASURES HAVE BEEN TAKEN AND/OR WILL BE TAKEN TO MINIMIZE ANY ADVERSE EFFECTS ON THE AVAILABILITY OF MARINE MAMMALS FOR SUBSISTENCE USES

The POA and Maritime Administration will meet with the Cook Inlet Marine Mammal Commission (CIMMC) to describe the project and discuss subsistence concerns. The meeting(s) should be sufficient to comply with the IHA requirement for a plan of cooperation (POC). NMFS has determined in other IHA permits that this level of communication is sufficient to comply with the POC (i.e., 2007 IHAs for ConocoPhillips Alaska, Inc. and Union Oil Company of California for Upper Cook Inlet). The meeting(s) will provide information on the time, location, and features of the POA project, opportunities for involvement by local people, potential impacts to marine mammals, and mitigation measures to avoid or minimize impacts.

The features of the project in combination with a number of actions to be taken by the POA and Maritime Administration during the project should prevent any adverse effects on the availability of marine mammals for subsistence, which have been identified in this application. They include the following:

- The project will occur outside of the traditional area for hunting marine mammals
- Construction operations will follow mitigation procedures to minimize effects on the behavior of marine mammals and, therefore, opportunities for harvest by local communities;
- Regional subsistence representatives may be hired to perform marine mammal observations along with marine mammal biologists during the monitoring program.
- The combination of the project location and size of the affected area, mitigation measures, and input from the CIMMC should result in project operations having no affect on the availability of marine mammals for subsistence uses.

This page intentionally left blank.

13.0 THE SUGGESTED MEANS OF ACCOMPLISHING THE NECESSARY MONITORING AND REPORTING THAT WILL RESULT IN INCREASED KNOWLEDGE OF THE SPECIES, THE LEVEL OF TAKING OR IMPACTS ON POPULATIONS OF MARINE MAMMALS THAT ARE EXPECTED TO BE PRESENT WHILE CONDUCTING ACTIVITIES AND SUGGESTED MEANS OF MINIMIZING BURDENS BY COORDINATING SUCH REPORTING REQUIREMENTS WITH OTHER SCHEMES ALREADY APPLICABLE TO PERSONS CONDUCTING SUCH ACTIVITY. MONITORING PLANS SHOULD INCLUDE A DESCRIPTION OF THE SURVEY TECHNIQUES THAT WOULD BE USED TO DETERMINE THE MOVEMENT AND ACTIVITY OF MARINE MAMMALS NEAR THE ACTIVITY SITE(S) INCLUDING MIGRATION AND OTHER HABITAT USES, SUCH AS FEEDING. GUIDELINES FOR DEVELOPING A SITE-SPECIFIC MONITORING PLAN MAY BE OBTAINED BY WRITING TO THE DIRECTOR, OFFICE OF PROTECTED RESOURCES; AND

13.1 PORT OF ANCHORAGE MARINE MAMMAL MONITORING PROGRAM

The POA is committed to avoiding or minimizing impacts to marine mammals from Port expansion activities. The POA has been working closely with NMFS, and other agencies to address marine wildlife and Project design issues. In collaboration with NMML, NMFS recommended the POA implement a marine mammal monitoring program in 2005 prior to, during, and one year after construction to observe and assess whale movements, timing, group size, locations, and patterns. In conjunction with NMFS and NMML, the POA developed a marine mammal monitoring program to document marine mammal activity inside and outside the Project footprint. Observers record the presence of any marine mammal sighted during observations. The objectives of the monitoring program are to:

1. Estimate the frequency at which beluga whales or other marine mammals are present in the Project footprint;
2. Characterize habitat use and behavior of beluga whales;
3. Determine construction and background noise levels to ensure that beluga whales and other marine mammals will not be harmed by construction activities conducted near the Port during ice-free months; and
4. Provide the construction manager with prompt notification of beluga whale proximity to expansion activities so construction can be shut down before any whales enter the designated safety radii.

The monitoring area includes all water visible from the monitoring stations located near the Port, within Knik Arm, Upper Cook Inlet, and just offshore of Anchorage. The observers must monitor all tide levels each month. Sightings within the Project footprint area are distinguished

from value-added data collected on beluga whale and marine mammal occurrence and behavior outside the Project footprint.

Port of Anchorage Pre-Construction Monitoring (2005-2006)

As part of a pre-construction monitoring program initiated by the POA, LGL, Inc. was contracted to implement the plan. LGL monitored beluga whale activity within the vicinity of the Port from August through November 2005 and from April through July 2006; the two monitoring stations were located at the Port and at Cairn Point on EAFB.

Preconstruction monitoring was conducted from May 3, 2006 until July 27, 2006 for 252 hours over 42 days (May = 60 hours, June = 108 hours, July = 84 hours). During these three months there were 17 beluga sightings, none of which were calves (each sighting represents one whale; because individual whales were not identified, individual whales may have been re-sighted several times over the course of the study). Belugas were sighted at a rate of 0.07 whales per hour. Mean estimated minimum group size was two whales (range one to five). Eight (47 percent) of all observed belugas were seen within the Project footprint. Average sighting rates were 0.03 beluga whales per hour within the Project footprint, and 0.04 belugas per hour outside of the Project footprint. Belugas were sighted relatively infrequently (8 of 42 days; 19 percent). When belugas were present, they were observed to spend 73 percent of the time within the Project footprint. Traveling and diving were the most commonly observed behaviors. Some milling behavior was observed, but not resting behavior. Suspected feeding activity was observed in the area between the base of Cairn Point and the Phase I North Backlands expansion site. Beluga movements were most often to the north and south. Group formations were linear or parallel, and animals were typically in small, tight groups (one to three body lengths between individuals). Belugas were seen throughout the low to mid-tidal cycle (each six-hour monitoring shift was centered on low tide).

Port of Anchorage Construction Monitoring During Phase I (2006)

Phase I construction monitoring was conducted from August 2, 2006 until November 3, 2006 for 299 hours and 46 minutes over 51 days (August = 92 hours 6 minutes, September = 96 hours, October = 96 hours, November = 15 hours 40 minutes). During these four months, there were 64 beluga whale sightings, including 5 calf sightings. Beluga whales were sighted at a rate of 0.21 whales per hour. Mean estimated minimum group size was four whales (range one to ten). Fifty-six (88 percent) of all observed beluga whales were seen within the Project footprint. Average sighting rates were 0.19 beluga whales per hour within the Project footprint, and 0.19 beluga whales per hour outside of the Project footprint. Beluga whales were sighted relatively infrequently (11 of 51 days; 22 percent). When beluga whales were present, they were observed to spend 75 percent of the time within the Project footprint. Traveling and diving were the most commonly observed behaviors. Some milling behavior was observed, but resting was not. Suspected feeding activity was observed in the area between the base of Cairn Point and the Phase I expansion site. Beluga movements were most often to the north and south, although in

some instances animals milled without directionality. Group formations were most often linear or parallel, and animals were in groups that ranged from tight (one to three body lengths between individuals) to dispersed (up to 12 body lengths between animals). Belugas were seen throughout the low to mid-tidal cycle (each six-hour monitoring shift was centered around low tide), although beluga whale use of the Project area peaked around low tide. This professional monitoring program, conducted by LGL from August through November 2006, implemented a notification procedure that informed the construction manager of whale presence. The construction manager enforced a shut-down criterion of 50 m when whales were observed during in-water construction.

The construction contractor for Phase I was also required to implement a whale monitoring program. The contractor stationed two full-time whale watchers (under contractual obligation) at the in-water construction site; these observers were required to complete a daily form for any beluga whales sighted during construction activities. All beluga whale sightings during in-water work were recorded on a whale sighting notification form. The POA immediately forwarded the forms to NMFS.

2006 Survey Summary

Temporal patterns

In order to learn more about the temporal patterns of beluga whale use of the area surrounding the Port, a study was conducted during the ice-free months (April through November) involving observations made from Cairn Point and the Port dock. August and September showed the highest rates of sightings with means of 0.4 and 0.3 sightings per hour, respectively. Beluga sightings also varied according to tidal stage. The highest sighting rates occurred at low ebb and low slack water. Whales were also spotted more frequently in the late morning/afternoon than in other parts of the day.

Spatial distribution

Spatial data were also collected by observers on shore using geo-referenced grid cell maps (Funk et al. 2005) and a surveyor's theodolite (Ramos et al. 2006). Eighty percent of sightings occurred within 500 m of the Project footprint, while 64 percent occurred within the footprint. Whales were sighted within the Project footprint once in April, once in May, three times in June, once in July, five times in August, and five times in September.

Behavior

Group size and age class composition, behavior, and movement patterns were also studied to gain a better knowledge of how beluga whales use the Port area. Time spent within the Project footprint varied between months from 0 to 41 minutes. Mean horizontal swimming speed of whales tracked with the theodolite was 6 km per hour. Mean group size was three whales, and 40 percent of sightings were of single whales. Calves were spotted in 20 percent of sightings,

usually as part of larger nursery groups with a mean of eight whales. Observed behaviors included foraging, diving and feeding behaviors, both confirmed and suspected.

Port of Anchorage Construction Monitoring (2007)

The Phase II construction monitoring for 2007 work was contracted to APU under the direction of Dr. Leslie Cornick. APU field researchers employed the same monitoring protocols as LGL employed during the previous two seasons at the Port. Phase II construction monitoring was conducted from October 9 to November 20, 2007 for 139 hours and 25 minutes over 42 days (October = 85 hours 45 minutes, November = 53 hours 40 minutes). During these two months, there were 67 beluga whale sightings. Of the 42 days of observation, belugas were sighted during 9 days. Belugas were sighted at a rate of 0.5 whales per hour. Mean estimated minimum group size was 4.3 whales (range 1 to 20). Seventy-nine percent of the groups were sighted along the southeast shoreline of Knik Arm, near the Port, and 21 percent were sighted toward the northern shoreline. Belugas were seen throughout the tidal cycle (each 6-hour monitoring shift was centered around low tide). Contrary to the past two seasons, only 28 percent of the beluga whale sightings occurred around low tide. Only preliminary data were available at the time of this writing (Kendall, personal communication, December 6, 2007).

Port of Anchorage 2008 Construction Monitoring

Phase II construction activities will require similar monitoring oversight from on-shore observers, including a contractual mandate for the contractor to enforce shut-down measures when a marine mammal approaches the safety radii. All beluga sightings during in-water work will be recorded on a whale sighting notification form; the Port will immediately convey this information to NMFS (Appendix D Beluga Sighting Notification Procedures and Reporting Form). This form is to be completed by POA employees, tenants, contractors and visitors. APU observers have been using the same form that LGL used when conducting their observations. The LGL form is included in Appendix D. For the 2008 construction season, the APU monitoring program will modify the LGL form and produce an updated work plan. APU will follow the same protocol previously set by LGL. A monitoring work plan is in development for the 2008 construction season. As an example, APU's 2007 Beluga Whale Monitoring Plan is also included in Appendix D.

Reporting - 2008 Construction Monitoring

During the 2008 construction season, whale monitoring progress reports will be generated and posted monthly on the POA website (http://www.portofanchorage.org). These monthly reports will then be compiled and the data analyzed and submitted to NMFS, Office of Protected Resources, within 90 days after the end of the 2008 in-water construction. This report will also be made available to the public and other resource agencies. The 90-day report will describe the construction activity that took place and the marine mammals that were detected near operations. It will provide documentation of methods, results, and interpretation pertaining to all marine mammal and acoustic monitoring. The report will summarize the pile driving activities and all

marine mammal sightings (dates, times, locations, numbers, and behavior) and will include estimates of the amount and nature of potential take of marine mammals by harassment or in other ways. The POA and the Maritime Administration will consult with NMFS after their review of the 90-day reports to determine future recommendations for this monitoring, shut down, and reporting program.

This page intentionally left blank.

14.0 SUGGESTED MEANS OF LEARNING OF, ENCOURAGING, AND COORDINATING RESEARCH OPPORTUNITIES, PLANS, AND ACTIVITIES RELATING TO REDUCING SUCH INCIDENTAL TAKING AND EVALUATING ITS EFFECTS.

Construction activities have been conducted in Alaska waters for over 25 years and, during this time there have been no noticeable adverse impacts on the marine mammal populations or their availability for subsistence uses. This includes previous pile driving activity involving larger piles than those proposed for this Project.

To minimize the likelihood that impacts will occur to the species, stocks and subsistence use of marine mammals, all construction activities will be conducted in accordance with all federal, state, and local regulations. To further ensure there will be no adverse effects resulting from the planned construction activities, the POA will continue to cooperate with the NMFS and other appropriate federal agencies (U.S. Fish and Wildlife Service, USCG, EAFB, U.S. Environmental Protection Agency, and USACE), the State of Alaska, CIMMCl, Tyonek Village Council, the affected communities, and other monitoring programs to coordinate research opportunities and assess all measures than can be taken to eliminate or minimize any impacts from these activities.

The POA will also cooperate with all other marine mammal researchers in southcentral Alaska in sharing field data and behavioral observations on beluga whales and other marine mammal species that occur in the project area. This information will also be shared with other governmental and private groups conducting studies of beluga whales including NMFS, ADF&G, LGL, Hubbs-Sea World Research Institute, and oil and gas exploration companies operating in Cook Inlet.

This page intentionally left blank.

15.0 REFERENCES

Abbott, R.R. 1973. Acoustic Sensitivity of Salmonids. PhD dissertation. University of Washington, College of Fisheries, Seattle.

Alaska Department of Natural Resources. 1999. Cook Inlet Area Wide 1999 Oil and Gas Lease Sale, Final Finding of the Director. Chapter Three: Habitat, Fish and Wildlife. Division of Oil and Gas. http://www.dog.dnr.state.ak.us/oil/products/publications/cookinlet/cia1999final_finding/cifinding_contents.htm. Accessed 17 February 2004.

Anchorage Port Expansion Team. 2005. Final Port Intermodal Expansion Project, Marine Terminal Redevelopment Environmental Assessment. March 2005.

Angliss, R.P., and R.B. Outlaw, editors. 2005. Alaska Marine Mammal Stock Assessments, 2005. U. S. Department of Commerce, NOAA Technical Memorandum. NMFS-AFSC-161, 250 p.. December. Available at:

Angliss, R.P., and R.B. Outlaw. 2007. Alaska Marine Mammal Stock Assessments, 2006. U.S. Department of Commerce, NOAA Technical Memorandum. NMFS-AFSC-168, 224 p.

Awbrey, F.T., J.A. Thomas, and R.A. Kasetelein. 1988. Low frequency underwater hearing sensitivity in belugas, *Delphinapterus leucas*. Journal of the Acoustical Society of America 84:2273-2275.

Blackwell, S.B. 2005. Underwater measurements of pile-driving sounds during the Port MacKenzie dock modifications. August 13 through 16, 2004. Report from 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; Department of Transportation and Public Facilities, Anchorage, AK; and Federal Highway Administration, Juneau, AK. 33 p.

Blackwell, S.B. and C.R. Greene Jr. 2002. Acoustic measurements in Cook Inlet, Alaska during August 2001. Greeneridge Report 271-2. Report from Greeneridge Sciences, Inc., Santa Barbara for National Marine Fisheries Service, Anchorage, AK. 43 p.

Blackwell, S.B., J.G. Lawson, M.T. Link. 2004. Tolerance by ringed seals (Phoca hispida) to impact pipe driving and construction sounds at an oil production island. Journal of the Acoustical Society of America 115:2346-2357.

Braham, H.W., and M.E. Dalheim. 1982. Killer whales in Alaska documented in the platforms of opportunity program. Pp 643-645 in Report of the International Whaling Commission 32. Cambridge, England.

Brueggeman, J.J. 2007. 2007 Spring Marine Mammal Monitoring Program for the ConocoPhillips Beluga River Seismic Operations in Cook Inlet Alaska: 90-day Report. Canyon Creek Consulting. Prepared for ConocoPhillips Alaska, Inc. 38 pp.

Brueggeman, J.J. 2007. Personal communication to Dave Erikson, URS Biologist, December 2007. Canyon Creek Consulting.

Burns, J.J., and G.A. Seaman. 1986. Investigations of belukha whales in coastal waters of western and northern Alaska. II. Biology and ecology. U.S. Department of Commerce, NOAA, OCSEAP Final Report 56 (1988): 221-357.

Carlson, T.J. 1994. Use of Sound for Fish Protection at Power Production Facilities: A Historical Perspective of the State of the Art. Phase I Final Report: Evaluation of the Use of Sound to Modify the Behavior of Fish. Report No. DOE/BP-62611-4. Prepared for waterfront Department of Energy; Bonneville Power Administration; Environment, Fish, and Wildlife. November.

Dahlheim, M.E. 1997. A photographic catalogue of killer whales (Orcinus orca) from the Central Gulf of Alaska to the southeastern Bering Sea. U.S. Department of Commerce, NOAA, Technical Report NMFS-131. 54 p.

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. Mar. Mammal Sci. 16(1):28-45.

Dalen, J., E. Ona, A.V. Soldal and R. Saetre. 1996. Seismic investigations at sea; an evaluation of consequences for fish and fisheries. Fisken og Havet 1996:1-26. (in Norwegian, with an English summary).

Department of the Navy. 2001. Final Overseas Environmental Impact Statement and Environmental Impact Statement for Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) Sonar. January.

Ebersole, B. and L. Raad. 2004. Tidal circulation modeling study to support the Port of Anchorage expansion. Appendix E: Hydrodynamics In: Port of Anchorage Marine Terminal Redevelopment Environmental Assessment.

Finneran, J.J., D.A. Carder, and S.H. Ridgeway. 2002. Low frequency acoustic pressure, velocity, and intensity thresholds in a bottlenose dolphin (*Tursiops truncatus*) and white whale (*Delphinapterus leucas*), Journal of the Acoustical Society of America 111:447-456.

Ford, J. K. B. and Fisher, H. D. 1983. Group-Specific Dialects of killer whales (Orcinus orca) in British Columbia. In: R. Payne (ed.) Communication and Behaviour of whales AAAs Selected Symposium 1976. Boulder, Colorado, West View Press.

Funk, D.W., R.J. Rodrigues, and M.T. Williams (eds.). 2005. Baseline studies of beluga whale habitat use in Knik Arm, Upper Cook Inlet, Alaska, July 2004-July 2005. Report from 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. December 9. 232 p.

Funk, D.W., T.M. Markowitz, and R. Rodrigues (eds.). 2005. Baseline studies of beluga whale habitat use in Knik Arm, Upper Cook Inlet, Alaska, July 2004-July 2005. Rep. from 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. 232 p.

Great Land Trust. 2000. Technical Report on Significant Natural Open Space in the Anchorage Bowl: A Survey of Biologically Important Habitat and Areas Identified as Important by the Anchorage Community. January.

Hastings, M.C. and A.N. Popper. 2005. Effects of Sound on Fish. Subconsultants to Jones & Stokes under California Department of Transportation Contract No. 43A0139. August 23.

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 estuary. Arctic 58(4):33 1-340.

Huntington, H.P. 2000. Traditional knowledge of the ecology of belugas, Delphinapterus leucas, in Cook Inlet, Alaska. Marine Fisheries Review 62: 134- 140.

Illingworth & Rodkin, Inc. 2001. Final data report: Noise and vibration measurements associated with the Pile Installation Demonstration Project for the San Francisco-Oakland Bay Bridge East Span. Submitted to the State of California, Department of Transportation, District 4, Toll Bridge Program, August 2001.

Illingworth & Rodkin, Inc. 2003. *Underwater Sound Levels Associated with Pile Driving Activities Associated with Construction of the Noyo Bridge*. Report to Caltrans. March 18 and revised April 9, 2003.

Illingworth & Rodkin, Inc. 2007. *Port of Oakland Berth 35/37 – Underwater Sound Measurements for the Installation of Steel Sheet Piles with a Hydraulic Vibratory Hammer*. Report to the Dutra Group, January 23, 2007.

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

Johnson, C.S. 1991. Hearing thresholds for periodic 60 kHz tone pulses in the beluga whale. Journal of the Acoustical Society of America 89:2996-3001.

Kastak, D., B. Southall, B.L., R.D. Schusterman, and C.R. Kastak. 2005. Underwater temporary threshold shifts in pinnipeds: effects of noise level and duration. Journal of the Acoustical Society of America 118: 3154-3163.

Kastak, D. and R.J. Schusterman. 1995. Aerial and underwater hearing thresholds for 100 Hz pure tones in two pinniped species. In: R.A. Kastelein, J.A. Thomas, and P.E. Nachtigall (eds), Sensory systems of aquatic mammals. De Spil Publisihsing, Woerden, Netherlands

Kastak, D. and R.J. Schusterman. 1998. Low-frequency amphibious hearing in pinnipeds: methods, measurements, noise, and ecology. *J. Acoust. Soc. Am.* 103(4):2216-2228.

Kastelein, R.A., P. Bunskoek, M. Hagedoorn, W.L. Au, and D. Haan. Audiogram of a harbor porpoise (*Phocoena phocoena*) measured with narrow-band frequency-modulated signals. Journal of the Acoustical Society of America 112:334-344.

Kendall, L. 2007. Beluga Whale Observations for the Port of Anchorage. Alaska Pacific University Beluga Observer Program. Unpublished data. December.

Ketten, D. 1998. Marine mammal auditory systems: a summary of audiometric and anatomical data and its implications for underwater acoustic impacts. NOAA-TM-NMFS-SWFSC-256. 74p.

Leatherwood, J.S., and M.E. Dahlheim. 1978. Worldwide distribution of pilot whales and killer whales. Naval Oceans Systems Center, Tech, Rep. 443:1-39.

Leatherwood, J.S., W.E. Evans, and D.W. Rice. 1982. The whales, dolphins, and porpoises of the eastern north Pacific. A guide to their identification in the water. Naval Undersea Center, NUC TP 282. 175p.

Longmuir, C. and T. Lively. 2001. Bubble Curtain Systems Help Protect the Marine Environment. PDCA, Quarterly Newsletter, Vol. 2, No. 3, Summer 2001.

Markowitz, T.M. and T.L McGuire. 2007. Temportal-spatial distribution, movements and behavior of beluga whales near the Port of Anchorage, Alaska. Final Report. Prepared for the Port of Anchorage and the U.S. Department of Transportation Maritime Administration by LGL Research Associates, Inc, Anchorage, Alaska.

McCauley, R.D., J. Fewtrell, A.J. Duncan, C. Jenner, M.N. Jenner, J.D. Penrose, R.I.T. Prince, A. Adhitya, J. Murdoch and K. McCabe. 2000a. Marine seismic surveys: Analysis of airgun signals; and effects of air gun exposure on humpback whales, sea turtles, fishes and squid. Rep. from Centre for Marine Science and Technology, Curtin Univ., Perth, W.A., for Austral. Petrol. Prod. Assoc., Sydney, N.S.W. 188 p.

McCauley, R.D., J. Fewtrell, A.J. Duncan, M.N. Jenner, C. Jenner, R.I.T. Prince, A. Adhitya, K. McCabe and J. Murdoch. 2000b. Marine seismic surveys - a study of environmental implications. APPEA (Austral. Petrol. Product. Explor. Assoc.) Journal 40:692-708.

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.

_____. 2000a. Taking marine mammals incidental to construction and operation of offshore oil and gas facilities in the Beaufort Sea/Final Rule. Federal Register 65(102, 25 May):34014-34032.

_____. 2003. Subsistence Harvest Management of Cook Inlet Beluga Whales Final Environmental Impact Statement. July.

_____. 2004a. Beluga Whale Tagging in Cook Inlet, Alaska.

http://www.fakr.noaa.gov/protected resources/whales/beluga.htm.

_____. 2004b. Personal communication from Brad Smith, Marine Mammalogist. Regarding information on beluga whale distribution and habitats in the vicinity of the Port of Anchorage. 8 October.

_____. 2006a. Species Under the Endangered Species Act (ESA).

http://www.nmfs.noaa.gov/pr/species/esa.htm. Last updated 15 March; accessed 16 March.

_____. 2006b. 2005 Cook Inlet Beluga Whale Population Estimate Completed. Alaska Region News Release, 20 January.
http://www.fakr.noaa.gov/newsreleases/belugaestimate012006.htm.

_____. In preparation. Draft Supplemental Environmental Impact Statement – Cook Inlet Beluga Whale Subsistence Harvest. Anchorage. NMFS.

National Marine Mammal Laboratory (NMML). 2004. Personal communication from Christy Sims, Marine Mammal Data Specialist. Regarding Opportinistic Marine Mammal Sightings (1999-2002) and beluga aerial survey data (1993-2004). Seattle, WA.

Pentec. 2004a. Summary of July Sampling Activities – Knik Arm, Alaska. Prepared for HDR Alaska, Inc. 13 August.

_____. 2004b. Summary of August Sampling Activities – Knik Arm, Alaska. Prepared for HDR Alaska, Inc. 6 October.

_____. 2004c. Summary of September Sampling Activities – Knik Arm, Alaska. Prepared for HDR Alaska, Inc. 6 October.

_____. 2004d. Summary of September Sampling Activities – Knik Arm, Alaska. Prepared for Integrated Concepts & Research Corporation. 15 October.

_____. 2004e. Summary of September 30-October 1 Sampling – Knik Arm, Alaska. Prepared for Integrated Concepts & Research Corporation. 15 October.

POA and Maritime Administration. 2005. Port Intermodal Expansion Project Marine Terminal Redevelopment Environmental Assessment: Final. March.

Popper, A.N., and T.J. Carlson. 1998. Application of Sound and Other Stimuli to Control Fish Behavior. *Transactions of the American Fisheries Society* 127:673-707.

Ramos, A.P., T.M. Markowitz, D.W. Funk, and M.R. Link. 2006. Monitoring beluga whales at the Port of Anchorage: Pre-expansion observations, August-November 2005. Report from LGL Alaska Research Associates, Inc., Anchorage, AK, for Integrated Concepts & Research Corporation, the Port of Anchorage, AK, and the waterfront Department of Transportation Maritime Administration.

Richardson, W.J., C.R. Greene, C.I. Malme, and D.H. Thomson. 1995. Marine Mammals and Noise. Academic Press, Inc., San Diego, CA.

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. Mar. Fish. Rev. 62(3): 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. http://www.fakr.noaa.gov/protectedresources/whales/beluga/ surveyrpt2003.pdf.

Rugh, D.J., B.A. Mahoney, and B. K. Smith. 2004a. Aerial surveys of beluga whales in Cook Inlet, Alaska, between June 2001 and June 2002. U.S. Dep. Commer. NOAA Tech. Memo. NMFS-AFSC-145.

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. http://www.fakr.noaa.gov/protected resources/whales/beluga/survey/2004.pdf.

Rugh, D.J., K.E.W. Shelden, and B.K. Smith. 2004c. Aerial Surveys of Beluga Whales in Cook Inlet, Alaska, between June 2001 and June 2002. NOAA Technical Memorandum NMFS-AFSC-145. July.

http://www.fakr.noaa.gov/protected resources/whales/beluga/survey/2004.pdf.

Rugh, D.J., K.E.W. Shelden, C.L. Sims, B.A. Mahoney, B.K. Smith, L.K. (Litzky) Hoberecht, 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. 71pp.

Rugh, D. J., K.T. Goetz, and B.A. Mahoney. 2005b. Aerial Surveys of Belugas in Cook Inlet, Alaska, August 2005. http://www.fakr.noaa.gov/protectedresources/whales/beluga/aerialsurvey05.pdf.

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 document. Natl. Mar. Mammal Lab., NMFS, NOAA, Alaska Fish. Sci. Cent., 7600 Sand Point Way, NE, Seattle, WA 98115. 17 p.

Rugh, D.J., K.T. Goetz, C.L. Sims, and B.K. Smith. 2006. Aerial surveys of belugas in Cook Inlet, Alaska, August 2006. Unpubl. NMFS report. 9 pp.

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. Unpubl. NMFS report. 16 pp.

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.

Sjare, B. and T.G. Smith. 1986a. The relationship between vocalizations and behavioral activity of white whales, *Delphinapterus leucas*. Canadian Journal of Zoology 64:2824-2831.

Sjare, B. and T.G. Smith. 1986b. The vocal repertoire of white whales, *Delphinapterus leucas*, summering in Cunningham Inlet, Northwest Territories. Canadian Journal of Zoology 64: 407-415.

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

Stanek, R. T. 1994. The subsistence use of beluga whale in Cook Inlet by Alaska Natives. 1993. Draft Final Report for year two, subsistence study and monitoring system No.50ABNF200055. Technical Paper No. 232. ADF&G, Juneau, AK. 23-pp.

Szymanski, M.D., D.E. Bain, K. Kiehl, S. Pennington, S. Wong, and K.R. Henry. 1999. Killer whale (*Orcinus orca*) hearing: Auditory brainstem response and behavioral audiograms. Journal of the Acoustic Society of America 106: 1134-1141.

Tougaard, J., J. Carstensen, O.H. Henriksen, H. Skov, and J. Teilmann. 2003. Short-term effects of the construction of wind turbines on harbor porpoises at Horns Reef. Technical report to Techwise A/S. Hedeselskabet.

URS Corporation. 2007. Port Of Anchorage Marine Terminal Development Project Underwater Noise Survey Test Pile Driving Program, Anchorage, Alaska. Report from URS Corporation for Integrated Concepts and Research Corporation. 110 p.

USACE. 2007. Department of Army Permit. Port of Anchorage, Permittee. Permit No. POA-2003-502-N. Issued by the U.S. Army Engineer District, Alaska

United States Department of Transportation (USDOT). 1983. Knik Arm Crossing Technical Memorandum No. 15: Marine Biological Studies. Prepared for waterfront Department of Transportation Federal Highway Administration and Alaska Department of Transportation and Public Facilities. 20 December.

Verboom, W.C. and R. Kastelein. 2004. Structure of harbor porpoise (*Phocoena phocoena*) acoustic signals with high repetition rates. In: Echolocation in Bats and Dolphins, Eds. J.A. Thomas, W.E. Pritchett, C. Moss, and M. Vater. University of Chicago Press.

Waite, J. M. and R. C. Hobbs. 1999. Small cetacean aerial survey in Prince William Sound and the western Gulf of Alaska in 1998 and preliminary harbor porpoise abundance estimates for the southeast Alaska and the Gulf of Alaska stocks. In A. L. Lopez and D. P. DeMaster (Editors), Marine Mammal Protection Act and Endangered Species Act

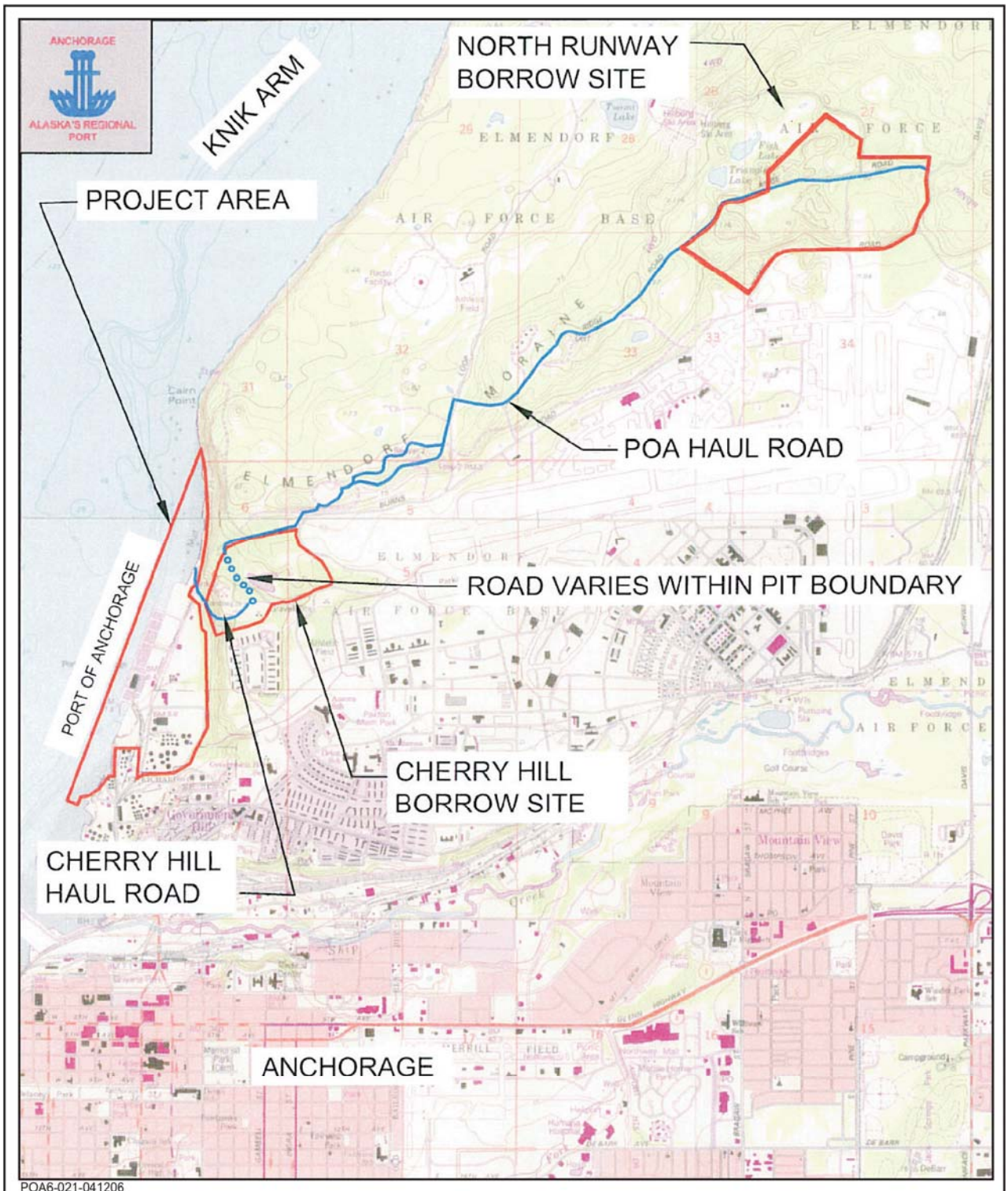
Implementation Program, 1998, p. 39-53, U.S. Dep. Commer., NOAA, Natl. Mar. Fish. Serv., Alaska Fish. Sci. Cent. Proc. Rep. 99-08.

White, M.J., Norris, J., Ljungblad, D., Baron, K. and Di Sciara, G. 1978. Auditory thresholds of two beluga whales (*Delphinapterus leucas*). Hubbs/Sea World Research Institute and Naval Ocean Systems Center, San Diego, California. Technical Report H/SWRI 78-109.

Wursig B, C.R. Greene Jr, T.A. Jefferson. 2000. Development of an air bubble curtain to reduce underwater noise of percussive piling. Marine Environmental Research 49:79-93.

FIGURES

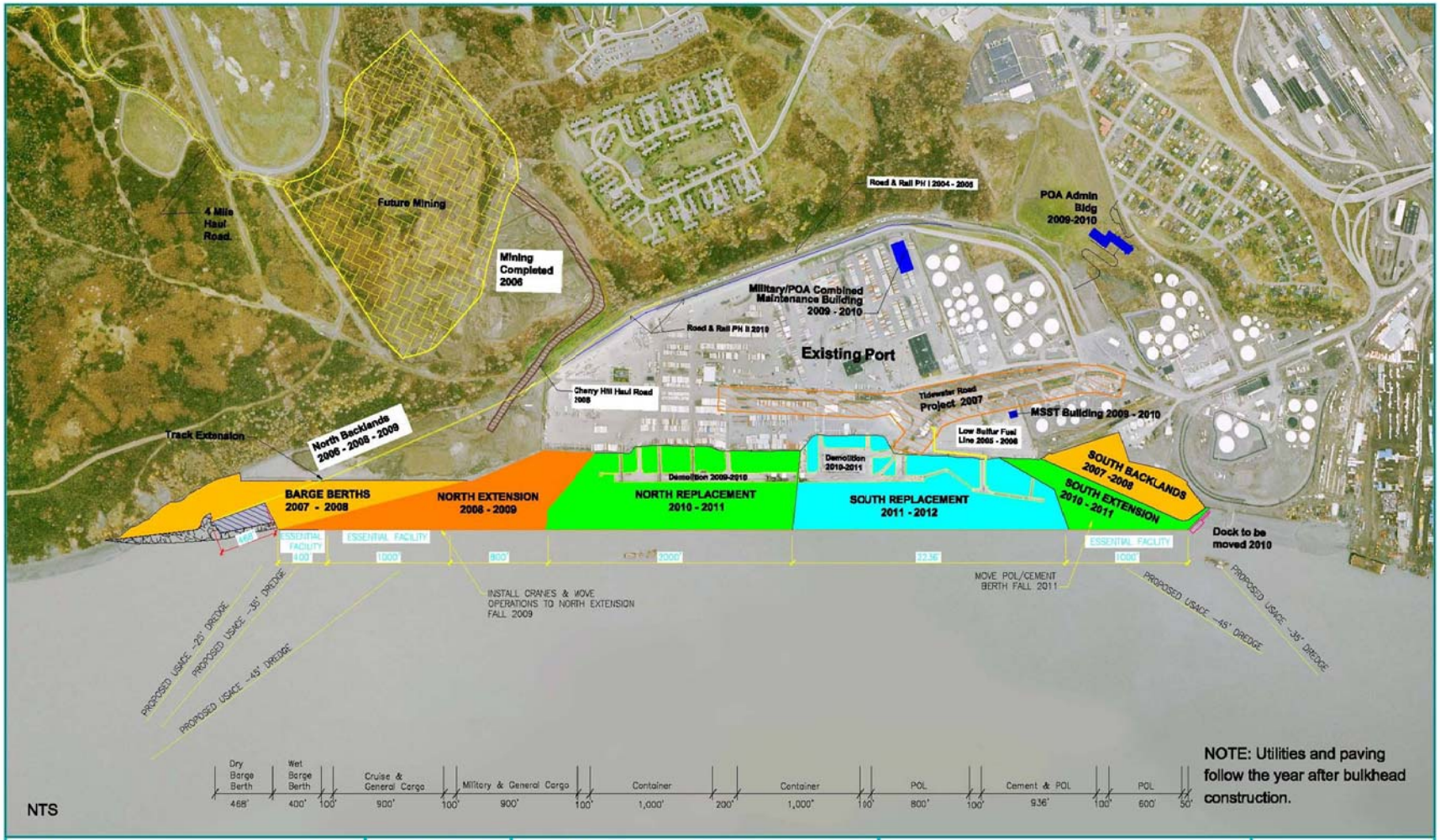
This page intentionally left blank.



POA6-021-041206

Figure 1
Marine Terminal Redevelopment Project
Vicinity Map

(Mcmahan and Holmes 1998)
(Anchorage, Alaska, United States 01 Jul 1965)



Anchorage Port Expansion Team

ICRC

Port of Anchorage Intermodal Expansion Project

PHASING PLAN

SHEET: 1 OF 1

5-4-07

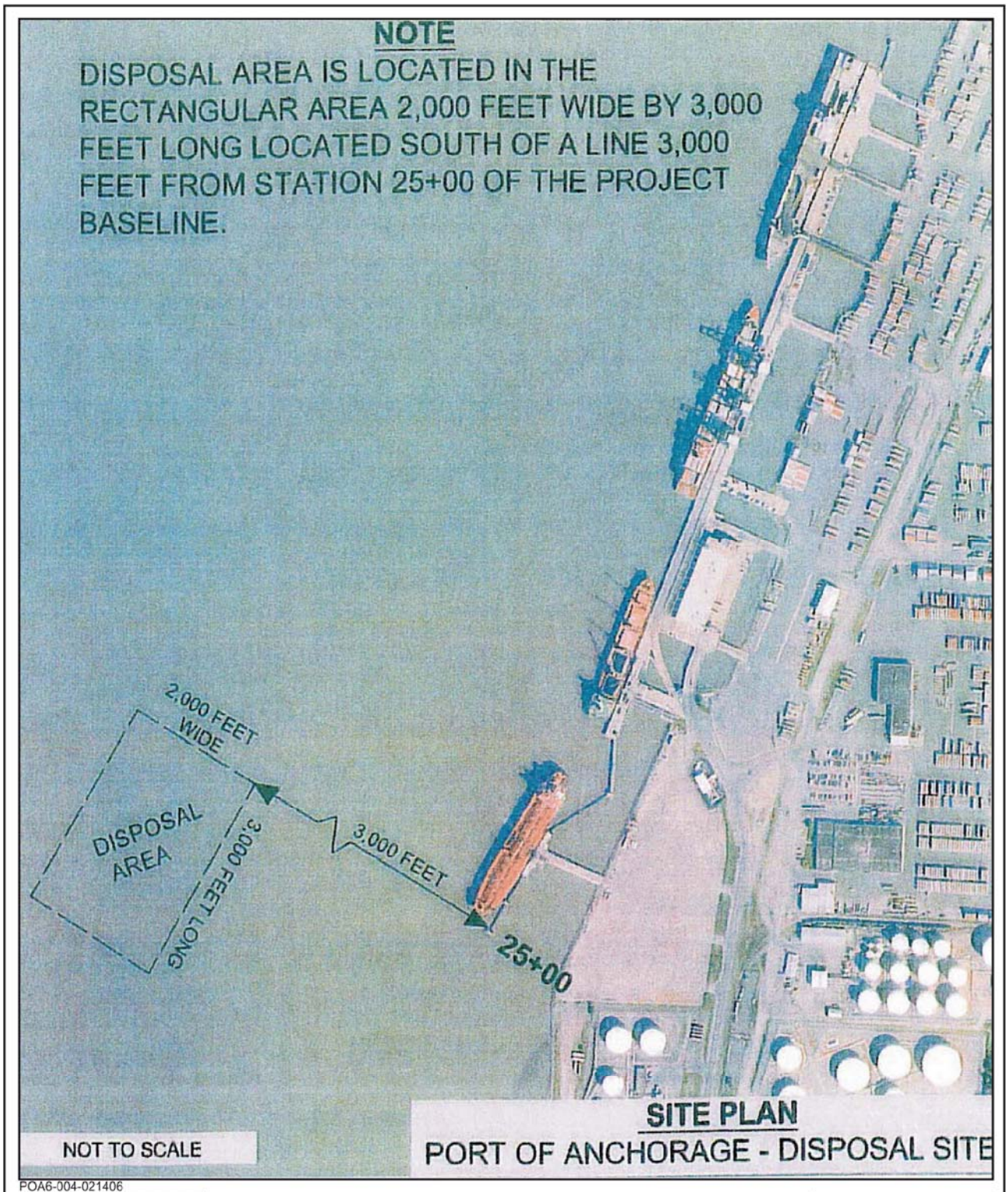


Figure 3
Non-Contaminated Dredged Material Disposal Site

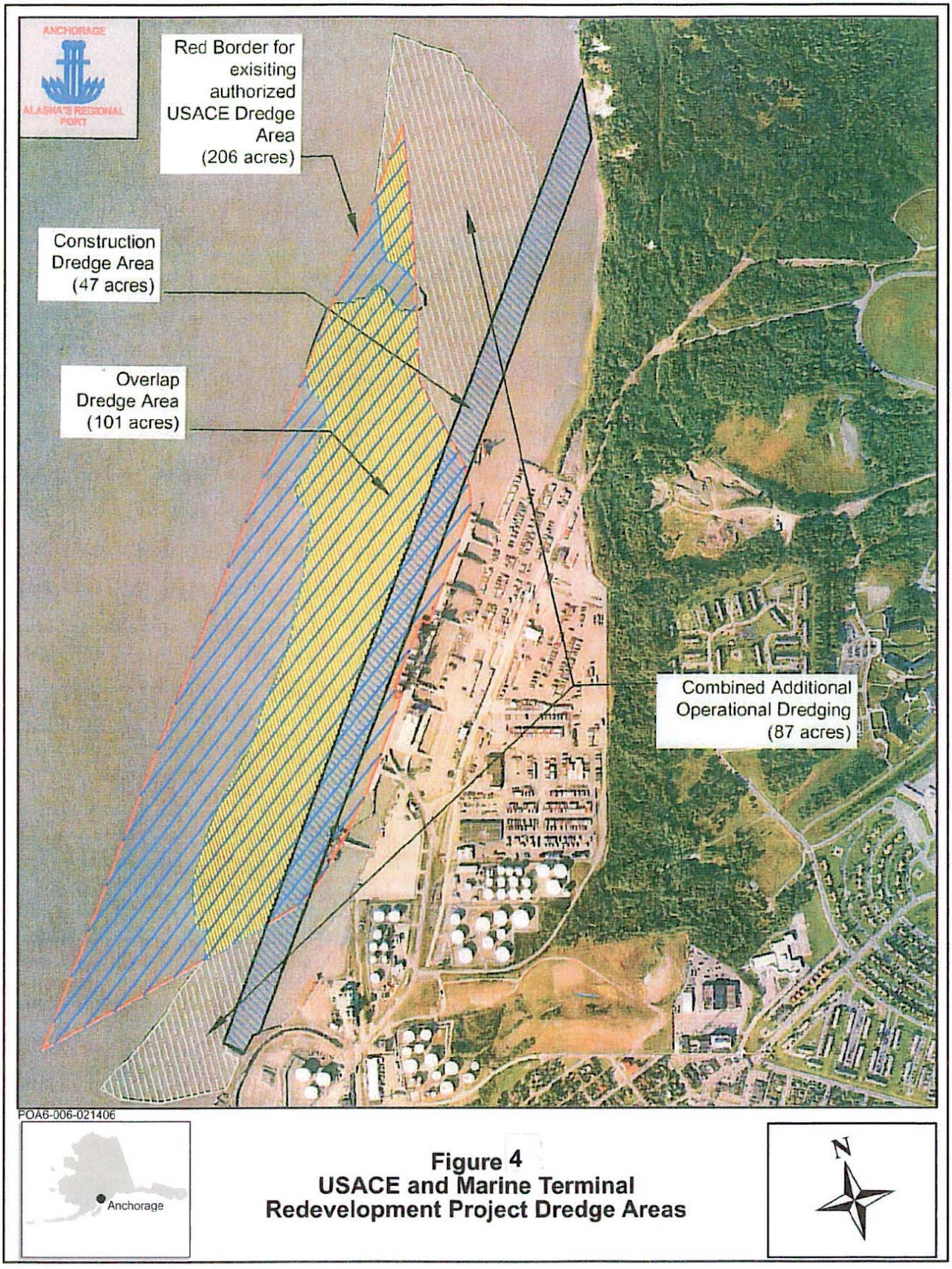


Figure 4
USACE and Marine Terminal Redevelopment Project Dredge Areas

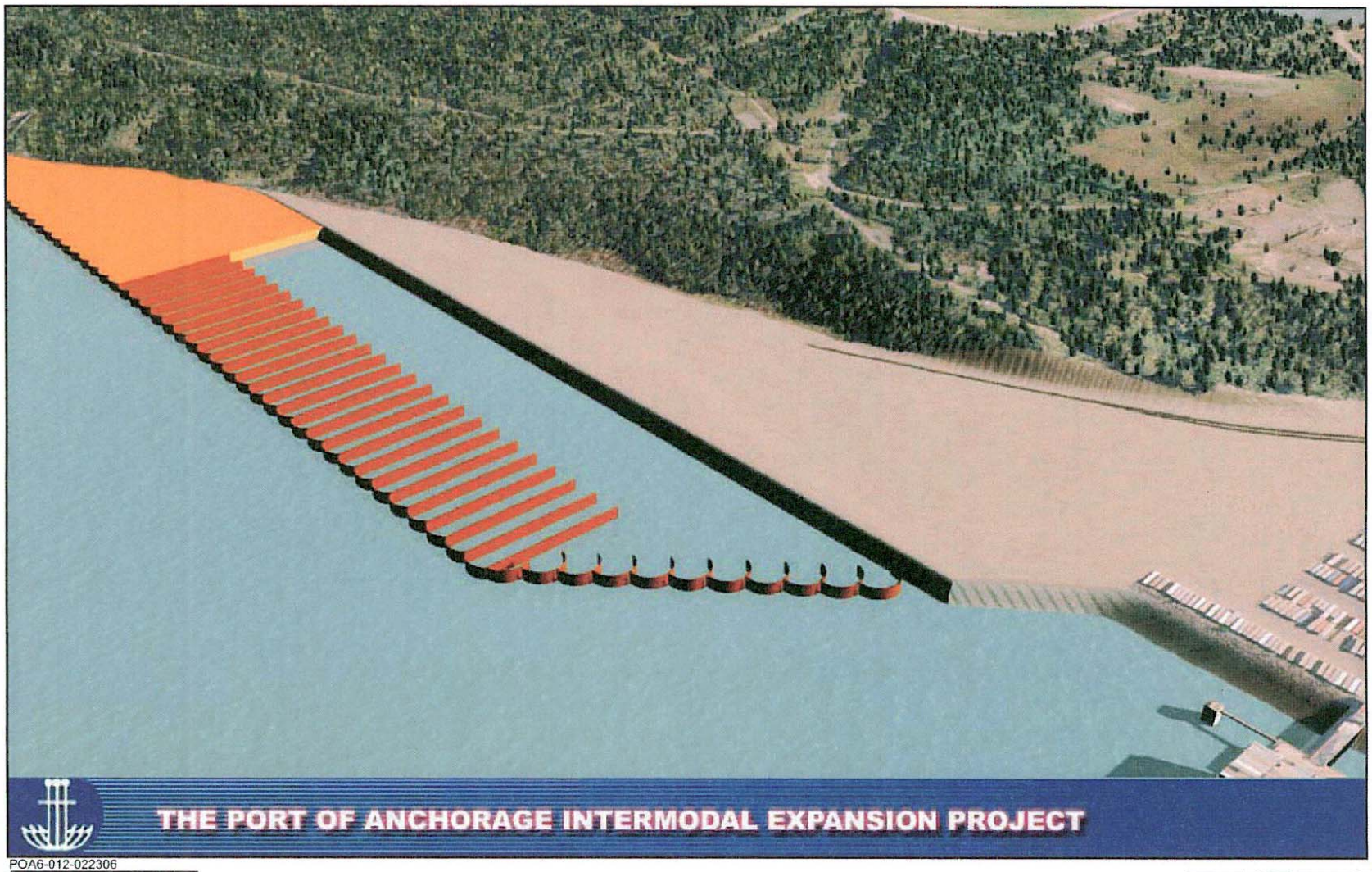


Figure 5

Open-Cell Sheet-Pile Construction

Figure 6
Example of Open Cell Sheet Pile Dock

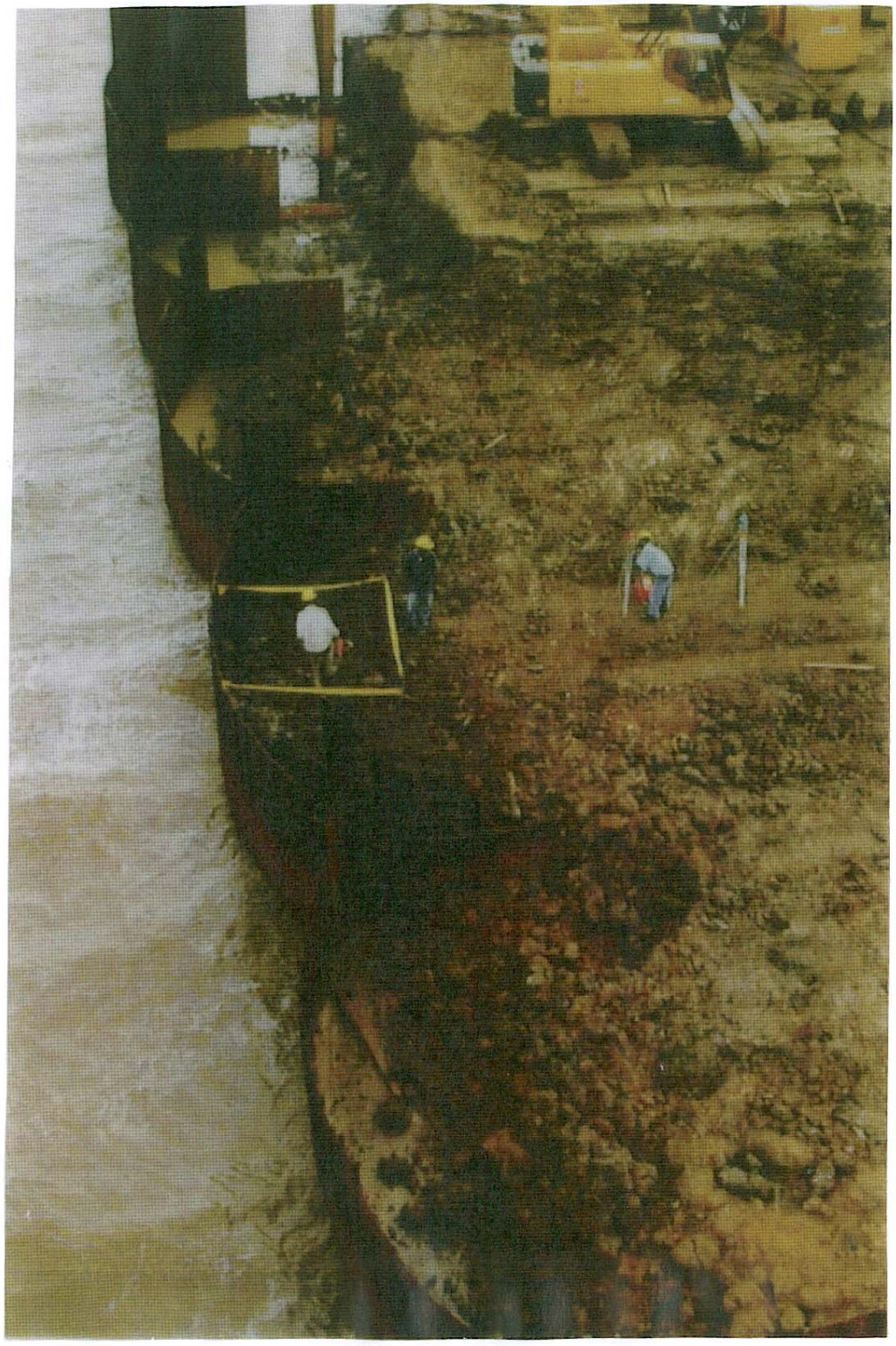


Figure 7
Fill Material Being Placed During Construction of an Open Cell Sheet Pile Dock

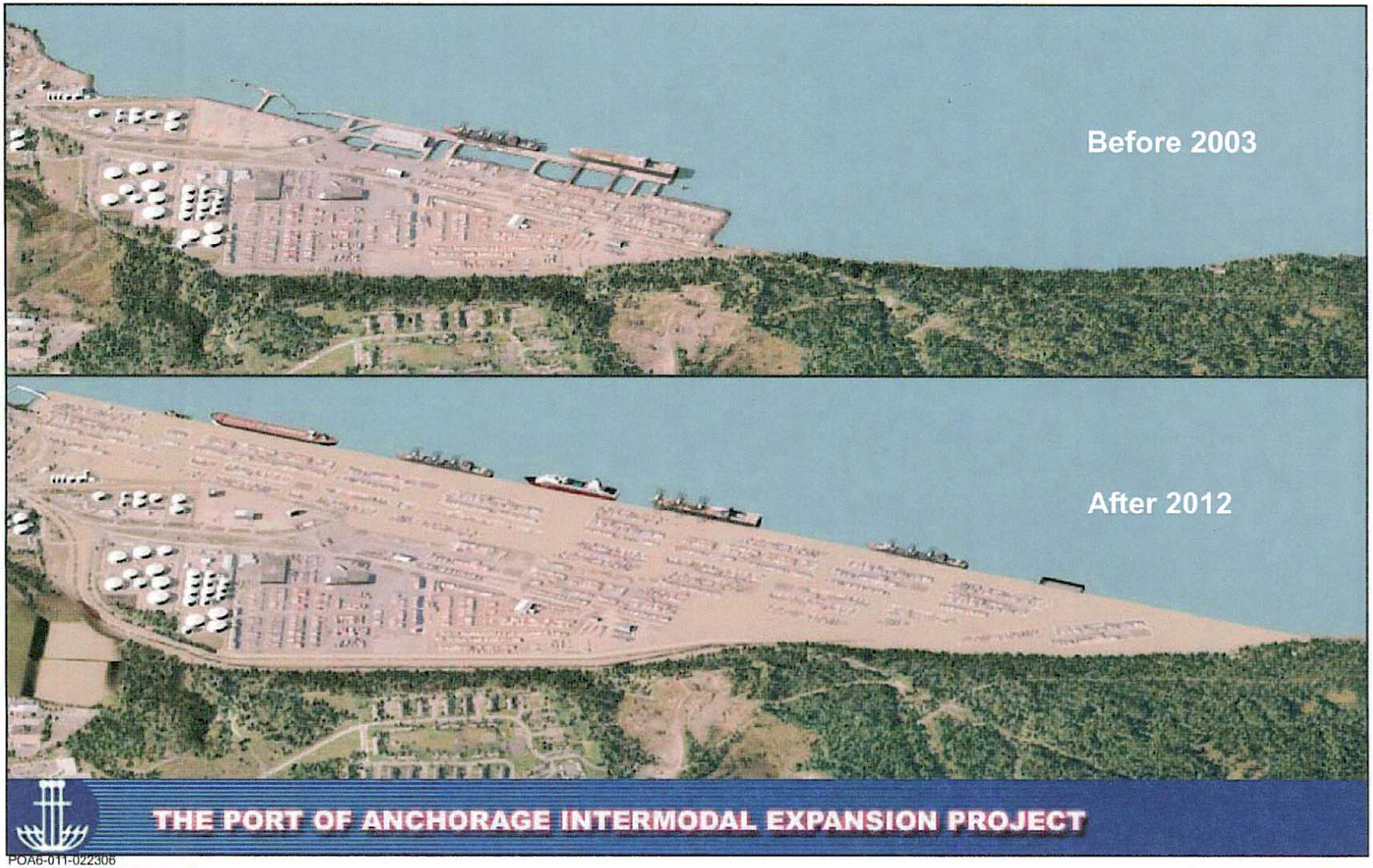
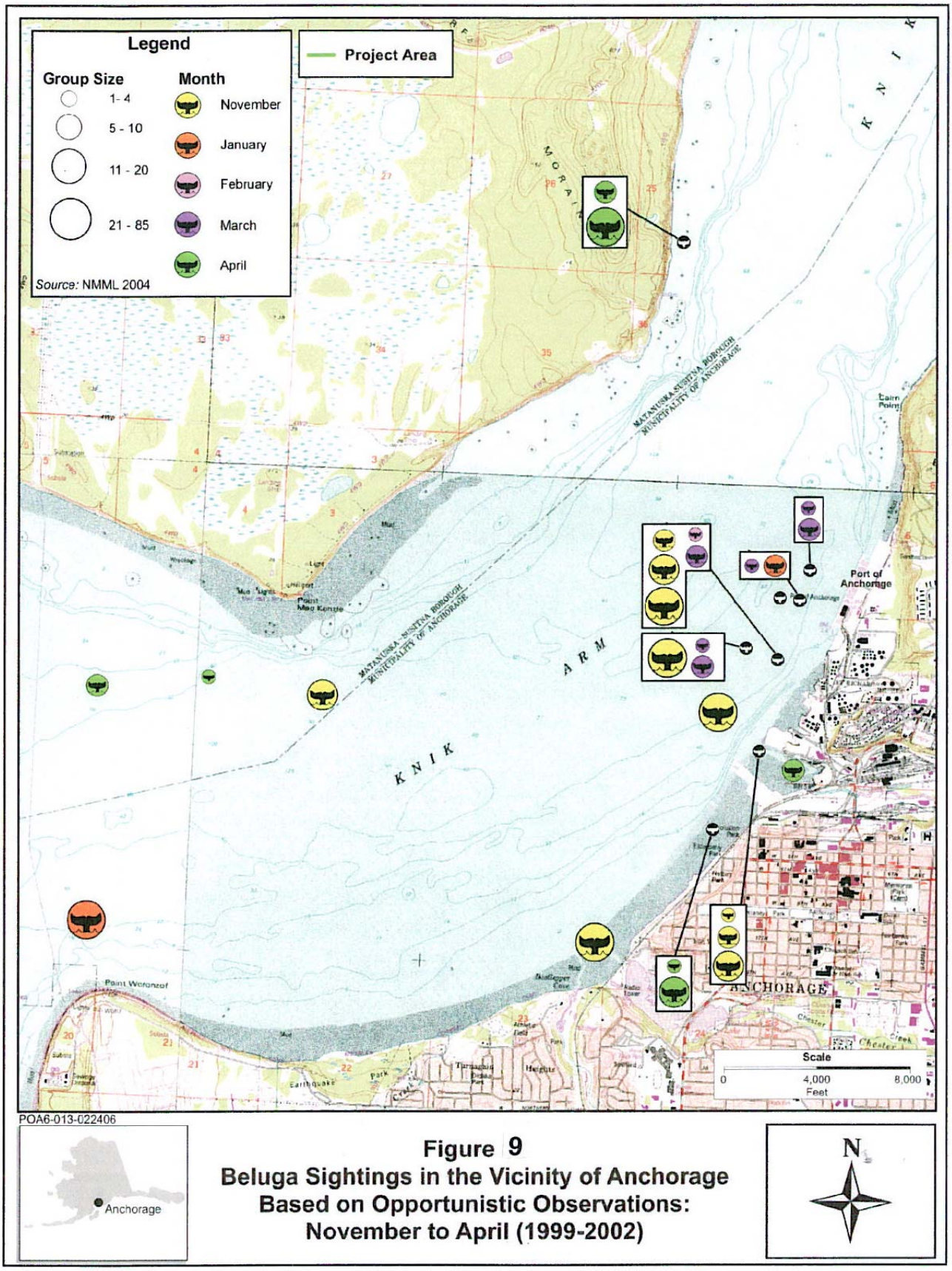
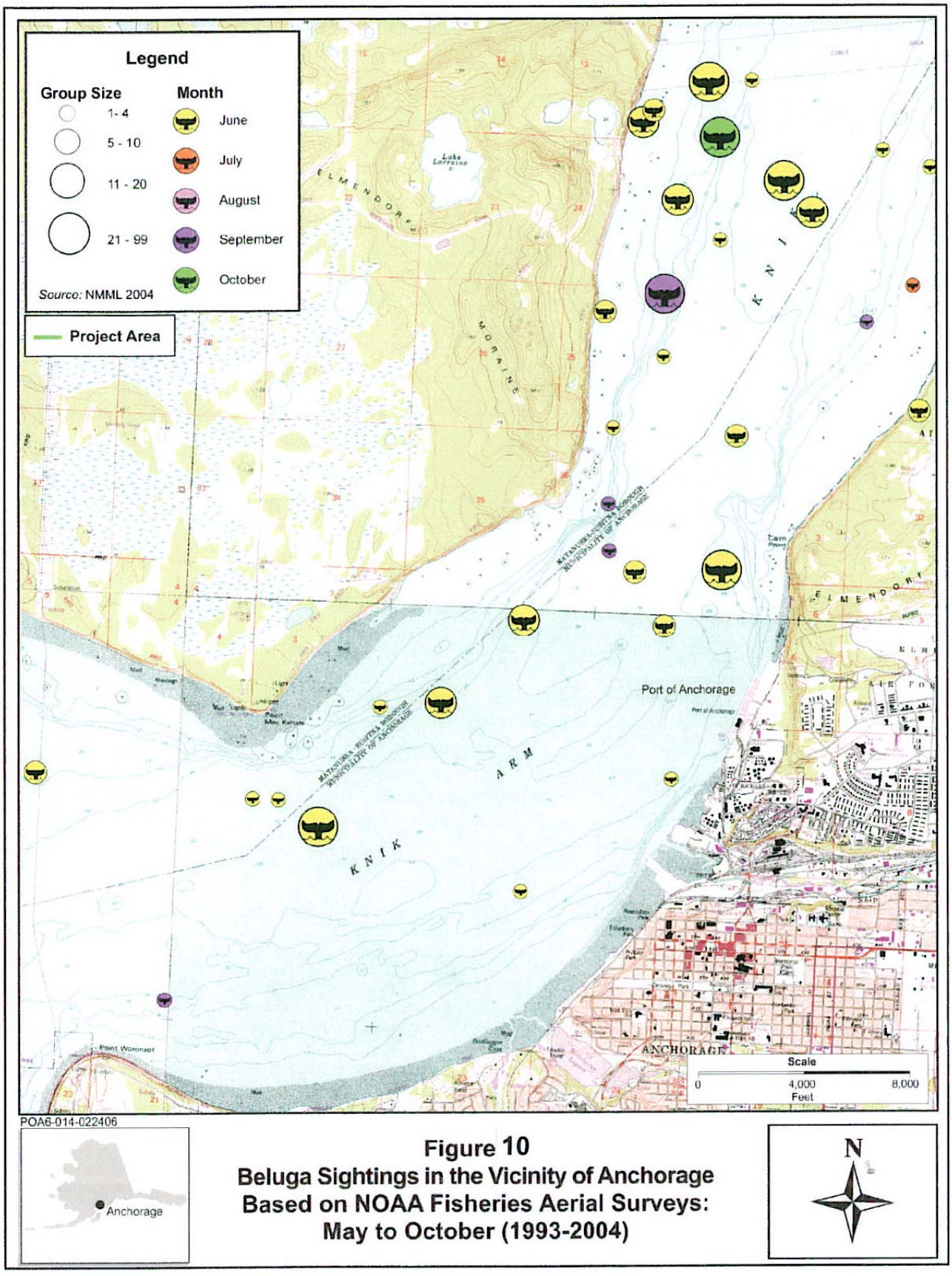


Figure 8
Marine Terminal Redevelopment Before and After



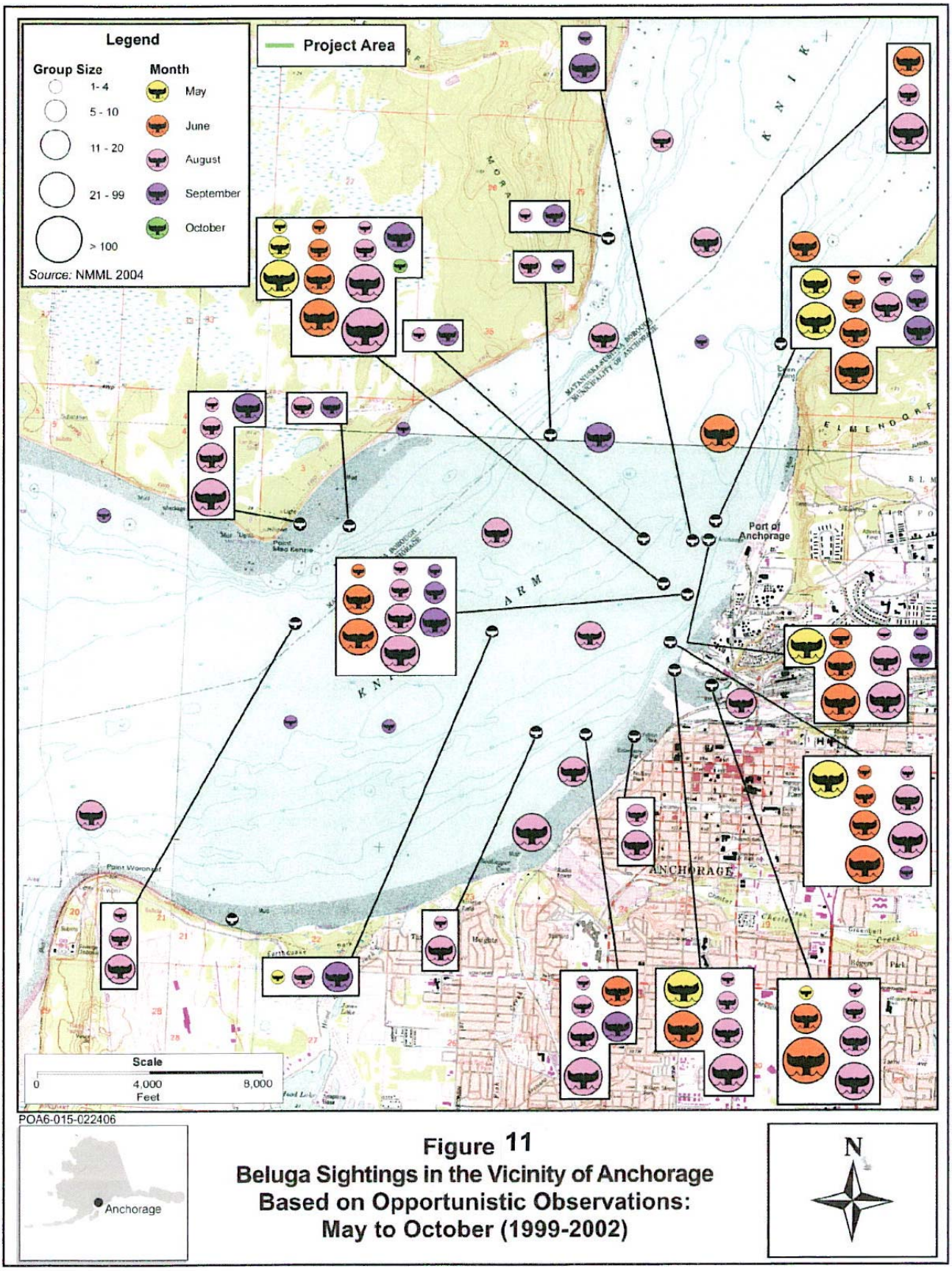
POA6-013-022406

Figure 9
Beluga Sightings in the Vicinity of Anchorage Based on Opportunistic Observations: November to April (1999-2002)



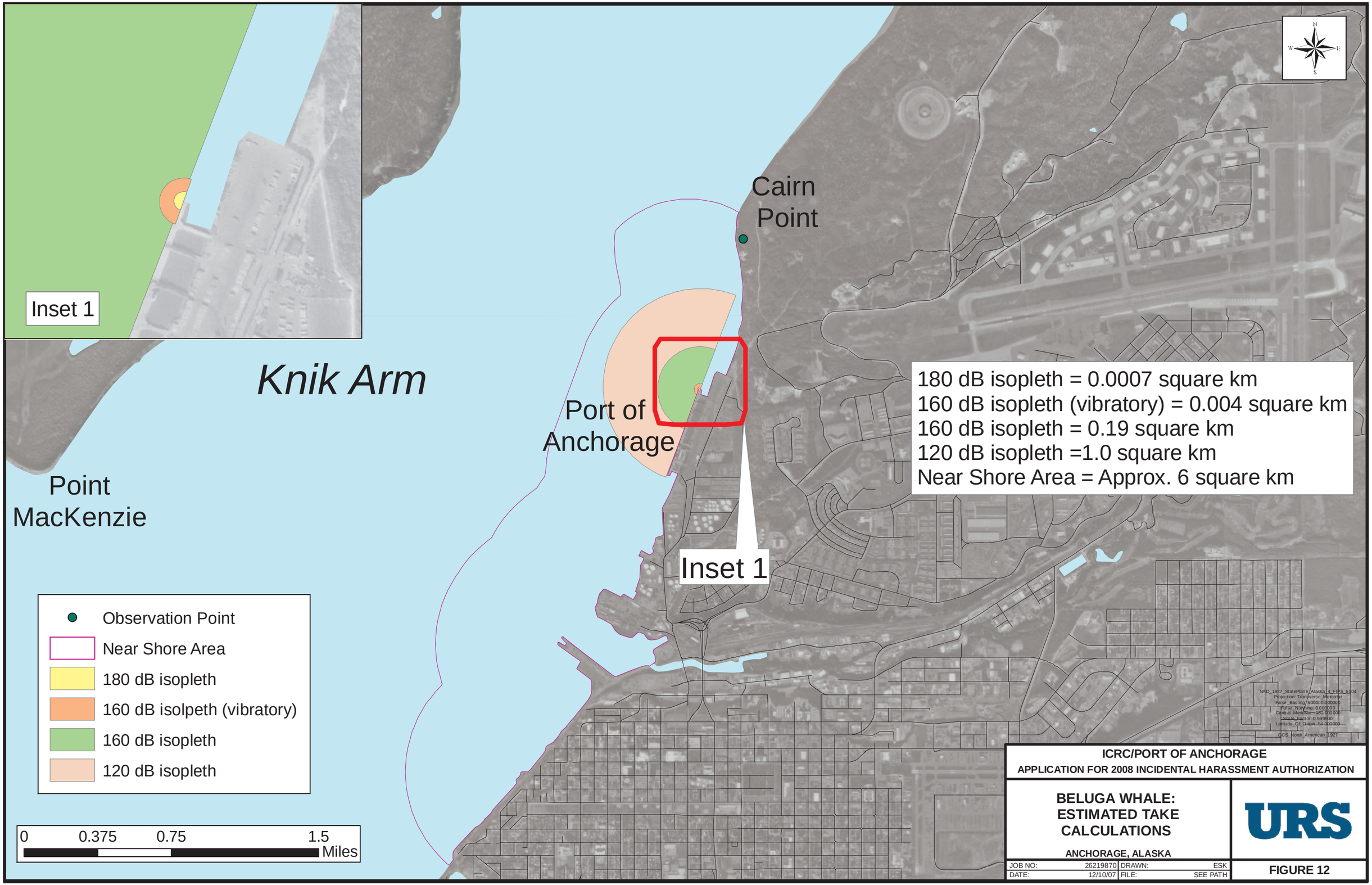
POA6-014-022406

Figure 10
Beluga Sightings in the Vicinity of Anchorage Based on NOAA Fisheries Aerial Surveys: May to October (1993-2004)



POA6-015-022406

Figure 11
Beluga Sightings in the Vicinity of Anchorage Based on Opportunistic Observations: May to October (1999-2002)



ICRC/PORT OF ANCHORAGE

APPLICATION FOR 2008 INCIDENTAL HARASSMENT AUTHORIZATION

BELUGA WHALE: ESTIMATED TAKE CALCULATIONS

ANCHORAGE, ALASKA

JOB NO:	26219870	DRAWN:	ESK
DATE:	12/10/07	FILE:	SEE PATH

URS

FIGURE 12

M:\Projects\2007\ICRC Beluga IHA\MXDs\IHA_radius_map_combined.mxd

APPENDIX A

This page intentionally left blank.

DEPARTMENT OF THE ARMY PERMIT

Permittee: Port of Anchorage

Permit No.: POA-2003-502-N

Issuing Office: U.S. Army Engineer District, Alaska

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below.

Project Description:

This permit authorizes work necessary for the construction of the Marine Terminal Redevelopment (Port Expansion) Project to expand, reorganize and improve the existing facilities at the Port of Anchorage to replace functionally obsolete structures; increase POA capacity, efficiency, and security; and accommodate the needs of the U.S. military for rapid deployment. The project involves the construction of a new open cell sheet pile (OCSP) dock in the tidelands west, northwest, and southwest of the existing dock. This permit authorizes the following work:

1. The discharge of fill material over 20.5 acres of wetlands associated with the development of the Cherry Hill and North End Runway borrow pits;

2. The dredging of approximately 258,000 cubic yards of sediment over approximately 21 acres necessary for the construction of the expanded dock and the discharge of the material at the existing Port of Anchorage maintenance dredging disposal site;

3. The discharge of approximately 9,663,420 cubic yards of clean fill material over 111 acres of intertidal and nearshore subtidal waters of Knik Arm necessary for the construction of the expanded dock.

All work will be performed in accordance with the attached plan, 9 sheets, dated July 2007.

Project Location:
The Port of Anchorage is located in the Knik Arm of Upper Cook Inlet, within section 31, T. 14 N., R. 3 W.; and sections 6 & 7, T. 13 N., R. 3 W; Seward Meridian; Latitude 61° 15' N., Longitude 149° 52' W.; in Anchorage, Alaska. The gravel extraction sites are located within sections 5 & 6, T. 13 N., R. 3 W.; and within sections 27, 28, 33, and 34, T. 14 N., R. 3 W.; Seward Meridian; on Elmendorf Air Force Base, northeast of the Port of Anchorage. Construction dredge material will be disposed at the designated maintenance dredging disposal area, located approximately 3,000 feet west of the existing dock.

Permit Conditions:

General Conditions:

1. The time limit for completing the work authorized ends on **August 31, 2014**. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.

2. You must maintain the activity authorized by this permit in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good

faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.

3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and State coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.

6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

Special Conditions:

I. Navigation:
The following conditions are to preserve free navigation, prevent navigational hazards, and to protect the interests of the United States in existing and future federal projects [(33 CFR Part 320.4(o)(3)].

1. Your use of the permitted activity must not interfere with the public's right to free navigation on all navigable waters of the United States.

2. You must install and maintain, at your expense, any safety lights and signals prescribed by the United States Coast Guard (USCG), through regulations or otherwise, on your authorized facilities. The USCG may be reached at the following address and telephone number: Commander (DPW), 17th Coast Guard District, P.O. Box 25517, Juneau, Alaska 99802; (907) 463-2269.

3. The permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

4. Appropriate and practicable mitigation measures shall be employed as needed to minimize adverse affects to federal dredging operations, adjacent properties, and/or flow patterns of waters of the U.S. from temporary changes in sedimentation patterns during the construction phases of the project. The Port of Anchorage shall cooperate with adjacent industrial businesses (e.g., barge terminals) to ensure that all appropriate and practicable mitigation measures are implemented during construction to both minimize and compensate for adverse affects to their operations.

II. Cultural Resources
The following two conditions are to ensure compliance with Section 106 of the National Historic Preservation Act and at the request of the applicant.

1. Procedures for managing inadvertent discoveries of cultural resources or skeletal remains shall be employed as described in the Cultural Resources Monitoring Plan for Cherry Hill and North End Material Extraction report (Anchorage Port Expansion Team, April 2006, or approved revisions).

2. Prior to ground disturbing activities, POA shall photograph and document site conditions of and around the trees of interest identified by representatives of the Native Village of Eklutna (Anchorage

Port Expansion Team, Cultural Resources Survey: Port of Anchorage Haul Road, Appendix D; October, 2006.).

III. Borrow Pits:

The following condition is to prevent and minimize impacts to nesting migratory birds. Under the Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703), it is illegal to "take" migratory birds, their eggs, feathers or nests.

1. To prevent impacts to nesting migratory birds, no vegetation clearing, fill placement, excavation, stockpiling, grading or other disturbing construction activities at the material extraction sites shall be conducted between 1 May and 15 July, except at sites that have been sufficiently disturbed or altered to the extent that suitable nesting habitat has been eliminated (e.g., covered or otherwise removed) prior to 1 May. If disturbing construction activities in areas containing potential nesting habitat are proposed after 1 May, the Port of Anchorage shall submit a plan to the Corps that demonstrates how compliance with the MBTA will be ensured. This plan must be coordinated with the USFWS and approved by the Corps prior to commencement of work that would potentially affect nesting habitat between 1 May and 15 July.

The following two conditions are necessary to prevent and minimize impacts to wetlands and aquatic organisms

2. The POA will establish a buffer between ground disturbing activities at the gravel extraction sites and adjacent wetland areas as necessary to prevent hydrological disturbances from development activities. Additionally, a buffer area shall be established around the Triangle/Fish Lake wetland complex and delineated onsite with silt fencing and signage and verified as adequate by the Corps prior to commencing extraction activities within 600 feet of the wetland complex. The extent and/or distance of the buffer boundaries shall be determined onsite based on vegetation, topography and hydrology as necessary to prevent an adverse disturbance to the wetland complex. The POA shall install and monitor a series of groundwater wells or piezometers in the western portion of the North End Borrow Pit to assure that gravel mining activities do not adversely affect adjacent wetland hydrology.

3. POA shall, to the extent practicable, limit disturbances to wetlands and open water areas where wood frogs are present to periods of time other than those known for breeding and tadpole growth (1 April to 15 July).

IV. Beluga Whales:

The following conditions are to prevent and minimize adverse impacts to marine mammals and to ensure compliance with the Marine Mammal Protection Act.

1. The POA has submitted petitions for an Incidental Harassment Authorization (IHA) for the 2007 construction season and a Letter of Authorization (LOA) for construction seasons 2008-2012 (Anchorage Port Expansion Team, Final Petition; January 2007) for Small Take Authorizations from the NOAA/NMFS under the Marine Mammal Protection Act (MMPA) for the incidental and unintentional taking of marine mammals. The conditions of the IHA and LOA Small Take Authorizations under the MMPA will be carried as special conditions of this DA permit unless otherwise noted by the Corps. The POA shall comply with the interim mitigation measures listed below to minimize project related adverse impacts to beluga whales. Upon receipt of the IHA and/or LOA MMPA authorizations, the Corps will reevaluate the terms or conditions of this permit and modify any conflicting conditions, if necessary.

    A. The POA shall measure and evaluate construction and operationally generated noise introduced in Knik Arm at the Port of Anchorage. The applicant shall develop a 'Sound Index' to accurately represent noise levels associated with Port of Anchorage operations and construction activities, which must specifically include noise levels generated from pile driving, dockside activities, vessel traffic in the channel, dredging, and docking activities. The evaluation shall characterize current baseline operational noise levels at the Port of Anchorage and develop an engineering report that identifies structural and/operational noise reduction measures, if necessary, to minimize the baseline operational noise levels at the expanded port to the maximum extent practicable. The final report will be provided to the NMFS two years prior to construction completion.

The Port of Anchorage Sound Index will be collaborated with the concurrent beluga whale monitoring program to correlate construction and operationally generated noise exposures with beluga whale presence, absence, and any altered behavior observed during construction and operations (i.e., a dose-response analysis). An annual review of beluga observations and noise exposure data shall be provided to NMFS no later than 1 Feb annually. The annual review shall also identify relevant technological advances in sound attenuation. The POA shall employ practicable noise minimization measures identified in the annual reports in subsequent POA construction activities.

B. In collaboration with the NMFS, the Port of Anchorage shall continue to develop and maintain a beluga monitoring program to estimate the frequency at which beluga whales are present in the project footprint; characterize habitat use and behavior of belugas near the Port during ice free months; map sound levels and distance attenuation related to POA background noise and expansion activity; and to characterize and assess the impacts of received noise from the POA on beluga whale behavior and movements. POA shall consult with NMFS to develop the program and shall include the following:

   a. Include visual observations (shore-based and opportunistic vessel observations) to monitor beluga movements, timing, group size, locations, identifiable behaviors and patterns, and use of the area in the vicinity of the Project during operations through the construction period. The POA will also provide one year of post-construction monitoring in continued consultation with NOAA/NMFS.

   b. Include a passive acoustic monitoring plan to correlate with visual observations. The POA shall install hydrophones (or employ other effective methodologies) necessary to detect and localize passing whales and to determine the proportion of belugas missed from visual surveys.

   c. The POA will employ a marine mammal observation team, separate from the construction contractor observer activities, for the duration of all construction activities.

C. The Port of Anchorage shall establish and enforce safety radii and shut down standards around the in-water pile driving areas. Initially, the safety radii requiring shut down shall be for any whale observed within 650 meters of pile driving. The Port of Anchorage shall conduct on-site underwater noise surveys to verify the 190, 180 and 160 dB re 1 µPa rms isopleths from in-water pile driving activities for the POA expansion. Safety zones appropriate to the POA site conditions and equipment will then be empirically determined and implemented. The 160 dB re 1 µPa rms safety zone should be in force unless the POA obtains authorization under the section 101 (a) of the Marine Mammal Protection Act for the incidental and unintentional taking of marine mammals; in which case the safety zones should be those provided within the authorization. The safety zone around pile driving areas shall be monitored for the presence of marine mammals before, during, and after any pile driving activity. If the safety radius is obscured by fog or poor lighting conditions, pile driving will cease until the entire safety radius is visible.

D. Prior to the start of seasonal pile driving activities, the POA will require construction supervisors and crews, the marine-mammal monitoring team, the acoustical monitoring team, and all project managers to attend a briefing. The purpose of the briefing will be to establish the responsibilities of each party, define the chains of command, discuss communication procedures, provide an overview of monitoring purposes, and review operational procedures.

E. The Port of Anchorage shall formally notify the NMFS prior to the seasonal commencement of pile driving and provide weekly monitoring reports. A summary monitoring report will be submitted at the end of annual construction activities and a final report will be submitted at the end of the one year post construction monitoring season.

F. The POA will establish daily "soft start" or "ramp up" procedures for pile-driving activities. The soft start technique will be used at the beginning of each piling installation to allow any marine mammal that may be in the area to leave before pile driving activities reach full energy. The soft start procedure will require contractors to initiate noise from vibratory hammers for 15 seconds at

reduced energy followed by a 1-minute waiting period. This procedure will be repeated two additional times. If an impact hammer is used, contractors will be required to provide an initial start of 3 strikes at 40-percent energy, followed by a 1-minute waiting period, then two subsequent 3-strike sets. If marine mammals are sighted within the safety zone prior to pile driving or during the soft start, the contractor will delay pile-driving continuation until the mammal has moved outside the safety zone. Pile installation will resume only after a qualified observer confirms that the marine mammal has moved outside the safety zone or after 15 minutes have elapsed since the marine mammal was last sighted.

G. The POA will erect whale-notification signage in the waterfront viewing areas near the Ship Creek Public Boat Launch and within the secured Port entrance that is visible to all Port users. This signage will provide information on the beluga whale and notification procedures for reporting beluga whale sightings to the NMFS. The POA will consult with the NMFS to establish the signage criteria.

H. During in-water construction activities, the POA shall ensure that construction contractors delegate supervisory responsibility to include on-site construction personnel to observe, record, and report marine mammal sightings and response actions taken, to include shut down or delay.

I. The POA shall establish a long-term, formalized marine-mammal sighting and notification procedure for all Port users, visitors, tenants, or contractors prior to and after construction activities. The notification procedure shall clearly identify roles and responsibilities for reporting all marine mammal sightings. The POA will forward documentation of all reported marine mammal sightings to the NMFS.

2. In-water impact pile-driving, excluding work when the entire pile is out of the water due to shoreline elevation or tidal stage, shall not occur within two hours of either side of each low tide.

V. Fish

The following conditions are necessary to minimize impacts to anadromous fish populations.

1. The Port of Anchorage shall either avoid pile driving activities between 15 May and 15 August or conduct an on-site fish study to analyze the impacts of vibratory and impact hammer sheet pile driving activities on salmonids at various distances and measured sound pressure levels. The study plan shall be developed in consultation with local representatives of the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, the Environmental Protection Agency, and approved by the Corps. The study plan should include a live cage fish study and hydroacoustic monitoring to assess the impacts of pile driving on the health and behavior of fish groups and individuals. The study plan shall be completed by 1 January 2008 and initiated in the 2008 construction season. The results shall be analyzed following the completion of the 2008 construction season and coordinated with the Corps and the aforementioned resource agencies. Based on the results of the study, this condition may be modified and/or supplemented to minimize adverse impacts to salmonids (including timing restrictions).

2. No in water fill placement or pile driving activities shall occur within a one week period following smolt releases from the Ship Creek Hatchery. The Port shall coordinate with hatchery staff to ensure compliance with this condition.

3. In-water sheet piles shall be driven with a vibratory hammer to the maximum extent possible (i.e., until desired depth is achieved and/or to refusal, prior to using an impact hammer).

4. The final design shall, wherever possible, incorporate end-of-phase construction joints that provide potential refuge habitat areas for salmonids in the non-structural voids. Although the spacing, size, and configuration of these structural joints will be dictated by stability and construction requirements, void spaces within these joints shall be developed to maximize the potential salmonid refuge value of the space. The design of the refuge area within the void space shall be approved by the Corps, in consultation with other federal resource agencies. The refuge area shall be monitored by the Port of Anchorage between 15 May and 15 August for a minimum of 2 years following construction to determine the extent and nature of use by salmonids. Based on the monitoring observations, this condition may be modified to improve the functional value of refuge areas if necessary.

VI. Design Coordination:
The following three conditions are to prevent and minimize adverse impacts to public safety and security and to protect the interests of the United States in existing and future federal projects:

1. A final analysis of the global and internal structural stability of the open cell sheet pile structure under static and seismic conditions shall be submitted to the Corps of Engineers a minimum of two months prior to sheetpile installation activities of 2008. The analysis shall state the assumptions made, data used, computational analyses performed, modeling input criteria used and output results generated (where modeling is applicable) that led to the final analysis. Additionally, to the maximum extent practicable, the final analysis shall, at minimum, include the following:

    a. Test the borrow source(s) to confirm the stability model input and determine the densification requirements. Provide your Quality Assurance Plan and the acceptance criteria for validating the densification of the backfill.

    b. For each soil profile, run static stability models with six feet of over dredge below the design project depth and at a water elevation of -5 ft. MLLW.

    c. Submit a plan that describes the proposed piezometer placements and all other instrumentation to be used to confirm how consolidation (and associated strength gain) is expected to occur, and to what degree. Additionally, the POA will submit annual reports of actual findings.

    d. Conduct a parametric sensitivity analysis, investigating strength, modulus, and geometry, with the model for seismic loading to determine if the model is sensitive to small changes in input parameters. The study shall further evaluate possible failure modes, to include toe heave.

    e. Define the target Factor of Safety for internal stability and model each construction phase area. All engineering parameters and design calculations for internal stability evaluation shall be included in the design analysis.

    f. Further evaluate earthquake loading by considering a minimum of five accelograms, with no more than two being synthetic, and refined target design response spectra criteria in the analysis. Specifically, develop design target spectra based on deterministic spectra for MCE scenario earthquakes from the Castle Mountain fault and Megathrust sources using M_{max} and closest distance parameters. Use a suite of ground motion attenuation models that are appropriate for the region and source. Combine this suite of models either by a weighting or enveloping procedure to develop final target spectra and match the selected accelograms to the target spectra. Review the latest information on USGS Alaska seismic hazard maps to assist in the selection of parameters and ground motion attenuation models. The development of the final suite of design ground motions shall be conducted by a professional engineering seismologist experienced with current practice for developing design ground motions for critical facilities.

    g. In light of the large strains predicted during an MCE, include laboratory residual shear strength tests in your analysis to investigate potential material responses.

    h. Develop compatible designs for adjacent cells with different seismic performance objectives.

2. The POA shall submit Open Cell Sheetpile design modifications to the Corps for review.

3. The POA shall submit as-built drawings of the OCSP structures, approved and stamped by the Engineer-of-Record, following completion of construction phases and the overall structure.

VII. Fill Material:
The following conditions are required to minimize adverse impacts of the discharge on special aquatic sites and other waters outside of the project area [33 CFR 320.4 (r), 40 CFR230.5 (j) and 40CFR 230 Subpart H, including parts 230.71, 230.72, 230.73, 230.75]]

1. Fill material shall consist of clean fill, free of unsuitable material (e.g., trash, debris, asphalt, etc.), and free of toxic pollutants.

2. All fill material shall be stabilized as necessary to prevent erosion and encroachment of fill material outside the authorized footprint before, during, and after construction. No fill or construction materials shall be stockpiled on adjacent mudflats outside of the authorized project boundary.

VIII. Compensatory Mitigation:

The following conditions are required to compensate for resource losses important to the human and aquatic environment. (33 CFR 320.4(r) and 40 CFR Parts 230.41 and 230.42)]

1. The Port of Anchorage shall provide funding equivalent to the monetary value of the debits of the authorized project impacts, as determined by the Anchorage Debit Credit Methodology, in accordance to the attached Memorandum of Agreement (MOA) concerning compensatory mitigation for the overall project. Compensatory mitigation funds from the account will be allocated primarily for construction related costs of selected mitigation projects, as specified in the MOA. In addition to the funding requirements, the Port of Anchorage shall provide for the project management actions necessary to obtain any applicable permits and/or authorizations, the preparation of necessary engineered designs, and monitoring of all selected mitigation projects as necessary.

2. In addition to the mitigation requirements specified above, the Port of Anchorage shall conduct a feasibility study to identify the most practicable and beneficial aquatic habitat restoration, enhancement, creation, and preservation projects available in the Lower Ship Creek watershed and estuary. The projects identified in this study will be used by the Corps, under consultation with a mitigation advisory committee (consisting of federal, state, and local resource agencies and other applicable stakeholders, as appropriate) to determine which project(s) shall be implemented and funded as part of the compensatory mitigation requirements of this permit. The content of the final feasibility study plan shall be approved by the Corps to ensure compliance with this requirement.

Special Information:

Any condition incorporated by reference into this permit by General Condition 5, remains a condition of this permit unless expressly modified or deleted, in writing, by the District Engineer or his authorized representative.

Further Information:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:

(X) Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403).

(X) Section 404 of the Clean Water Act (33 U.S.C. 1344).

( ) Section 103 of the Marine Protection, Research, and Sanctuaries Act of 1972 (33 U.S.C. 1413).

2. Limits of this authorization.

a. This permit does not obviate the need to obtain other Federal, State, or local authorization required by law.

b. This permit does not grant any property rights or exclusive privileges.

c. This permit does not authorize any injury to the property or rights of others.

d. This permit does not authorize interference with any existing or proposed Federal project.

3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following:

a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.

c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

d. Design or construction deficiencies associated with the permitted work.

e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

5. Reevaluation of Permit Decision. This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a revaluation include, but are not limited to, the following:

a. You fail to comply with the terms and conditions of this permit.

b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (See 4 above).

c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you to comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

6. Extensions. General Condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

(PERMITTEE) AND TITLE

8-10-07
(DATE)

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

KEVIN J. WILSON
COLONEL, CORPS OF ENGINEERS
DISTRICT COMMANDER

10 Aug 2007
(DATE)

When the structures or work authorized by this permit are still in existence at the time the property is transferred the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions have the transferee sign and date below.

(TRANSFEREE)

(DATE)

MEMORANDUM OF AGREEMENT
BETWEEN THE
U.S. ARMY CORPS OF ENGINEERS
&
THE MUNICIPALITY OF ANCHORAGE

Concerning the Administration and Management of
Compensatory Mitigation Funds for the
Port of Anchorage Expansion Project
Department of the Army Permit POA-2003-502

SECTION 1. INTRODUCTION & BACKGROUND

1.1 This Memorandum of Agreement (MOA) establishes a formal agreement between the Regulatory Division of the Alaska District Corps of Engineers (hereinafter "Corps") and the Municipality of Anchorage (hereinafter "Municipality") for the administration of compensatory mitigation funds, as required by Department of the Army (DA) permit POA-2003-502-2 and subsequent modifications authorizing work in waters of the U.S. associated with the Port of Anchorage Expansion Project (Port Expansion). This MOA describes the objectives, process and the roles and responsibilities associated with the management and allocation of compensatory mitigation funds. Mitigation projects shall be reviewed and selected in the context of their comparative abilities to offset the direct losses of aquatic habitat and functions attributed to the Port Expansion project, as well as their overall ecological benefit relative to cost (cost/benefit analysis). Mitigation projects for consideration will include projects that restore, enhance, create, and/or preserve aquatic habitat and functions of Knik Arm and its tributaries, including projects that support and enhance the Municipality's sustainable salmon and creek restoration programs. This MOA is effective as of the last date set forth on the signatory page hereto.

1.2 DA permit POA-2003-502-2 authorized the discharge of fill material over 27 acres of intertidal mudflats in Knik Arm north of the existing dock at the Port of Anchorage (Port). DA Permit POA-2003-502-N, if issued, would authorize discharges of fill material over the remainder of the proposed Port Expansion project area, which includes an additional 111 acres of intertidal mudflats and nearshore subtidal waters of Knik Arm and gravel extraction activities that would result in the removal of 20.5 acres of wetlands on Elmendorf Air Force Base (EAFB).

SECTION 2. AUTHORITY

2.1 The Corps has regulatory jurisdiction over discharges of dredged and/or fill material in waters of the United States, including wetlands, under Section 404 of the Clean Water Act and work in or affecting navigable waters of the United States under Section 10 of the Rivers and Harbors Act of 1899. The Corps Regulatory Program strives to avoid, minimize, and offset adverse impacts to aquatic resources, while allowing reasonable infrastructure development and economic growth through fair, flexible and balanced permit decisions. Authorized adverse impacts to the aquatic environment are offset by appropriate and practicable compensatory mitigation requirements, which may include restoring, enhancing, creating and/or preserving aquatic habitat and their functions and values.

2.2 The Municipality is recognized as a qualified entity for the administration and management of mitigation funds on behalf of the Port of Anchorage under the terms and conditions of this MOA. The Municipality has staff with expertise in land management, law, wetlands, hydrology, and planning. Additionally, the Municipality's Creeks Community Development Manager provides oversight and coordination of the Municipality's salmon habitat protection and restoration program, pursuant to the Southeast Sustainable Salmon Program and the Pacific Coast Salmon Recovery Fund. The Watershed Task Force, established by the Mayor of Anchorage, provides advice and guidance to the Municipality as it implements salmon restoration and watershed projects.

Section 3 PROGRAM ADMINISTRATION

3.1 The Municipality of Anchorage Office of Economic and Community Development shall oversee implementation of the MOA including organizing the Port of Anchorage Mitigation Advisory Committee (advisory committee) and related administrative support. The advisory committee shall include an initial permanent panel consisting of representatives of federal, state, and municipal resource agencies. Other public, private, nonprofit, and/or tribal entities will be invited for consultation on particular mitigation projects as appropriate and mutually agreed upon by the Corps and the Municipality. The Municipality and the Corps will consult with the advisory committee for advice and recommendations as to the overall ecological benefits and the appropriateness of proposed mitigation projects in meeting the purpose, objectives and outcomes of this MOA, which are described in Section 4. The initial permanent panel members shall consist of representatives from the following agencies:

1. Alaska Department of Natural Resources
   Office of Habitat Management and Permitting
2. U.S. Fish and Wildlife Service
3. Environmental Protection Agency
3. National Marine Fisheries Service
4. Municipality of Anchorage, Planning Department

7. Department of the Air Force, 3 CES/CEVP
8. Municipality of Anchorage
   Office of Economic and Community Development
9. U.S. Army Corps of Engineers, Regulatory Division

3.2 The Municipality of Anchorage Creeks Community Development Manager shall chair the advisory committee, which includes responsibilities to organize meeting dates, times, and place, in consultation with members of the advisory committee. The Municipality shall convene meetings with the Corps and the advisory committee as necessary to execute the terms and conditions of this MOA, at minimum once a quarter, and maintain a written record of meetings. Additionally, the Municipality will track and present the progress of projects funded pursuant to this MOA to the Corps and the advisory committee.

3.3 The Corps shall be the final approval for the allocation and distribution of mitigation funds after considering all comments and recommendations provided by the advisory committee.

SECTION 4 PURPOSE OBJECTIVES & OUTCOMES

4.1 Purpose: This MOA establishes the procedures and process for the management and administration of compensatory mitigation funds as required under DA permit POA-2003-502-2 and any applicable subsequent permit modifications, which authorize work in waters of the U.S associated with the Port of Anchorage Expansion. Mitigation funds shall be used for the restoration, enhancement, preservation, and/or creation of aquatic habitats and functions to offset, as practicable, respective losses associated with authorized activities. The establishment of a mitigation account to fund compensatory mitigation projects within adjacent and/or nearby tributary watersheds of Knik Arm (which may include tributaries within the Matanuska-Susitna Borough) has been determined to represent the most appropriate and practicable compensatory mitigation opportunity available to offset the unavoidable adverse impacts associated with DA authorized Port Expansion activities.

4.2 Objectives: Compensatory mitigation projects shall be selected based on the ecological benefits that would be provided and their respective contributions toward offsetting the losses of aquatic habitats and functions associated with DA authorized Port Expansion activities. Projects will be prioritized based on their availability, their respective locations and aquatic function gains relative to the authorized project impacts, and comparative cost to benefit ratios. When practicable, on-site compensatory mitigation (i.e., in areas adjacent or continuous to the impacted aquatic areas of the Port expansion) will be preferential over offsite mitigation projects. Off-site compensatory mitigation projects will be undertaken in the same geographic area and types of aquatic habitat impacted by the authorized work to the extent practicable. Additionally, in-kind compensatory mitigation projects that would offset the direct aquatic resource functional

losses associated with Port Expansion activities will be undertaken to the extent practicable.

4.3 DA permit POA-2003-502-2 authorized the discharge of fill material over 27 acres of intertidal mudflats adjacent to the existing Port in Knik Arm. DA permit POA-2003-502-D authorized the discharge of fill material over 0.21 acre of wetlands on Elmendorf Air Force Base for maintenance activities on the POA Haul Road. DA permit POA-2003-502-N, if issued, would authorize the discharge of fill material over an additional 111 acres of adjacent intertidal mudflats and nearshore subtidal waters at the existing Port location in Knik Arm and 20.5 acres of ponded wetlands on EAFB. Priority shall be given to projects in proximity and of similar habitat types as the impacted areas of the Port Expansion. The authorized impact areas of the Port Expansion involve the intertidal mudflats and nearshore waters of Knik Arm, located north of the mouth of Ship Creek and south of Cairn Point, and wetlands within the Cherry Hill and North End Runway Borrow Pits on EAFB, northeast of the Port (See Attachment A). Mitigation projects contiguous or adjacent to authorized impact areas have the highest priority, followed by projects which are in the same watershed, followed by projects in other watersheds nearby. Additionally, mitigation projects involving the same or similar aquatic habitat types as those impacted and lost by Port Expansion activities will be given priority over other habitat types. To contribute towards offsetting the intertidal mudflats and nearshore marine habitat losses associated with the expansion of the Port infrastructure, mitigation projects adjacent to the impact areas in Knik Arm will be given the highest priority, followed by projects in the intertidal and tidally influenced estuarine and riparian reaches of nearby freshwater tributaries of Knik Arm, mainly Ship Creek, just south of the Port expansion (See Attachment A). To offset the wetland losses associated with the gravel extraction developments on EAFB, located within the proximity of the Six Mile Creek watershed, priority will be given to wetland and riparian mitigation projects within the Six Mile Creek watershed.

4.4 The primary aquatic resource losses associated with the port expansion are the losses of intertidal and nearshore habitat used by salmon and beluga whales, species of high social and ecological value. The intertidal and nearshore subtidal waters of the Port Expansion area are used by juvenile and adult salmonids, originating from tributaries of Knik Arm, for refuge from the strong currents of Knik Arm and as a migration corridor for adult salmonids. The mouth of Ship Creek is located approximately 2000 feet from the southernmost limit of the Port expansion project. Ship Creek supports a hatchery enhanced urban sport fishery of high social and economic importance to the City of Anchorage and the State of Alaska. Ship Creek hatchery produced Chinook and Coho smolt represent the salmonid populations that would experience the greatest direct impact from the habitat losses associated with the Port Expansion. Cook Inlet Beluga whales, a depleted marine mammal, are known to frequent the Port area, especially the gyre formation south of Cairn Point, and are believed to use the area for the feeding opportunities provided by the salmonid use. In-kind mitigation options that involve the direct replacement of the intertidal and nearshore subtidal habitat losses associated with the Port Expansion are not currently available or practicable. Mitigation projects that would best offset Port Expansion impacts by restoring, enhancing, or preserving nearby

intertidal and nearshore salmonid habitats will be given the highest priority, including projects located in the estuarine and lower riparian reaches of nearby Knik Arm tributaries. It is anticipated that projects that improve salmon habitat to maintain and enhance Pacific salmon populations near the Port Expansion area would also provide a direct benefit to beluga whales by maintaining and/or enhancing a primary food source.

4.5 Compensatory mitigation projects that would contribute toward offsetting the functional losses attributed to the Port Expansion would support salmon populations through the restoration, enhancement, creation and/or preservation (listed in order of priority) of existing nearby estuarine and associated lower riparian habitats. Projects would include the removal and restoration of historical fills and developments, the removal of fish passage barriers, the restoration of natural hydrodynamics and sediment transport patterns, the enhancement and/or creation of estuarine juvenile salmonid refuge and rearing habitat, restoration and enhancement of riparian buffers and streambanks, the preservation of estuarine and riparian habitats, and projects that protect natural riparian buffers and streambanks by providing public access and improving overall social function (fishing, viewing, etc.) The allocation of mitigation funds for studies and evaluations will be approved sparingly only as absolutely necessary to implement high priority compensatory mitigation projects.

4.6 Prior to the allocation of mitigation funds, the Corps, Municipality, and the advisory committee will review available mitigation projects and prioritize them in accordance to their overall ability to offset the aquatic function losses of the Port expansion and their respective cost/benefit or cost/credit ratio. Applicable mitigation projects include projects identified in the Municipality of Anchorage's Sustainable Salmon initiative and/or other projects that may later be identified that would meet the purpose and objectives of this MOA. Nearby Knik Arm tributaries and the preliminary mitigation projects currently available for review and consideration by the Corps, Municipality and the advisory committee are summarized below (the following list is not absolute and does not limit other Knik Arm tributaries or projects which may be later identified).

Chester Creek

Chester Creek Aquatic Ecosystem Restoration, Westchester Lagoon to Cook Inlet, Phase II is an aquatic restoration project at the mouth of Chester Creek in Anchorage, Alaska. The proposed project is to improve anadromous fish passage by removing a major obstruction, constructed in 1971, to salmon at the mouth of Chester Creek. The mitigation project involves the construction/creation of a new intertidal channel to allow unobstructed fish migration in and out of Chester Creek from Knik Arm.

Status: An environmental assessment, finding of no significant impact, and preliminary engineer design drawings have been completed for this project. The final design for the project is anticipated by October 2007. The allocation of mitigation funds associated with DA permit POA-2003-502-2 for the construction

of this project is available for the immediate review and consideration by the Corps, Municipality, and the advisory committee.

Six Mile Creek

To offset the unavoidable wetland losses associated with the borrow pit developments on EAFB, the following compensatory mitigation projects have been identified within the Six Mile creek watershed:

Lower Six Mile Lake: This project would replace fish ladders that are impeding fish migration in an effort to improve fish passage for adult and juvenile salmon.

Upper Six Mile Lake: This project is intended to stabilize the edge of Talley Avenue separating Upper and Lower Six Mile Lakes and enhance the existing gravel spawning beds. The project will also design and construct spawning channels along with check dams to coincide with freshwater flows.

Six Mile Creek: This project would design and construct four irregularly shaped over-wintering ponds at the location where Six Mile Creek meanders through the wetlands west of Fairchild Avenue.

Status: The Six Mile Creek fisheries enhancement projects would be available for review and consideration by the Corps, Municipality, and the advisory committee following issuance of DA permit POA-2003-502-N. Design drawings and environmental review and permitting would commence following the review and approval of the projects by the Corps under consultation with the advisory committee.

Lower Ship Creek

Ship Creek, which is the closest and most directly impacted watershed by the Port expansion area, has been historically degraded from human development activities. The Ship Creek estuary has been historically diminished in both size and function and the lower reaches of Ship Creek have been channelized, dammed and developed. The industrial developments have diminished streamside riparian habitat and buffering, salmon spawning and rearing habitat, and several dams have created major obstructions to salmon passage, which have substantially reduced the creek's wild salmon population. Mitigation activities that would restore and/or enhance the ecological functions of the Ship Creek estuary would provide the greatest opportunities to offset the unavoidable direct and indirect impacts of the Project. Due to the private ownership of the creek bed and adjacent lands in lower reaches of the creek, coupled with conflicting stake holder interests in the lower and upper reaches of the creek, mitigation projects are very controversial in the area. The Corps, Municipality and the advisory committee will consider appropriate and practicable mitigation projects identified

in a Ship Creek Mitigation Feasibility Study, which would be sponsored by the Port of Anchorage following the issuance of DA permit POA-2003-502-N. Pre-identified projects to include in the feasibility study for consideration include:

Estuary Enhancement and Expansion: Currently Coho and Chinook smolt released from Ship Creek hatchery have limited estuarine habitat for refuge. Opportunities should be explored that would expand the estuary to the south to provide access to higher value mudflats, refuge from tidal currents, and potential juvenile rearing habitat for hatchery smolts and for restoring wild salmonid populations.

Dam Removal and/or Fish Passage Modifications: This action includes the planning, permitting, design, and construction associated with improving fish passage and/or removing the Knik Arm Power Plant (KAPP) dam (and potentially other dams located on Elmendorf and Fort Richardson) located on Ship Creek. This action is intended to restore historic salmon passage, restore and enhance riparian and estuarine habitat, increase downstream sediment transport, and improve public fish viewing opportunities.

Conservation Easements: This action would preserve critical areas within the remaining tidal estuary with the placement of easement restrictions on those properties to preclude further losses by development.

Riparian Buffering: Ship Creek has been degraded by the absence of riparian buffering from industrial development located on the north side of the lower reach of the creek to its mouth. Projects shall be explored that would provide buffering, creek restoration and greater public access along Ship Creek from the North Ship Creek Point access bridge to the mouth of the creek.

Status: Mitigation projects would be available for review and consideration by the Corps, Municipality, and the advisory committee following the issuance of DA permit POA-2003-502-N and completion of the feasibility study, which would identify appropriate and practicable mitigation projects. Design drawings and environmental review and permitting would commence following the review and approval of the projects by the Corps under consultation with the advisory committee.

4.7 In the event that any of the initially proposed projects identified above are determined to be infeasible, remaining funds will be directed towards other restoration, enhancement, and/or preservation projects approved by the Corps under consultation with the Mitigation Advisory Committee.

4.8 Outcomes: The monetary value of the Mitigation Fund is based on functional habitat losses attributed to DA authorized Port of Anchorage Expansion activities based on the calculation of debits in accordance to the Anchorage Debit-Credit Methodology (ADCM). Therefore, the purpose and outcomes of compensatory mitigation projects will

be to appropriately offset functional losses through the generation of credits in accordance to the ADCM (i.e., credit-debit balancing). The overall measurement of success will consider the geographic area of successful restoration, enhancement, creation, and/or preservation, and the resultant improvements to the relative ecological value and/or aquatic function in accordance to the ADCM. The Corps and the Municipality, under consultation with the advisory committee, will establish the specific objectives for which to guide, measure, and execute compensatory mitigation projects funded pursuant to this MOA. The debits and relative ecological values of Port Expansion activities authorized by DA permits POA-2003-502-2, POA-2003-502-D, and potentially POA-2003-502-N are as follows:

Relative Ecological Values (REV) and Type	**Debits**
Phase I permit: POA-2003-502-2	
REV 2 (intertidal, unvegetated mudflats)	17.45
POA Haul Rd: POA-2003-502-D	
REV 2 (EAFB wetlands)	0.11
Phase II permit: POA-2003-502-N	
REV 1 (intertidal, unvegetated mudflats)	11.04
REV 2 (nearshore subtidal and EAFB wetlands)	48.40
REV 3 (degraded subtidal)	20.07

Section 5: FINANCIAL ADMINISTRATION

5.1 The Municipality agrees to separately account for all mitigation funds received pursuant to this MOA in a "Port Compensatory Mitigation Account" (Account). Funds in this account will be managed and invested consistent with the provisions of Chapter 6.50 of the Anchorage Municipal Code. Interest earned on the account will be used to offset inflation rates of mitigation project costs as well other reasonable costs associated with establishing, maintaining and investing the funds contained within the subject account. Annual rates of inflation will be based on the Consumer Price Index of the Bureau of Labor Statistics. Interest earnings that exceed annual inflation rate percentages of the account balance, as well as the other reasonable account management costs described above, will be treated as unrestricted earnings of the Port of Anchorage.

5.2 The Municipality will assess the Account a one time fee of 5% for indirect administrative management and support provided pursuant to Sections 3, 5, and 6 of the MOA. Any allocation of Account funds to project management costs associated with the specific mitigation projects will be determined on a project-by-project basis based on advice from the advisory committee and approval by the Corps.

5.3 Disbursements from the account shall be made by the Municipality upon full consideration of recommendations received by the advisory committee and receipt of a written authorization from the Corps.

5.4 Disbursements for mitigation projects shall require written authorization and direction from the Corps for the distribution of specified amounts for specified purposes. Funds will be disbursed from the account for specified mitigation projects upon written approval of the Corps in consultation with the advisory committee. In compliance with the written authorization, the Municipality of Anchorage's Chief Fiscal Officer, or designee, shall direct issuance of funds in specified amounts for specified purposes as authorized by the Regulatory Division of the U.S. Army Corps of Engineers, Alaska District.

5.5 The Municipality will furnish an annual report by January 15th to the Corps and the advisory committee detailing all project activities and outcomes and financial information including: income, disbursements, and interest earned with respect to the Account.

5.6 The Municipality, on behalf of its department, the Port of Anchorage, shall establish the mitigation account with an initial balance of Nine Hundred Fifty-five Thousand Nine Hundred Ninety-eight Dollars ($968,782.60), as required under DA permit POA-2003-502-2 and POA-2003-502-D. These funds may be allocated towards the implementation of eligible mitigation projects upon execution of this MOA. Subsequent funds associated with the mitigation requirements of DA permit POA 2003-502-N will, at minimum, be made by the Municipality over a period of five years (i.e., 20% increments) with annual deposits of $1,407,849.73, with the first installment occurring within 30 days of permit issuance. The monetary mitigation amounts required by DA permits POA-2003-502-2, POA-2003-502-D (POA Haul Rd.) and POA-2003-502-N (if issued), are as follows:

Phase I permit: POA-2003-502-2:	**$ 955,998.00**
POA Haul Rd: POA-2003-502-D:	**$ 12,784.60**
Phase II permit: POA-2003-502-N:	**$7,039,248.64**
Total	**$ 8,008,031.24**

Section 6. TIME FOR PERFORMANCE

6.1 This MOA becomes effective when signed by the authorized parties to this MOA. The parties to this MOA shall commence performance of the work described herein immediately following signature. The selection and implementation of mitigation projects associated with the compensatory mitigation requirements of DA permit POA-2003-502-N, if issued, will be completed over a 5 year period, commensurate with the annual mitigation deposits by the Port and the construction phasing of the Port Expansion project, if practicable.

6.2 The administrative terms of this MOA shall remain effective for a period of five (5) years or until identified mitigation projects have been completed and available mitigation funds are depleted. If after five (5) years mitigation funds and appropriate and practicable mitigation projects remain, there will be an option to renew the agreement for an additional period up to five (5) years, as necessary to complete the administration of the funds. As mitigation projects may require post construction monitoring, monitoring requirements will remain in effect following construction of the last mitigation project approved under this MOA as necessary.

Section 7. GENERAL PROVISIONS

7.1. Amendments: This contract shall only be amended or modified by a written memorandum, executed by authorized representatives of the parties, with the same formality as this contract was executed. For the purposes of any amendment modification or change to the terms and conditions of this contract, the only authorized representatives of the parties are:

Chief, South Branch
Regulatory Division
U.S. Army Corps of Engineers, Alaska District

Municipal Manager
Municipality of Anchorage

Any attempt to amend, modify, or change this contract by either an unauthorized representative or unauthorized means shall be void.

7.2. Jurisdiction; Choice of Law: Any civil action rising from this contract shall be brought in the federal district court of the State of Alaska at Anchorage. Federal law shall govern the rights and obligations of the parties under this contract.

7.3 Severability: Any provision of this contract decreed invalid by a court of competent jurisdiction shall not invalidate the remaining provisions of the contract.

7.4 Termination: The duration of this MOA is in accordance with the terms specified in Section 6.0.

Section 8. NOTICES

8.1. Any notice required pertaining to the subject matter of this contract shall be either sent via facsimile (FAX) or mailed by prepaid first class registered or certified mail, return receipt requested to the following addresses:

Municipality of Anchorage
Dept. of Economic and Community Development
P.O. Box 196650
Anchorage, AK 99519-6650
FAX: (907) 343-4318

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, ALASKA
REGULATORY DIVISION
ATTN: POA-2003-502

P.O. BOX 6898
ELMENDORF AFB, ALASKA 99506-0898
FAX: (907) 753-5567

Notices are effective upon the earlier of receipt, proof of good transmission (facsimiles only), or five (5) days after proof of proper posting.

8.2 Staff support: Staff contacts to this MOA are:

Ryan Winn
Project Manager
Regulatory Division
US Army Corps of Engineers
Alaska District
Phone: 907.753.2712
Email: Ryan.H.Winn@poa02.usace.army.mil.

David Wigglesworth
Creeks Community Development Manager,
Municipality of Anchorage
Phone: 907.343.7116
Email: wigglesworthdt@muni.org.

Section 9. SIGNATORIES

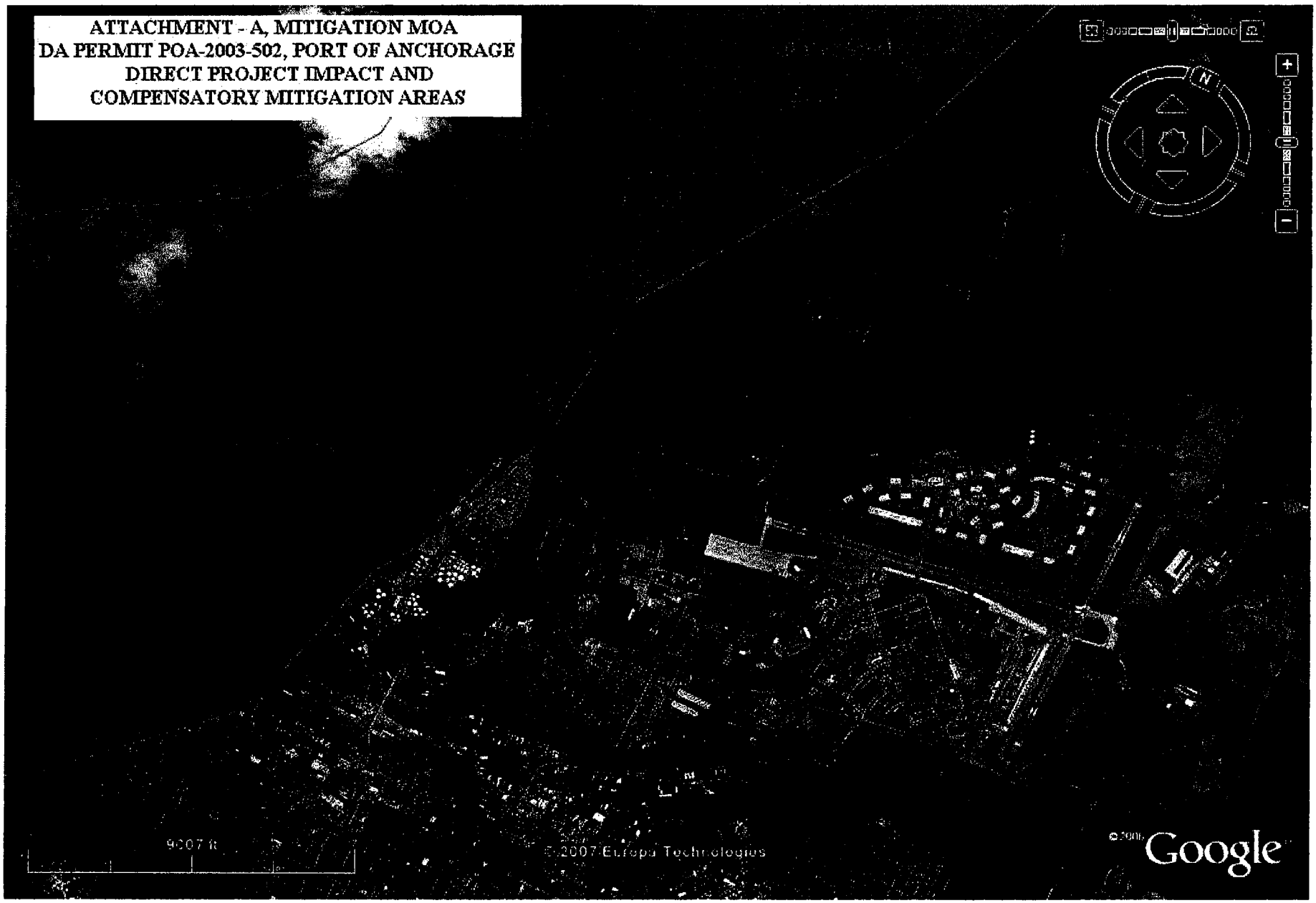
IN WITNESS WHEREOF, the parties have executed this contract on the date and at the place shown below.

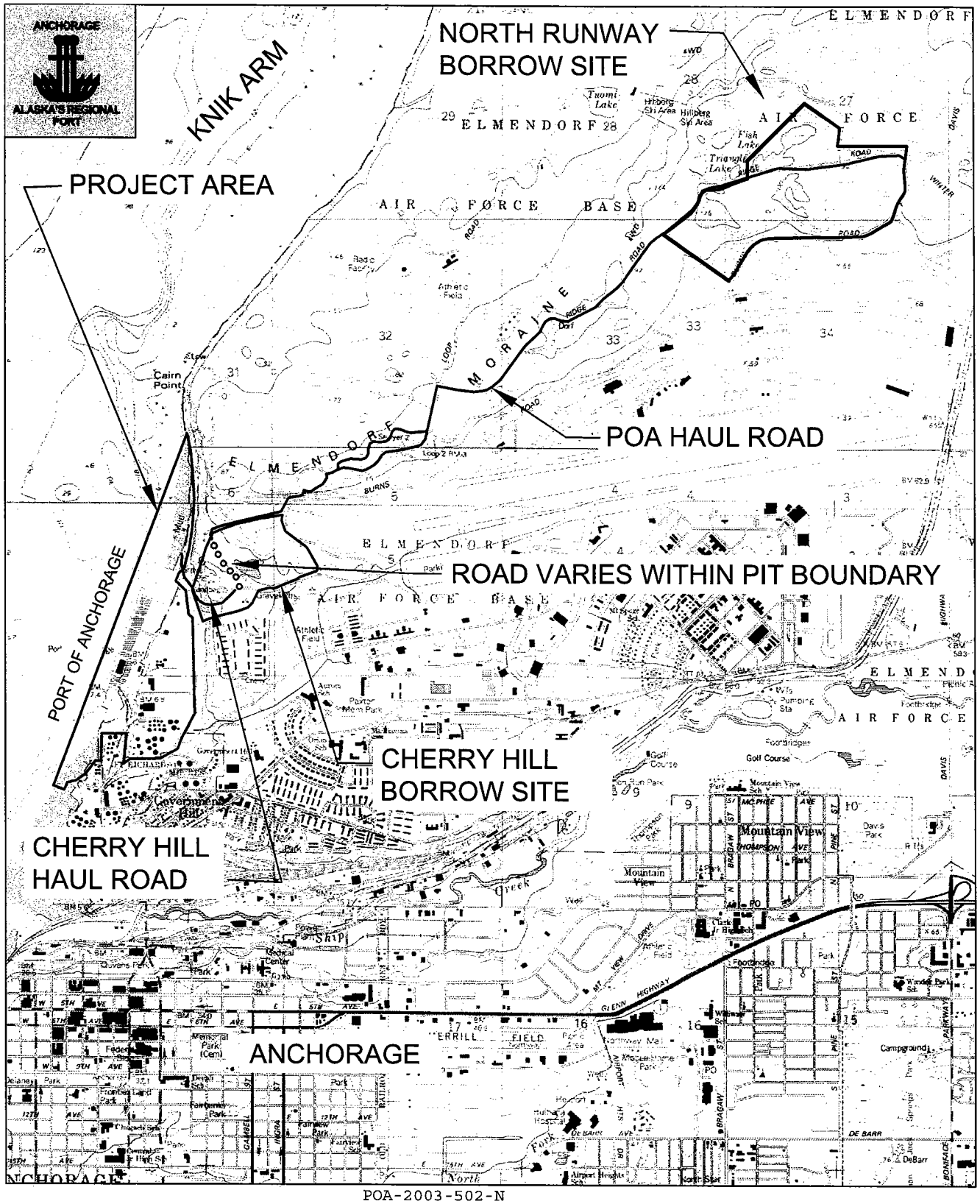
MUNICIPALITY OF ANCHORAGE

Denis LeBlanc
Municipal Manager
Date: 8/8/07

US ARMY CORPS OF ENGINEERS

William A. Keller
Chief, South Branch
Date: 8/9/07


ATTACHMENT - A, MITIGATION MOA
DA PERMIT POA-2003-502, PORT OF ANCHORAGE
DIRECT PROJECT IMPACT AND
COMPENSATORY MITIGATION AREAS
N
9607 ft
©2007 Europa Technologies
©2007 Google



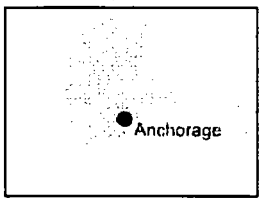
POA-2003-502-N

Sheet 1 of 9

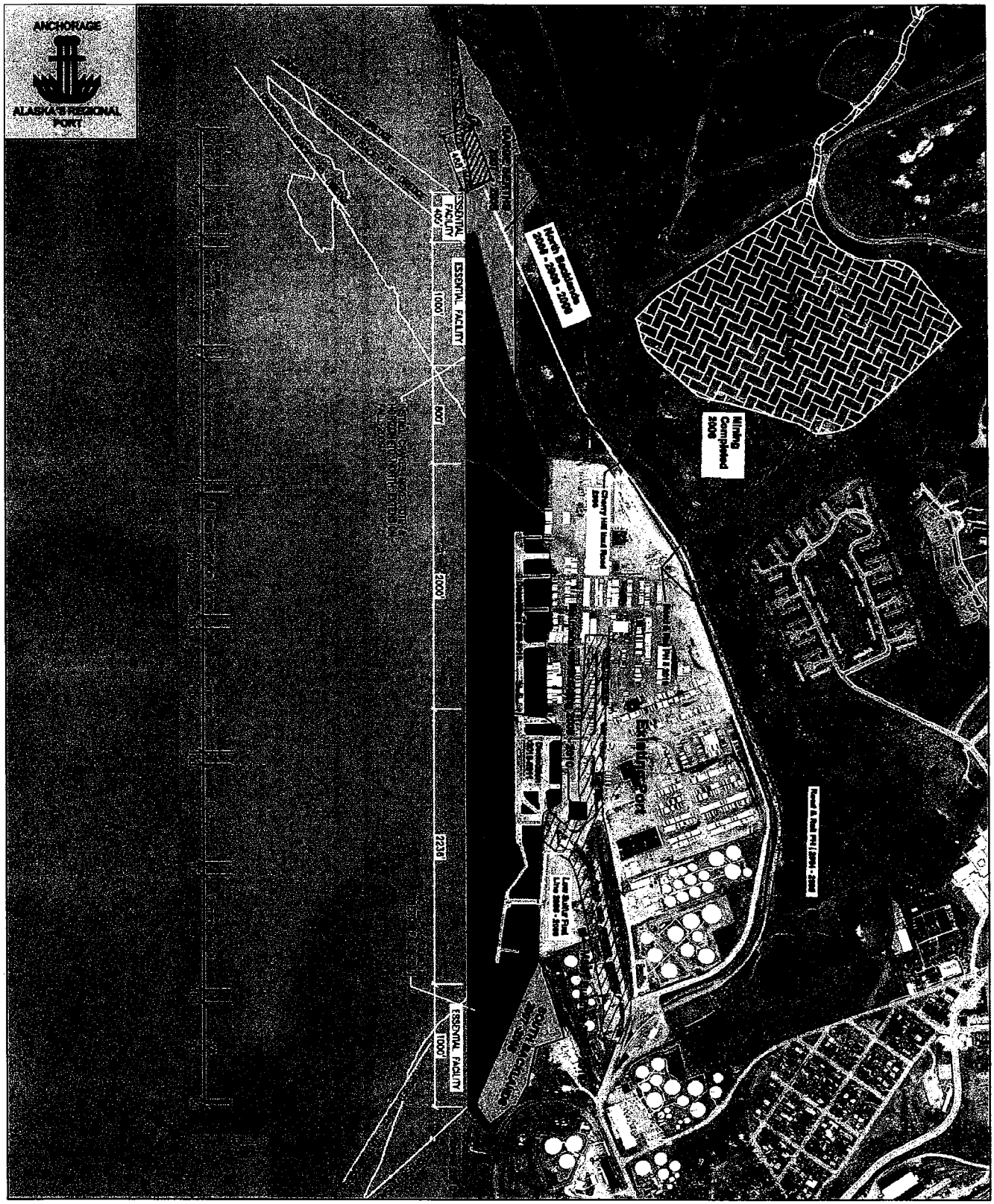
July 2007

MARINE TERMINAL REDEVELOPMENT PROJECT VICINITY MAP

(McMahan and Holmes 1996)
(Anchorage, Alaska , United States 01 Jul 1965)



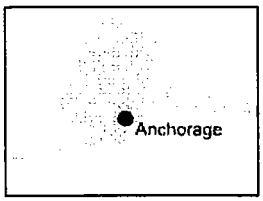
PHASE II APPLICATION



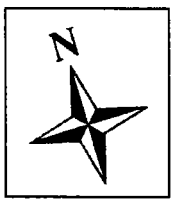
POA-2003-502-N

Sheet 2 of 9

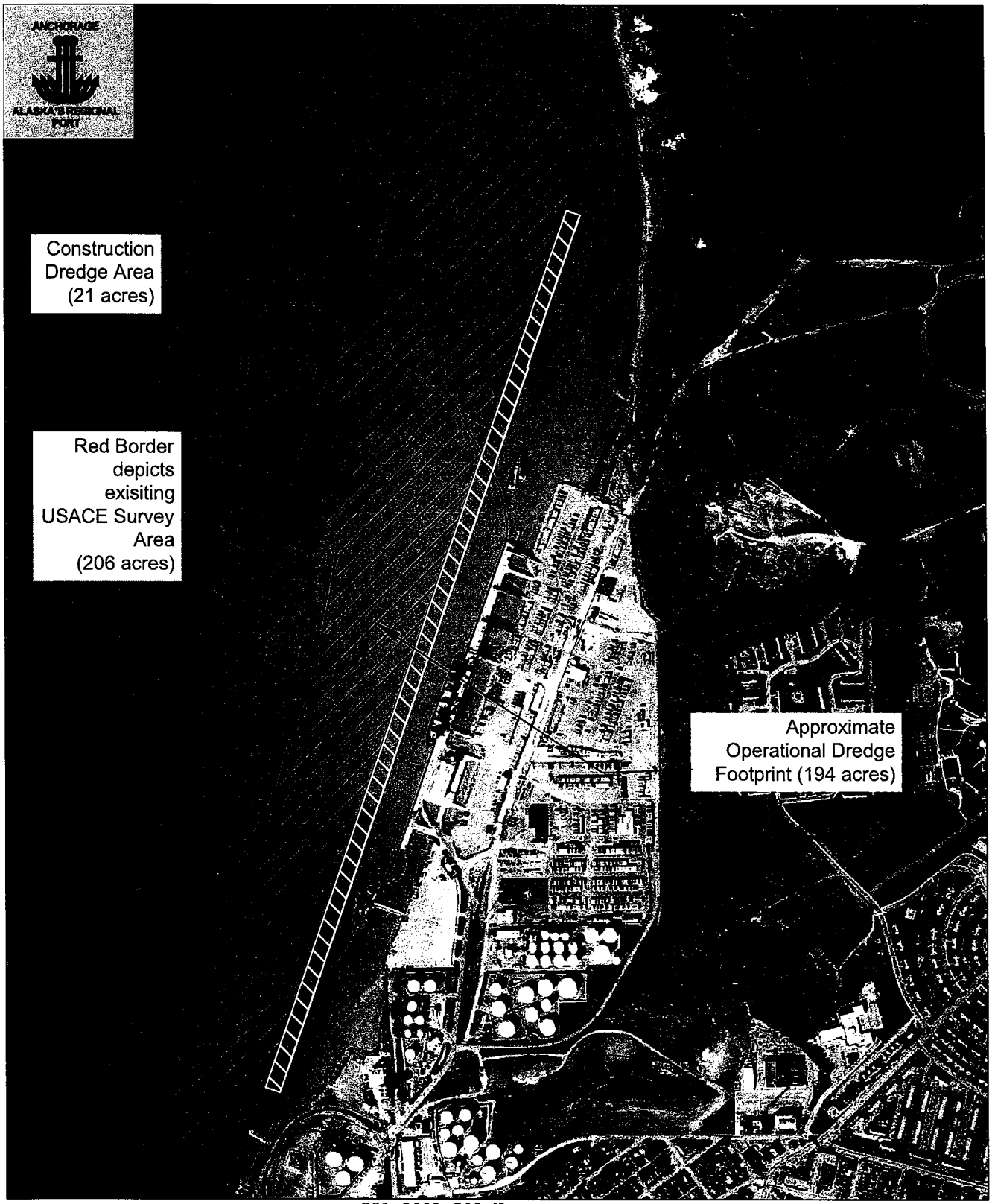
July 2007



Phasing Plan



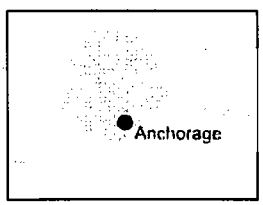
PHASE II APPLICATION



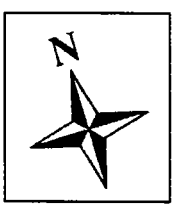
POA-2003-502-N

Sheet 3 of 9

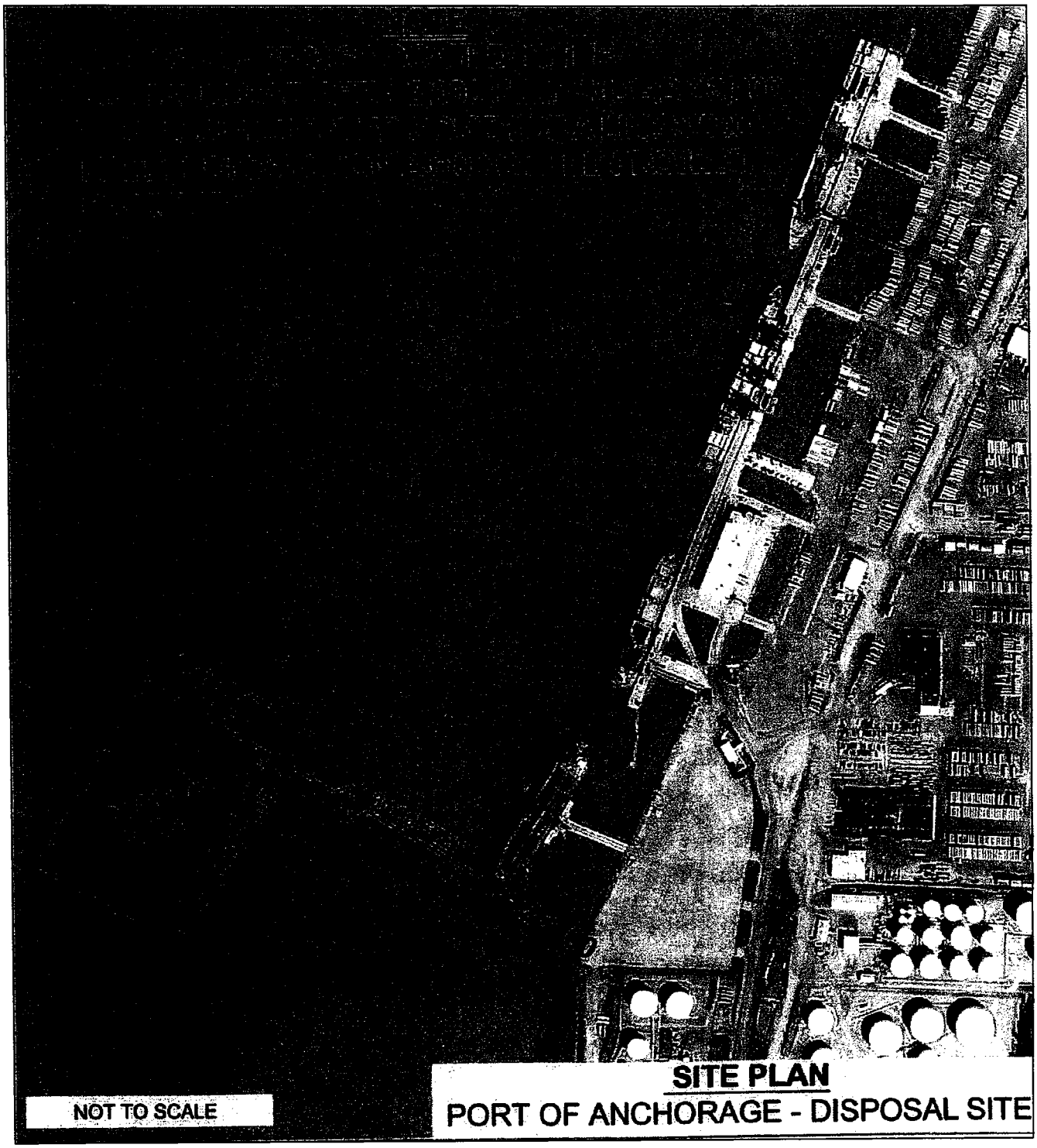
July 2007



USACE and Marine Terminal Redevelopment Project Dredge Areas



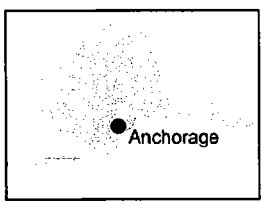
PHASE II APPLICATION



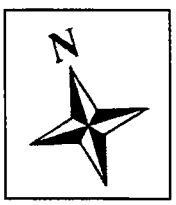
POA-2003-502-N

Sheet 4 of 9

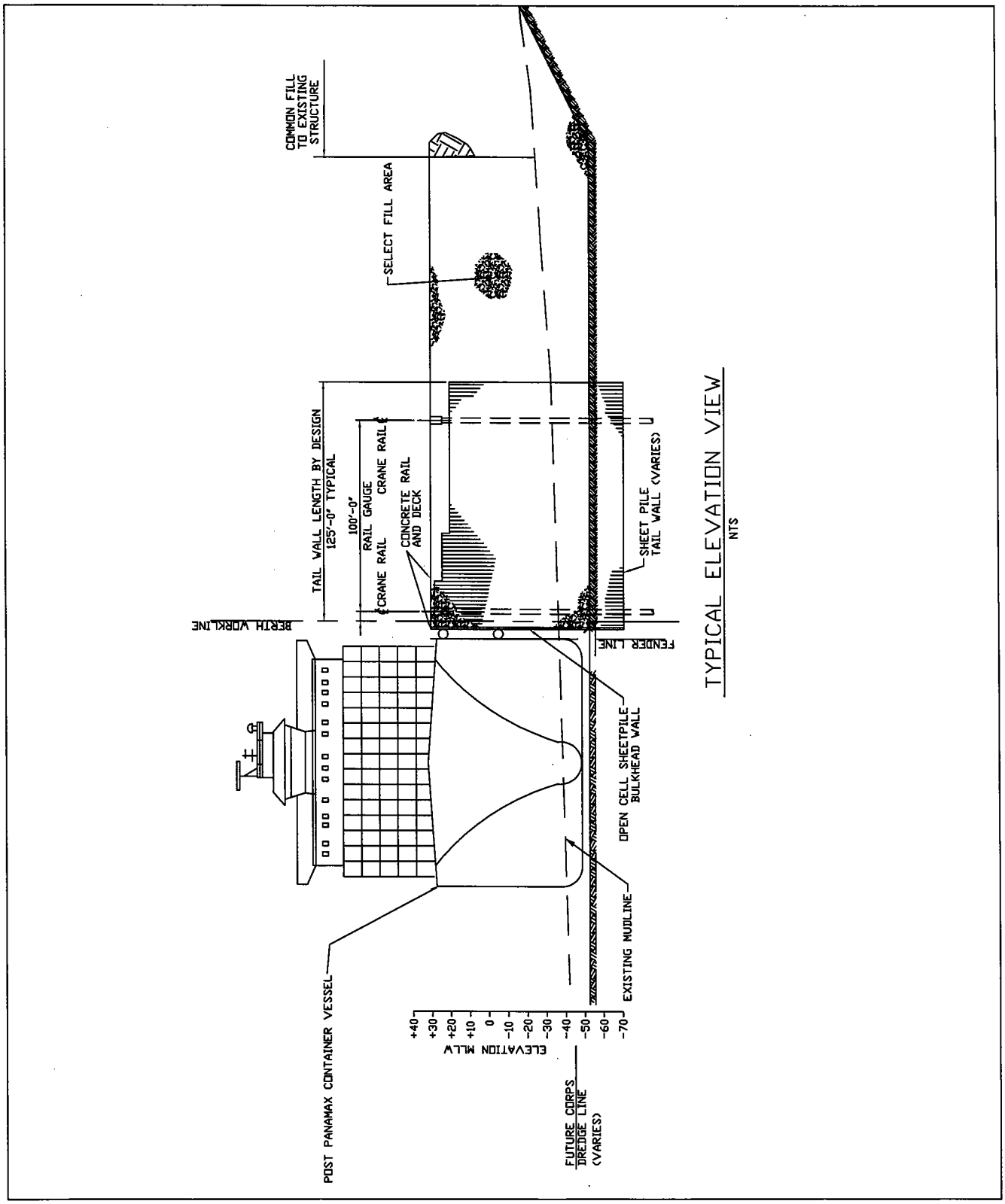
July 2007



NON-CONTAMINATED DREDGED MATERIAL DISPOSAL SITE



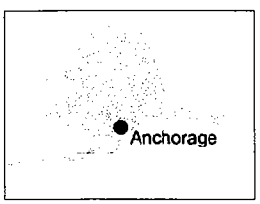
PHASE II APPLICATION



POA-2003-502-N

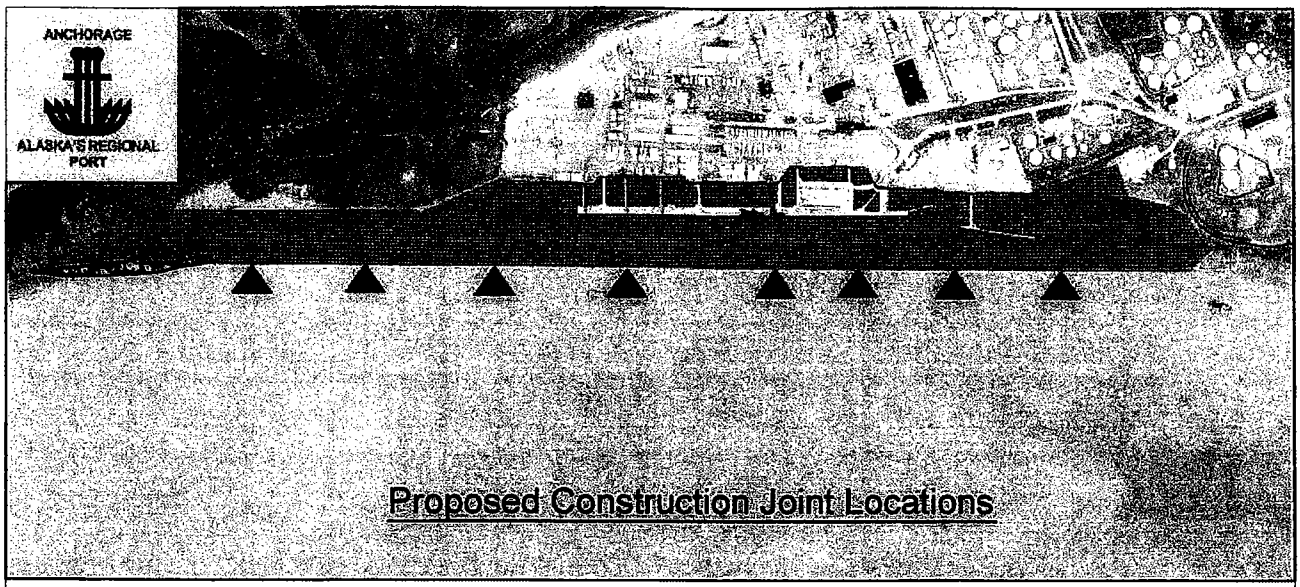
Sheet 5 of 9

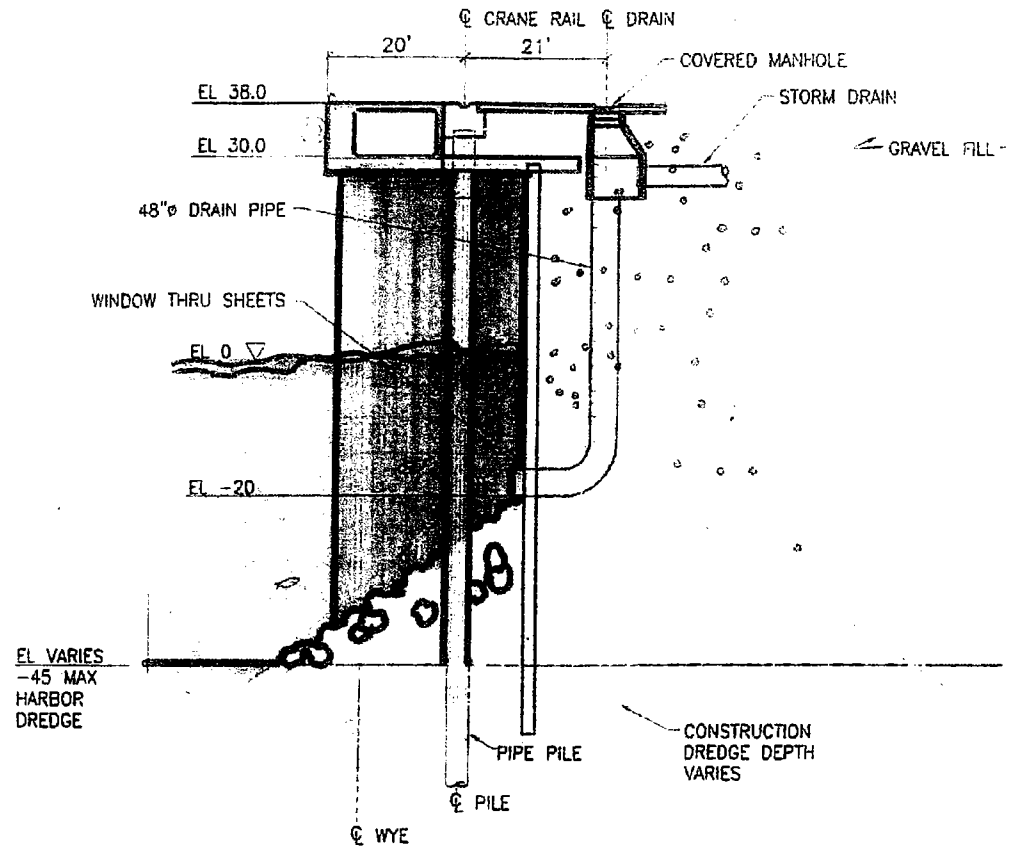
July 2007



Example Cross Section through Dock

PHASE II APPLICATION





Typical Section @ Sheet Pile Cell Unit Construction Cell

POA-2003-502-N

Sheet 6 of 9

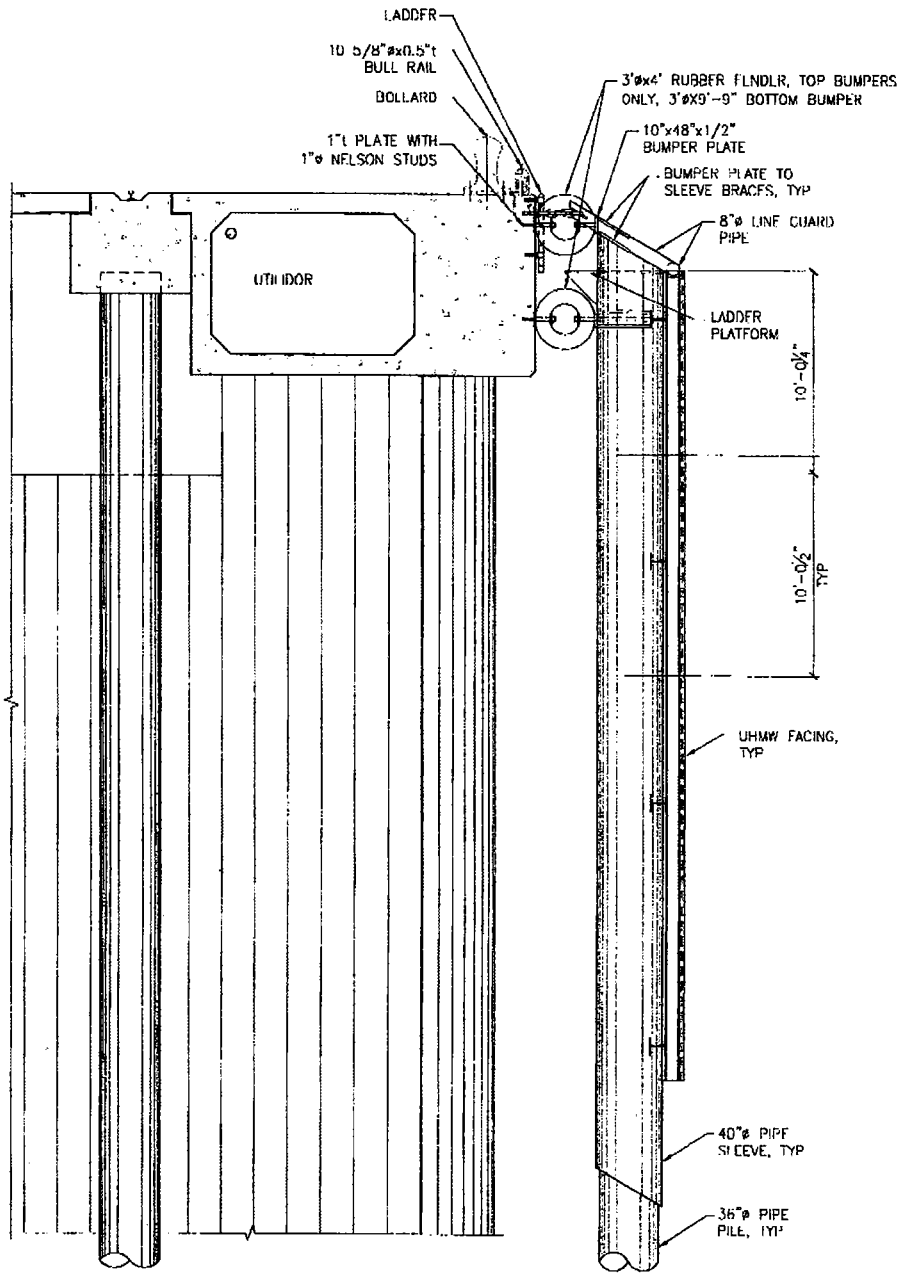
July 2007

Anchorage

Construction Joint Locations

N

PHASE II APPLICATION



Typical Fendering @ 55' Spacing

POA-2003-502-N

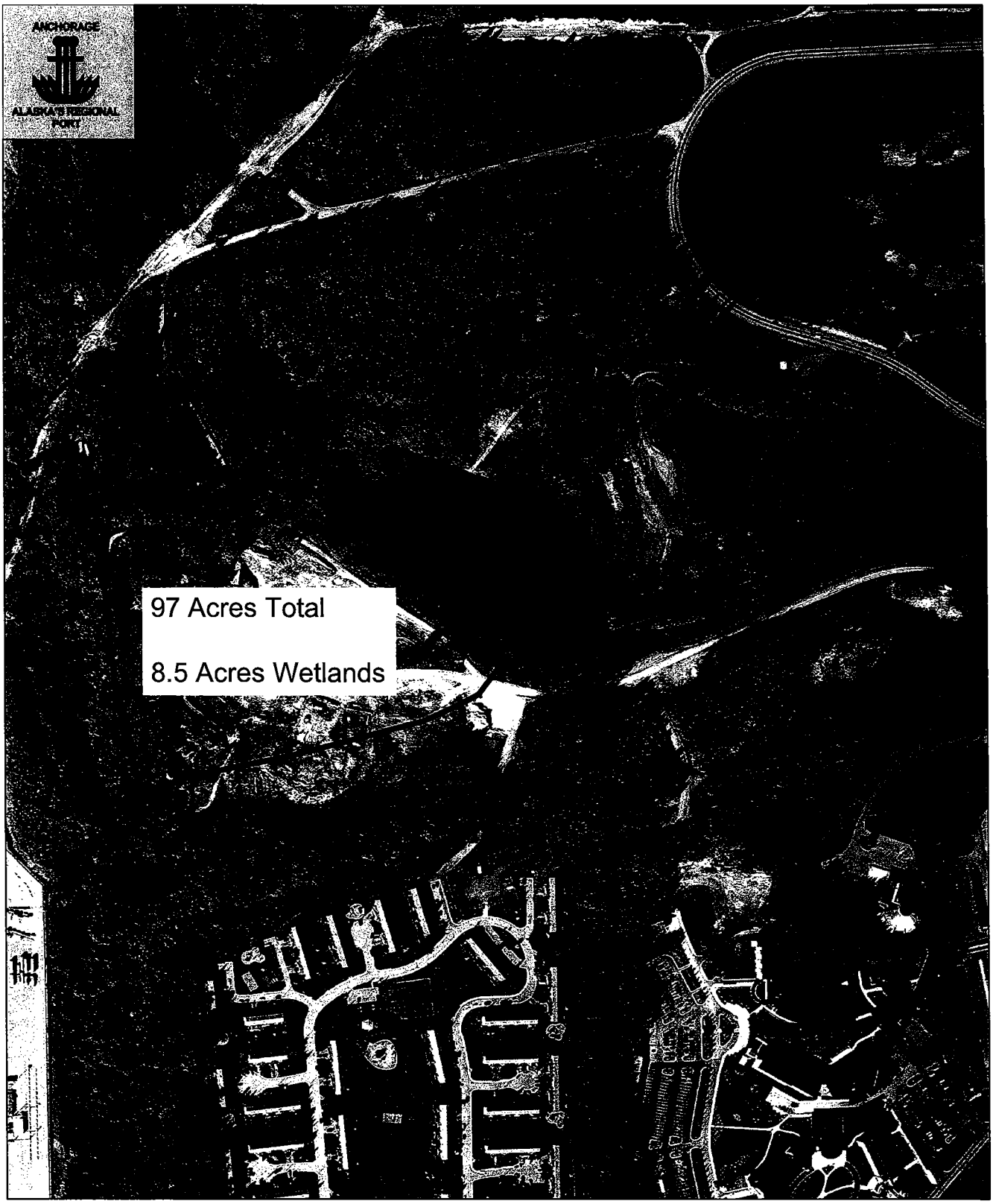
Sheet 7 of 9

July 2007

TYPICAL FENDERING

Anchorage

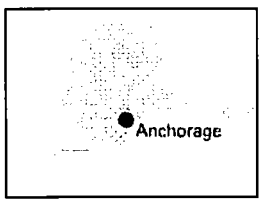
PHASE II APPLICATION



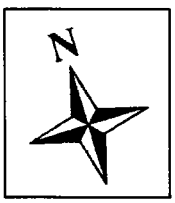
POA-2003-502-N

Sheet 8 of 9

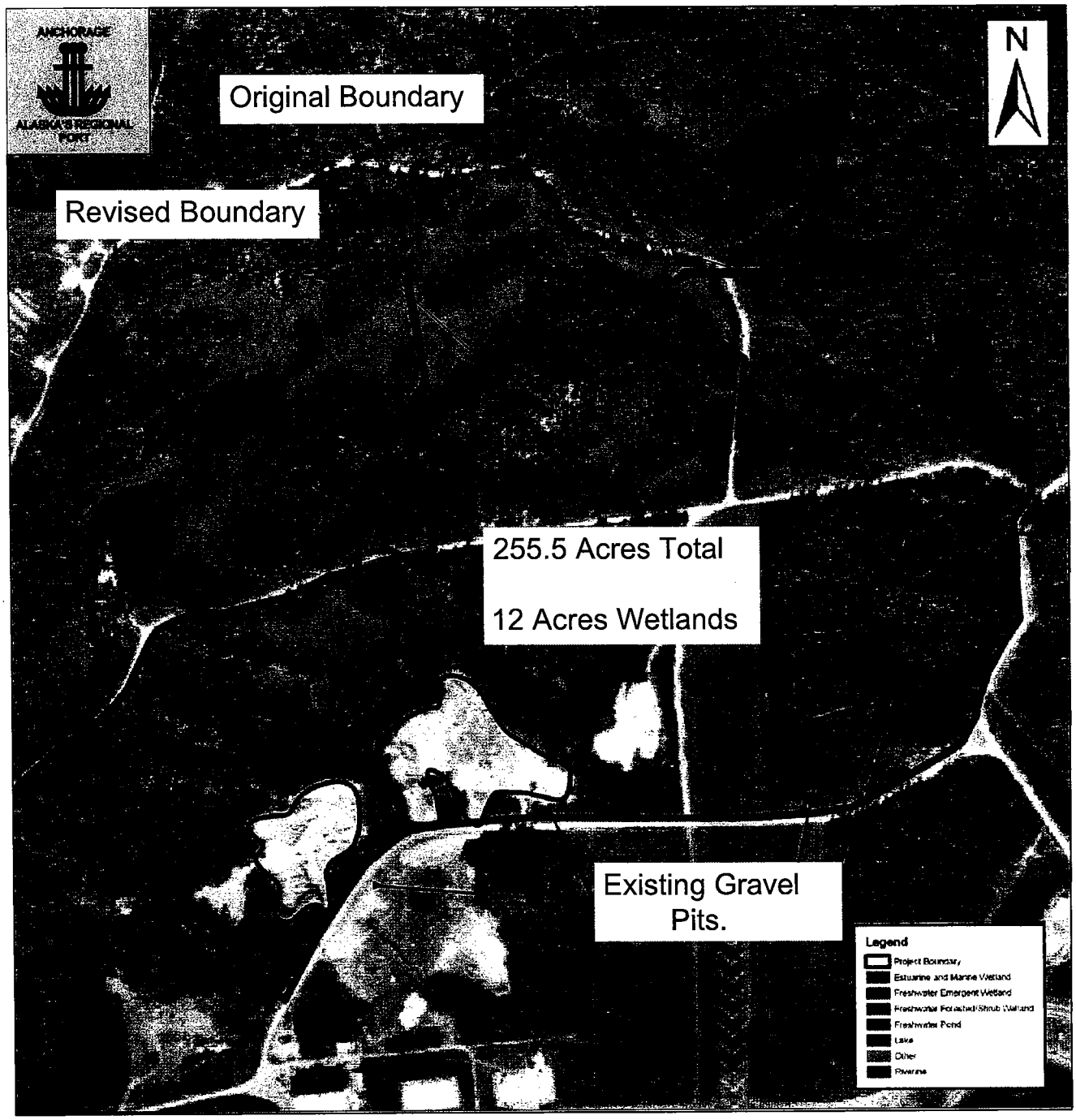
July 2007



Cherry Hill
Borrow Site



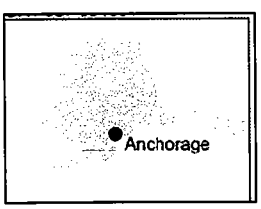
PHASE II APPLICATION



POA-2003-502-N

Sheet 9 of 9

July 2007



North End North / South Runway
Borrow Site

PHASE II APPLICATION

RW

STATE OF ALASKA

DEPT. OF ENVIRONMENTAL CONSERVATION
DIVISION OF WATER
Non-Point Source Pollution Water Control Program

FRANK H. MURKOWSKI, GOVERNOR
555 Cordova Street
Anchorage, AK 99501-2617
Phone: (907) 269-7564
Fax: (907) 334-2415
TTY: (907) 269-7511
http://www.state.ak.us/dec/

July 21, 2006
Certified Mail 7006-0810-0000-8656-8991

Mr. Kevin Bruce
Deputy Port Director
Port of Anchorage
2000 Anchorage Port Road
Anchorage, AK 99501

Subject: Ship Creek Port Expansion
Reference No. POA-2003-502-N
State I.D. No. AK0601-11AA

Dear Mr. Bruce:

In accordance with Section 401 of the Federal Clean Water Act of 1977 and provisions of the Alaska Water Quality Standards, the Department of Environmental Conservation is issuing the enclosed Certificate of Reasonable Assurance for the proposed dredging and discharge of fill material in approximately 135 acres of intertidal and sub tidal waters of Cook Inlet in Anchorage, Alaska.

Department of Environmental Conservation regulations provide that any person who disagrees with this decision may request an adjudicatory hearing in accordance with 18 AAC 15.195 – 18 AAC 15.340 or an informal review by the Division Director in accordance with 18 AAC 15.185. Informal review requests must be delivered to the Director, Division of Water, 555 Cordova St., Anchorage, AK 99501, within 15 days of the permit decision. Adjudicatory hearing requests must be delivered to the Commissioner of the Department of Environmental Conservation, 410 Willoughby Avenue, Suite 303, Juneau, AK 99801, within 30 days of the permit decision. If a hearing is not requested within 30 days, the right to appeal is waived.

By copy of this letter we are advising the Corps of Engineers and the Office of Project Management and Permitting of our actions and enclosing a copy of the certification for their use.

Sincerely,

James Rypkema
Program Manager

Enclosure
cc: (with encl.)
Ryan Winn, COE Anchorage
Jim Renkert, DNR/OPMP Anchorage
Stewart Seaberg, DNR/OHMP Fairbanks
EPA, AK Operations
Ann Rappoport, USFWS Anchorage
William Ashton, ADEC
Greg Drzewiecki, ADEC

STATE OF ALASKA
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
CERTIFICATE OF REASONABLE ASSURANCE

A Certificate of Reasonable Assurance, in accordance with Section 401 of the Federal Clean Water Act and the Alaska Water Quality Standards, is issued to Port of Anchorage, 2000 Anchorage Port Road, Anchorage, AK 99501 for the proposed Marine Terminal Redevelopment Project. This project involves the construction of a new sheet pile constructed dock in the tidelands west, northwest, and southwest of the existing dock. The overall port expansion project involves a total discharge of fill material over approximately 135 acres of intertidal and subtidal waters of upper Cook Inlet and construction and operational dredging within 235 acres. Phase I (for regulatory purposes) of the project was previously permitted and encompasses 27 acres of the intertidal fill area on the north end of the Port. This certificate covers the following: a discharge of approximately 9.4 million cubic yards of fill material over the remaining 108 acres of intertidal and subtidal fill; the dredging of approximately 633,000 cubic yards of material, over approximately 47 acres, required for the construction of the proposed sheet pile dock; the construction of an 8,800 foot long open cell sheet pile dock; and the roads, which would cumulatively remove approximately 34.5 acres of wetlands.

The Port of Anchorage indicated that any suspect fill material mined from Elmendorf Air Force Base or from commercial sources would be tested for hydrocarbon and metal contaminates. DEC recommends sampling be done in accordance with the Environmental Protection Agency (EPA) methodology and standard operating procedures. Please refer to EPA guidelines for the most current sampling protocols.

The proposed activity is located in Upper Cook Inlet, within Section 31, T. 14 N., R. 3 W., and Sections 6 and 7, T. 13 N., R. 3 W., Seward Meridian, in Anchorage, Alaska.

Public notice of the application for this certification was given as required by 18 AAC 15.180.

Water Quality Certification is required under Section 401 because the proposed activity will be authorized by a Corps of Engineers permit, reference number POA-2003-502-N, and a discharge may result from the proposed activity.

Having reviewed the application and comments received in response to the public notice, the Alaska Department of Environmental Conservation certifies that there is reasonable assurance that the proposed activity, as well as any discharge which may result, will comply with applicable provisions of Section 401 of the Clean Water Act and the Alaska Water Quality Standards, 18 AAC 70, provided

that the following alternative measures are adhered to.

1. Petrochemical and other hazardous substance spill cleanup equipment shall be available on site. Material such as sorbent pads and booms shall be available and used immediately to contain and cleanup oil, fuel, hydraulic fluid, antifreeze or other pollutant spills as a result of construction and in water activities.

2. Reasonable precautions and controls must be used to prevent incidental and accidental discharge of petroleum products. Petroleum storage and handling activities must be sited, constructed and conducted so that there is no contamination of surface runoff by petroleum products.

3. Runoff discharged to surface water from a construction site disturbing 1 or more acres must be covered under EPA's NPDES General Permit for Storm Water Discharges from Large and Small Construction Activities in Alaska (AKR10-0000). This permit requires that a Storm Water Pollution Prevention Plan (SWPPP), describing construction runoff and erosion control, be prepared. For projects that disturb greater than 5 acres, this SWPPP must also be submitted to ADEC (Greg Drzewiecki phone 907-269-7692) prior to construction. Please contact EPA directly concerning the NPDES storm water permit

4. Design plans for the post-construction (permanent) collection and treatment of stormwater runoff must be submitted to and approved by the Alaska Department of Environmental Conservation (Greg Drzewiecki, 907-269-7692) prior to construction (18 Alaska Administrative Code 72.600). The plans must demonstrate that the storm water management system has the ability to remove total suspended solids particles greater than 20 microns in size from storm water runoff during storms equal to or less than the 2-year 6-hour rainfall event.

5. Fill material must be free from petroleum products and toxic contaminants in toxic amounts.

6. If contaminated soils or dredge spoils are encountered or petroleum sheen appears during excavation, dredging or fill activities, all work within the suspected contaminated area shall immediately cease. Linda Nuechterlein, ph. 907-269-7530 at the Department of Environmental Conservation (DEC) Contaminated Sites Section Anchorage Office shall be contacted and approval given before work resumes in that area. DEC Contaminated Sites Program Department approval is necessary to insure contaminated soils are not carried to other locations and appropriate monitoring of the site for contamination movement is not hindered.

7. Along the POA haul road and at any upland site prior to fill placement, a silt fence or similar structure shall be installed on a line parallel to and within 5' of the proposed fill toe of slope within all wetland areas containing standing water that are connected to any natural body of water or where the fill toe is within 25' of such a water body. This structure shall remain in place until the fill has been stabilized or contained in another manner and shall be removed when permanent site stabilization has been achieved.

8. Silt and sediment from the site excavation and fill materials may not enter wetlands or waters outside the necessary working area. Site preparation, excavation, fill placement, and construction activities must be conducted to prevent, minimize and contain the generation of silt and sediment that could be carried off-site by surface runoff. If silt and sediment are evident in standing or flowing water outside the excavation and fill area, the Port of Anchorage, or its contractors, shall apply appropriate control and containment measures. These measures may include fabric fences, straw bales, other effective filters, matting, settling ponds, or avoiding work during heavy precipitation.

9. Natural drainage patterns must be maintained, to the extent practicable, without introducing ponding or drying. Control of drainage must be provided by appropriate ditching, culverts, and other measures. Drainage ways must be vegetated to help control the transport of fine sediments.

10. During fill placement, the applicant shall limit the introduction of silts and organics into Knik Arm. To the extent practicable the creation of a turbidity plume during construction shall be minimized. Techniques to minimize the formation of a plume include, but are not limited to, use of silt curtains, use of fill clean of silts and organics, use of a fill dike to enclose the area to be filled, or construction during low water.

11. Portions of the material site that will not remain in operation after construction shall be re-contoured, stabilized, and revegetated as soon as practicable. During reclamation stockpiled organic material shall be spread over the contoured mine workings to promote natural plant growth. The goal of this condition is to promote the natural succession of vegetation that is representative of the area. Acceptable indicators that this process is occurring would be a reasonable presence, density, and distribution of pioneer species of plants typical to the area. The goal is to achieve a 40% live plant cover of the reclaimed area within two complete growing seasons.

This certification expires five (5) years after the date the certification is signed. If your project is not completed by then and work under Corps of Engineers Permit will continue, you must submit an application for renewal of this certification no later than 30 days before the expiration date (18AAC15.100).

Date July 21, 2006

James Rypkema
Program Manager

STATE OF ALASKA

FRANK H. MURKOWSKI
GOVERNOR

DEPARTMENT OF NATURAL RESOURCES
OFFICE OF PROJECT MANAGEMENT AND PERMITTING
ALASKA COASTAL MANAGEMENT PROGRAM

SOUTHCENTRAL REGIONAL OFFICE
550 W. 7TH AVENUE, SUITE 1660
ANCHORAGE, ALASKA 99501
PH: (907) 269-7470 / FAX: (907) 269-3981

CENTRAL OFFICE
P.O. BOX 111030
JUNEAU, ALASKA 99811-1030
PH: (907) 465-3562 / FAX: (907) 465-3075

PIPELINE COORDINATOR'S OFFICE
411 WEST 4TH AVENUE, SUITE 2C
ANCHORAGE, ALASKA 99501-2343
PH: (907) 257-1351 / FAX: (907) 272-3829

www.alaskacoast.state.ak.us

July 7, 2006

Port of Anchorage
2000 Anchorage Port Road
Anchorage, AK 99501
Attn. Kevin Bruce

Subject: Port of Anchorage Expansion
State I.D. No. AK0601-11AA
Final Consistency Response

Dear Mr. Bruce:

The Office of Project Management & Permitting (OPMP) has completed coordinating the State's review of your proposed project for consistency with the Alaska Coastal Management Program (ACMP). OPMP has developed the attached final consistency response based on reviewers' comments.

Based on an evaluation of your project by the Alaska Departments of Fish and Game and Natural Resources and the Municipality of Anchorage Coastal District, OPMP *concurs* with your certification that the project is consistent with the ACMP and affected coastal district's enforceable policies. This concurrence is also based on your adoption of alternative measures to achieve consistency with the ACMP enforceable policies.

This is the *final consistency decision* for your project.

This consistency response is only for the project as described. If you propose any changes to the approved project, including its intended use, prior to or during its siting, construction, or operation, you must contact this office immediately to determine if further review and approval of the revised project is necessary.

By copy of this letter, I am informing the U.S. Army Corps of Engineers of OPMP's final

finding.

If you have any questions regarding this process, please contact me at 907-269-0029 or email jim_renkert@dnr.state.ak.us.

Sincerely,

Jim Renkert
Project Review Coordinator

Enclosures

cc: Bob Shavelson, Cook Inlet Keeper, Homer
William Ashton, DEC, Anchorage
Holly Kent, Anchorage Waterways Council, Anchorage
Mary Sims-Walter, DMLW, Anchorage
Kevin Johnson, ACMP Liaison, DNR/DOL, Anchorage
Linda Markham, ADOT/PF, Anchorage
Robin Willis, DFG, Anchorage
Margie Goatley, DNR/SHPO, Anchorage
Stewart Seaberg, DNR/OHMP Anchorage
Thede Tobish, Municipality of Anchorage
Mark Fink, DFG, Anchorage
Don Shiesl, Mat-Su Borough, DPW, Palmer
Gary Porter, Bald Mountain Exploring, Homer
Heather Dean, EPA, Anchorage
Jeanne Hanson, NMFS, Anchorage
Janet Herr, NMFS, Anchorage
Katie Gage, Lands Department, Cook Inlet Region, Incorporated, Anchorage
Ryan Winn, COE Regulatory Branch
Andrew McCarthy, National Park Service

ALASKA COASTAL MANAGEMENT PROGRAM
FINAL CONSISTENCY RESPONSE
CONCURRENCE

DATE ISSUED: JULY 7, 2006

PROJECT TITLE: PORT OF ANCHORAGE EXPANSION

STATE ID. NO.: AK 0601-11AA

AFFECTED COASTAL RESOURCE DISTRICT(S): MUNICIPALITY OF ANCHORAGE

PROJECT DESCRIPTION AND SCOPE OF THE PROJECT SUBJECT TO CONSISTENCY REVIEW:
The proposed project subject to this consistency review is Phase II of the proposed expansion of the Port of Anchorage. Phase II entails the following:

- The discharge of approximately 9.4 million cubic yards of fill material over 108 acres of intertidal and subtidal fill.
- The dredging of approximately 633,000 cubic yards of material over approximately 47 acres for the construction of the proposed 8,880 foot sheet pile dock.
- The removal of approximately 34.5 acres of wetlands for the development of the Cherry Hill and North End Borrow pits and their respective haul roads.

The Port of Anchorage (POA) and the U.S. Department of Transportation, Maritime Administration (MARAD), are proposing to expand, reorganize and improve the facilities at the Port of Anchorage. The proposed Marine Terminal Redevelopment (Port Expansion) Project involves the construction of a new 8,880 foot sheet pile constructed dock in the tidelands west, northwest and southwest of the existing dock. The new dock face will be located approximately 400 feet seaward and parallel to the face of the existing dock structure. The overall port expansion project involves a total discharge of fill material over approximately 135 acres of intertidal and subtidal waters of upper Cook Inlet along with construction and operational dredging within 235 acres. Phase I (for regulatory purposes) of the project was previously reviewed and permitted and encompasses 27 acres of the intertidal fill area on the north end of the Port.

The purpose of the Port Expansion Project is to replace functionally obsolete structures; increase POA capacity, efficiency, and security; and accommodate the needs of the U.S. military for rapid deployment. Please refer to the attached *Phase II Description for Port Expansion* Project for additional information.

OPMP is phasing this consistency review pursuant to AS 46.40.094 and CFR 930.36(d) because the applicant and the U.S. Army Corps of Engineers determined that the project requires a phased approach to permitting. The ACMP Final Consistency Response for Phase I was completed on June 17, 2005.

The applicant has agreed to incorporate the following alternative measures into the project proposal:

1. The project shall pay compensatory mitigation funding in an amount established by the US Army Corps of Engineers (USACE) using the Anchorage debit/credit methodology for the loss of 108 acres of inter-tidal and sub-tidal lands. Federal, State, and Municipal agencies that have specific projects or interests in mitigation funding due to the loss of these inter-tidal and sub-tidal lands shall consult with USACE over the use of these mitigation funds.

2. The POA and MARAD shall continue to evaluate the practicability of alternative build designs that may avoid or minimize changes to the tidal currents of Knik Arm or that will avoid or minimize potential impacts to the migration patterns of fishes migrating to and from upper Knik Arm and from upper Knik Arm.

3. The POA and MARAD shall include in their annual and final reclamation plans for the North End Borrow site measures to slope grades to feed surface water flows toward adjacent wetlands to the extent that US Air Force Elmendorf Air Force Base allows in accordance with an existing Bird Aircraft Strike Hazard (BASH) program.

4. The project shall pay mitigation funding in an amount established by the US Army Corps of Engineers (USACE) using the Anchorage debit/credit methodology for the loss of up to 20.5 acres of wetlands for the Cherry Hill and North End Runway Borrow sites to the extent that the wetlands are impacted. Federal, State, and Municipal agencies that have specific projects or interests in mitigation funding due to the loss of these wetlands shall consult with USACE over the use of these mitigation funds

CONSISTENCY STATEMENT: OPMP concurs with the consistency certification submitted by Port of Anchorage.

AUTHORIZATIONS: State agencies shall issue the following authorizations within five days after OPMP issues the final consistency determination that concurs with the applicant's consistency certification, unless the resource agency considers additional time to be necessary to fulfill its statutory or regulatory authority.

U.S. Army Corps of Engineers (COE)
Section 404 and 10 Permit No. POA-2003-502-N

Alaska Department of Environmental Conservation (DEC)
401 Certificate of Reasonable Assurance

The Department of Environmental Conservation (DEC) will review any activities subject to DEC permits, certifications, approvals, and authorizations for consistency with 11 AAC 112.310. The issuance of the permits, certifications, approvals, and authorizations by DEC establishes consistency with 11 AAC 112.310 for those specific activities.

Please note that, in addition to their consistency review, State agencies with permitting responsibilities will evaluate this proposed project according to their specific permitting authorities. Agencies will issue permits and authorizations only if they find the proposed project complies with their statutes and regulations in addition to being consistent with the coastal program. An agency permit or authorization may be denied even though the State concurs with the ACMP. Authorities outside the ACMP may result in additional permit/lease conditions. If a requirement set out in the project description (per 11 AAC 110.260) is more or less restrictive than a similar requirement in a resource agency authorization, the applicant shall comply with the more restrictive requirement. Applicants may not use any State land or water without Department of Natural Resources (DNR) authorization.

APPEAL: This final consistency response is a final administrative order and decision under the ACMP and for purposes of Alaska Appellate Rules 601-612. Any appeal from this decision to the superior court of Alaska must be made within thirty (30) days of the date this determination is issued.

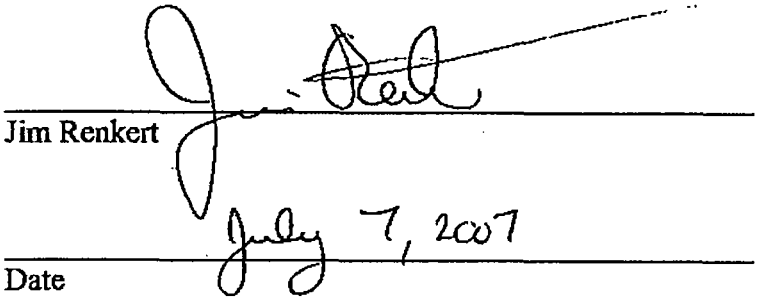
ENFORCEMENT: Pursuant to 11 AAC 110.260(e) and 110.445(e), if after receiving this final consistency response, the applicant fails to implement an adopted alternative measure, or if the applicant undertakes a project modification not incorporated into the final determination and not reviewed under 11 AAC 110.800-11 AAC 110.820, State resource agency may take enforcement action according to the resource agency's statutory and regulatory authorities, priorities, available resources, and preferred methods.

ADVISORIES:

Please be advised that although the OPMP concurs with your certification that the project is consistent with the ACMP, you are still required to meet all applicable State and federal laws and regulations. This consistency finding may include reference to specific laws and regulations, but this in no way precludes your responsibility to comply with other applicable laws and regulations.

If the proposed activities reveal cultural or paleontological resources, please stop any work that would disturb such resources and immediately contact the State Historic Preservation Office (907-269-8720) and the U.S. Army Corps of Engineers (907-753-2712) so that consultation per section 106 of the National Historic Preservation Act may proceed.

Final Consistency Response Prepared By:
Jim Renkert, Project Review Coordinator
550 W. 7th Ave., Suite 1660
Anchorage, AK 99501
(907)269-0029



Jim Renkert

July 7, 2007

Date

ACMP CONSISTENCY EVALUATION

Pursuant to the following evaluation, the project as proposed is consistent with applicable ACMP statewide and affected coastal resource district enforceable policies (copies of the policies are available on the ACMP web site at http://www.alaskacoast.state.ak.us).

STATEWIDE ENFORCEABLE POLICIES
11 AAC 112.200. Coastal development
a) In planning for and approving development in or adjacent to coastal waters, districts and state agencies shall manage coastal land and water uses in such a manner that those uses that are economically or physically dependent on a coastal location are given higher priority when compared to uses that do not economically or physically require a coastal location. (b) Districts and state agencies shall give, in the following order, priority to (1) water-dependent uses and activities; (2) water-related uses and activities; and (3) uses and activities that are neither water-dependent nor water-related for which there is no practicable inland alternative to meet the public need for the use or activity **Evaluation:** b) Development of the Port of Anchorage (POA) facilities is a water-dependant activity and as such is given first priority for coastal development. The coastal area involved in the POA expansion is designated as an Area Meriting Special Attention "AMSA" and the land is designated for primary use for port activities. c) OPMP defers to the United States COE to interpret compliance with the referenced standards.
11 AAC 112.210. Natural hazard areas
Evaluation: Applicant has previously consulted with and will adhere to the final seismic evaluation review provided by the Municipal Geotechnical Advisory Commission. Any design changes from the seismic review shall be incorporated into the final project description.
11 AAC 112.220. Coastal access
Evaluation: N/A
11 AAC 112.230. Energy facilities
Evaluation: N/A
11 AAC 112.240. Utility routes and facilities
Evaluation: N/A
11 AAC 112.250. Timber harvest and processing
Evaluation: N/A
11 AAC 112.260. Sand and gravel extraction
Evaluation: N/A
11 AAC 112.270. Subsistence

Evaluation: No comments were received from the district or state agencies indicating that the proposed project would affect designated subsistence areas.

11 AAC 112.280. Transportation routes and facilities

Evaluation: The proposed project involves the continued development of the POA which is the major transportation hub for the majority of goods and materials which are distributed throughout the state.

11 AAC 112.300. Habitats

The Habitat Standard requires that habitats in the coastal area be managed so as to avoid, minimize, or mitigate significant adverse impacts to habitat. In addition, estuaries, wetlands and tideflats must be managed to avoid, minimize, or mitigate significant adverse impacts to:

a) adequate water flow and natural water circulation patterns;
b) competing uses such as commercial, recreational, or subsistence fishing, to the extent that those uses are determined to be in competition with the proposed use;
c) water flow and natural drainage patterns;
d) competing uses such as commercial, recreational or subsistence uses, to the extent that those uses are determined to be in competition with the proposed use.

Evaluation: The applicant has agreed to adopt alternative measures provided by DNR/OHMP to address:

1) impacts to competing uses of the resource by recreational and commercial uses;
2) impacts to the natural tidal currents and circulation patterns in Knik Arm;
3) competing uses of the resource by recreational and commercial fishers;
4) impacts to the water flow and natural drainage patterns of wetlands within the Cherry Hill and North End Runway Borrow sites.

11 AAC 112.310. Air, land, and water quality.

Evaluation: Notwithstanding any other provision of this chapter, the statutes and regulations of the Department of Environmental Conservation with respect to the protection of air, land, and water quality identified in AS 46.40.040(b) are incorporated into the program and, as administered by that department, constitute the exclusive components of the program with respect to those purposes. (Eff. 7/1/2004, Register 170)

11 AAC 112.320. Historic, prehistoric, and archeological resources.

Evaluation: Comments from the district and the State did not identify the proposed project location as an area which is important to the study, understanding, or illustration of national, state, or local history or prehistory. The applicant has been advised to contact DNR/SHPO and the U.S. Army Corps of Engineers and the Alaska State Troopers should a site of cultural or historical significance be suspected or revealed and to stop any work that would disturb any resources.

AFFECTED COASTAL RESOURCE DISTRICT ENFORCEABLE POLICIES

Municipality of Anchorage Coastal Management Program,
Anchorage Wetlands Management Plan

I. This project lies within the Anchorage Coastal Management Plan *Preservation, Conservation and Utilization Environments* which include the following applicable Resource Policy Unit (RPU) Enforceable Polices:

a) *Preservation Environment:* Tidal Flats (Includes Tidal Creeks, Mudflats, and/or Estuarine Beaches), Coastal Bluffs/Cliffs, and Hazardous Lands.
b) *Conservation Environment*: Marginal Lands and River Floodplains.
c) *Utilization Environment*: Urban Waterfront.

The project is also within the Port of Anchorage Area Meriting Special Attention (AMSA)

These RPU's address the protection of basic intertidal functions with development to be limited to water-dependent/water-related port-type activities and on the use of safeguards that address seismic considerations. *[See especially Tidal Flats Policy and Urban Waterfront Policy]*. This proposed land use relates directly to existing marine and water-dependent activities at the Port.

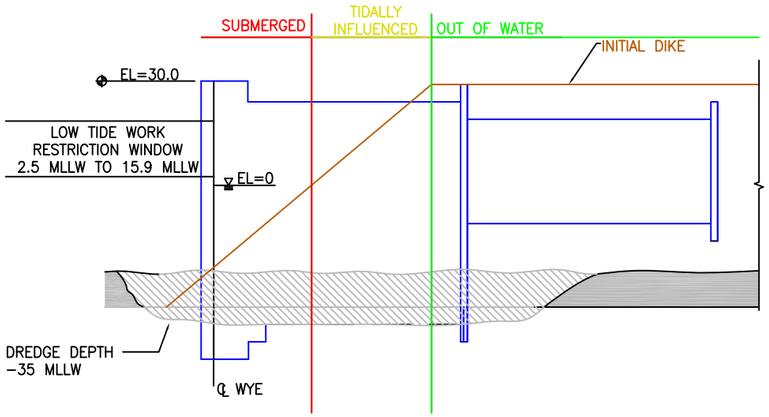
II. Relevant enforceable policies in the Anchorage Wetlands Management Plan that are applicable to the project include the following:

Best Management Practices

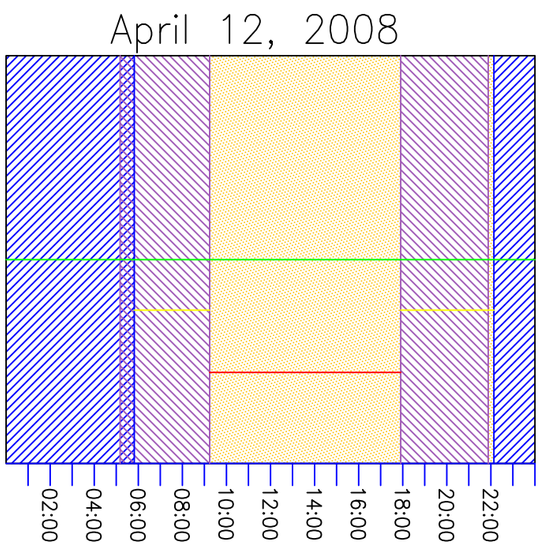
11. Required Plans
12. Drainage Impact Analysis
13. Site Drainage Plan
14. Water Quality Control Plan
16. Minimization and Habitat Avoidance
17. Additional Information

APPENDIX B

This page intentionally left blank.



TYPICAL SECTION D-D



Represents the low tide window for April 12, 2008

Civil Twilight window

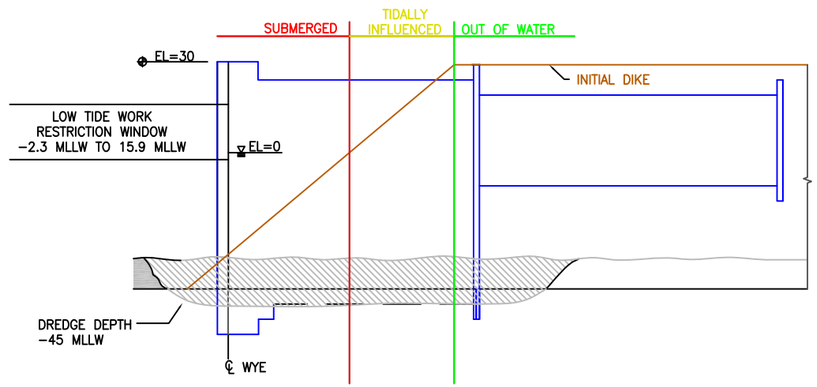
Low Tide window

Unrestricted Work window

Submerged Piledriving

Tidally Influenced Piledriving

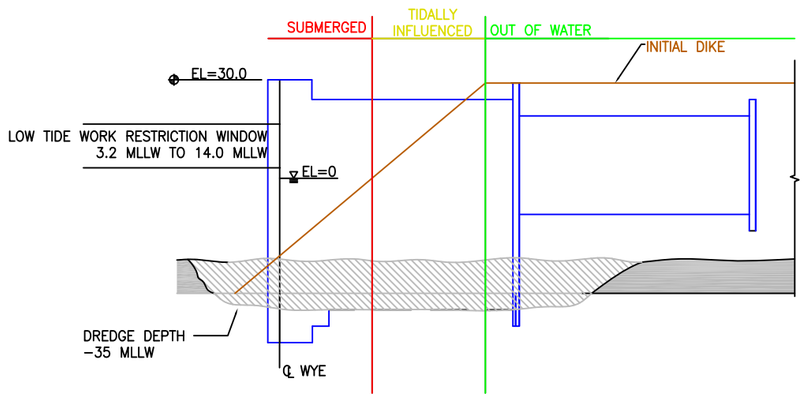
Out of Water Piledriving



TYPICAL SECTION E-E

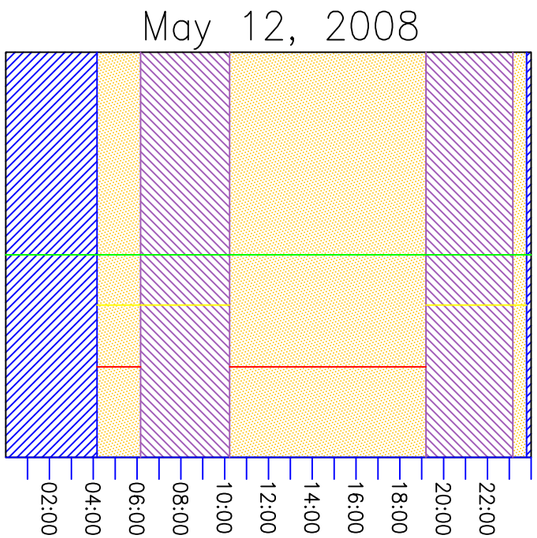
Represents the low tidal range for the entire month of April 2008

Date	Civil Twilight		2 Hours Before		Actual Low Tide		2 Hours After		2 Hours Before		Actual Low Tide		2 hours After		2 Hours Before		Actual Low Tide		2 Hours After		Unrestricted Work Window 1			Unrestricted Work Window 2			Unrestricted Work Window 3			Hourly Totals		
	Begin	End	Time	MLLW	Time	MLLW	Time	MLLW	Time	MLLW	Time	MLLW	Time	MLLW	Time	MLLW	Time	MLLW	Time	MLLW	Start	End	Hours	Start	End	Hours	Start	End	Hours	Daily	Monthly	Yearly
4/1/2008	6:34	21:31					0:25	10.9	8:55	13.3	10:55	8.5	12:55	14.5	21:23	9.2	23:23	3.7	1:23	10.6	6:34	8:55	2.4	12:55	21:23	8.5				10.8	10.8	10.8
4/2/2008	6:31	21:34					1:23	10.6	9:51	12.4	11:51	6.2	13:51	13.3	22:13	9.1					6:31	9:51	3.3	13:51	21:34	7.7				11.1	21.9	21.9
4/3/2008	6:28	21:37	22:13	9.1	0:13	2.6	2:13	10.7	10:40	11.2	12:40	4.0	14:40	12.4	22:58	9.1					6:28	10:40	4.2	14:40	21:37	7.0				11.2	33.1	33.1
4/4/2008	6:24	21:39	22:58	9.1	0:58	2.0	2:58	11.3	11:26	9.8	13:26	2.0	15:26	11.8	23:41	9.2					6:24	11:26	5.0	15:26	21:39	6.2				11.3	44.3	44.3
4/5/2008	6:21	21:42	23:41	9.2	1:41	1.9	3:41	12.4	12:10	8.4	14:10	0.3	16:10	11.4							6:21	12:10	5.8	16:10	21:42	5.6				11.4	55.7	55.7
4/6/2008	6:17	21:45	0:22	9.4	2:22	2.1	4:22	13.4	12:53	7.1	14:53	-1.0	16:53	10.9							6:17	12:53	6.6	16:53	21:45	4.9				11.5	67.2	67.2
4/7/2008	6:14	21:48	1:03	9.8	3:03	2.5	5:03	14.3	13:35	6.1	15:35	-2.0	17:35	10.2							6:14	13:35	7.4	17:35	21:48	4.2				11.6	78.7	78.7
4/8/2008	6:11	21:51	1:44	10.2	3:44	3.2	5:44	14.9	14:19	5.3	16:19	-2.3	18:19	9.8							6:11	14:19	8.1	18:19	21:51	3.6				11.7	90.4	90.4
4/9/2008	6:07	21:54	2:27	10.7	4:27	4.1	6:27	15.3	15:04	5.2	17:04	-1.9	19:04	9.4							6:27	15:04	8.6	19:04	21:54	2.9				11.5	101.9	101.9
4/10/2008	6:04	21:57	3:13	11.3	5:13	5.3	7:13	15.5	15:54	5.5	17:54	-0.7	19:54	9.5							7:13	15:54	8.7	19:54	21:57	2.1				10.8	112.6	112.6
4/11/2008	6:00	22:00	4:06	11.9	6:06	6.7	8:06	15.7	16:51	6.4	18:51	1.0	20:51	9.8							8:06	16:51	8.8	20:51	22:00	1.2				9.9	122.6	122.6
4/12/2008	5:57	22:03	5:09	12.6	7:09	8.1	9:09	15.9	17:57	7.7	19:57	2.5	21:57	10.2							9:09	17:57	8.8	21:57	22:03	0.0				8.8	131.4	131.4
4/13/2008	5:53	22:06	6:23	13.3	8:23	8.5	10:23	15.3	19:08	9.0	21:08	3.2	23:08	10.0							5:53	6:23	0.0	10:23	19:08	8.8				8.8	140.1	140.1
4/14/2008	5:50	22:09	7:39	13.5	9:39	7.6	11:39	13.7	20:16	9.8	22:16	3.0	0:16	9.5							5:50	7:39	1.8	11:39	20:16	8.6				10.4	150.6	150.6
4/15/2008	5:46	22:12					0:16	9.5	8:47	12.9	10:47	5.6	12:47	11.6	21:15	10.3	23:15	2.4	1:15	9.2	5:46	8:47	3.0	12:47	21:15	8.5				11.5	162.0	162.0
4/16/2008	5:43	22:15					1:15	9.2	9:46	11.8	11:46	3.4	13:46	10.1	22:07	10.5					5:43	9:46	4.1	13:46	22:07	8.4				12.4	174.4	174.4
4/17/2008	5:39	22:18	22:07	10.5	0:07	2.1	2:07	9.6	10:36	10.8	12:36	1.6	14:36	9.2	22:52	11.0					5:39	10:36	5.0	14:36	22:18	7.7				12.7	187.1	187.1
4/18/2008	5:36	22:21	22:52	11.0	0:52	2.4	2:52	10.5	11:22	9.9	13:22	0.5	15:22	9.2	23:34	11.5					5:36	11:22	5.8	15:22	22:21	7.0				12.8	199.9	199.9
4/19/2008	5:32	22:24	23:34	11.5	1:34	3.3	3:34	12.0	12:03	9.2	14:03	0.1	16:03	9.4							5:32	12:03	6.5	16:03	22:24	6.4				12.9	212.8	212.8
4/20/2008	5:29	22:27	0:12	12.0	2:12	4.4	4:12	13.6	12:41	8.6	14:41	0.1	16:41	9.9							5:29	12:41	7.2	16:41	22:27	5.8				13.0	225.7	225.7
4/21/2008	5:25	22:30	0:49	12.2	2:49	5.6	4:49	15.1	13:17	7.8	15:17	0.3	17:17	10.3							5:25	13:17	7.9	17:17	22:30	5.2				13.1	238.8	238.8
4/22/2008	5:22	22:33	1:23	12.3	3:23	6.5	5:23	16.0	13:52	6.9	15:52	0.6	17:52	10.6							5:23	13:52	8.5	17:52	22:33	4.7				13.2	252.0	252.0
4/23/2008	5:18	22:36	1:56	12.3	3:56	7.1	5:56	16.2	14:24	6.3	16:24	0.9	18:24	10.3							5:56	14:24	8.5	18:24	22:36	4.2				12.7	264.7	264.7
4/24/2008	5:15	22:40	2:29	12.3	4:29	7.5	6:29	15.9	14:57	5.9	16:57	1.4	18:57	9.8							6:29	14:57	8.5	18:57	22:40	3.7				12.2	276.9	276.9
4/25/2008	5:11	22:43	3:04	12.5	5:04	8.0	7:04	15.3	15:31	6.2	17:31	2.1	19:31	9.1							7:04	15:31	8.5	19:31	22:43	3.2				11.7	288.6	288.6
4/26/2008	5:07	22:46	3:44	12.8	5:44	8.6	7:44	14.7	16:13	6.8	18:13	3.1	20:13	9.0							7:44	16:13	8.5	20:13	22:46	2.6				11.1	299.6	299.6
4/27/2008	5:04	22:49	4:37	12.9	6:37	9.3	8:37	14.7	17:10	7.4	19:10	4.3	21:10	9.7							8:37	17:10	8.6	21:10	22:49	1.7				10.2	309.8	309.8
4/28/2008	5:00	22:53	5:48	12.7	7:48	9.8	9:48	15.1	18:23	7.9	20:23	5.2	22:23	11.0							5:00	5:48	0.0	9:48	18:23	8.6	22:23	22:53	0.0	8.6	318.4	318.4
4/29/2008	4:57	22:56	7:07	12.4	9:07	9.2	11:07	15.1	19:34	8.6	21:34	5.3	23:34	11.7							4:57	7:07	2.2	11:07	19:34	8.5				10.6	329.0	329.0
4/30/2008	4:53	22:59	8:16	11.9	10:16	7.5	12:16	13.9	20:36	9.2	22:36	4.8	0:36	12.0							4:53	8:16	3.4	12:16	20:36	8.3				11.7	340.8	340.8



TYPICAL SECTION D-D

Represents the low tide window for May 12, 2008



Civil Twilight window

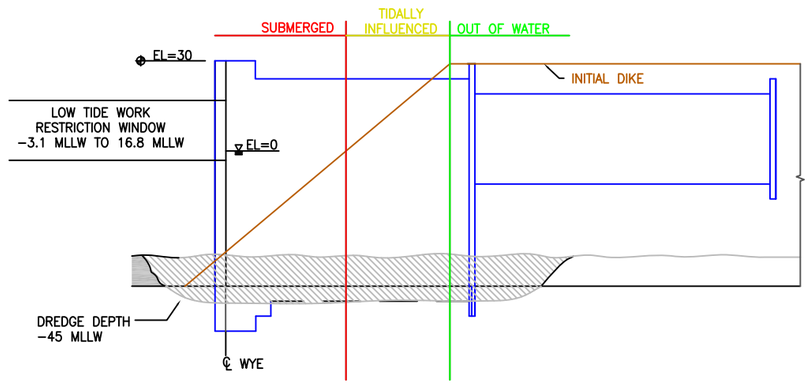
Low Tide window

Unrestricted Work window

Submerged Piledriving

Tidally Influenced Piledriving

Out of Water Piledriving

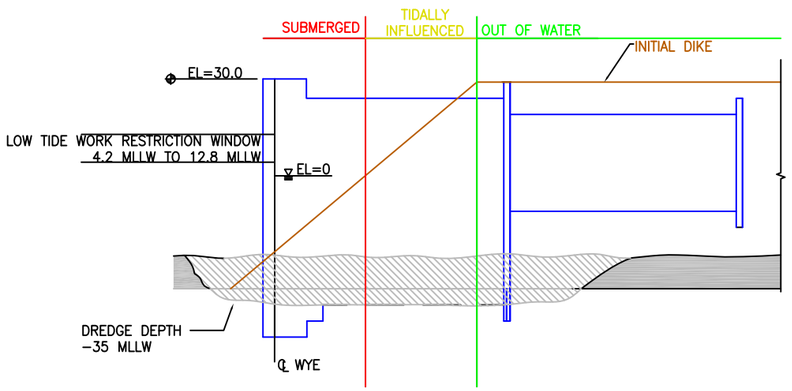


TYPICAL SECTION E-E

Represents the low tidal range for the entire month of May 2008

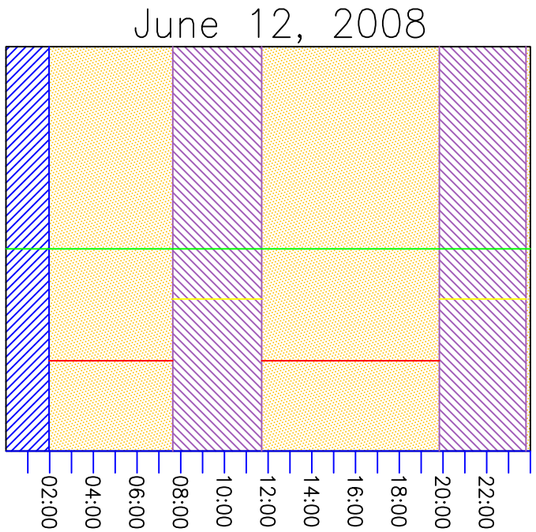
May 11 through May 17 reflect Ship Creek smolt release projections, during which time no piledriving may be performed.

Date	Civil Twilight		2 Hours Before		Actual Low Tide		2 Hours After		2 Hours Before		Actual Low Tide		2 hours After		2 Hours Before		Actual Low Tide		2 Hours After		Unrestricted Work Window 1			Unrestricted Work Window 2			Unrestricted Work Window 3			Hourly Totals		
	Begin	End	Time	MLLW	Time	MLLW	Time	MLLW	Time	MLLW	Time	MLLW	Time	MLLW	Time	MLLW	Time	MLLW	Time	MLLW	Start	End	Hours	Start	End	Hours	Start	End	Hours	Daily	Monthly	Yearly
5/1/2008	4:49	23:03					0:36	12.0	9:15	10.8	11:15	5.2	13:15	12.6	21:30	9.6	23:30	4.3	1:30	12.4	4:49	9:15	4.4	13:15	21:30	8.3				12.7	12.7	353.4
5/2/2008	4:46	23:06					1:30	12.4	10:08	9.5	12:08	2.8	14:08	11.5	22:20	10.0					4:46	10:08	5.4	14:08	22:20	8.2				13.6	26.3	379.7
5/3/2008	4:42	23:10	22:20	10.0	0:20	4.0	2:20	13.1	10:57	8.1	12:57	0.7	14:57	10.6	23:08	10.4					4:42	10:57	6.3	14:57	23:08	8.2				14.4	40.7	394.1
5/4/2008	4:39	23:13	23:08	10.4	1:08	4.0	3:08	14.1	11:44	6.8	13:44	-1.1	15:44	9.9	23:54	11.0					4:39	11:44	7.1	15:44	23:13	7.5				14.6	55.3	408.7
5/5/2008	4:35	23:16	23:54	11.0	1:54	4.2	3:54	15.0	12:31	5.8	14:31	-2.3	16:31	9.5							4:35	12:31	7.9	16:31	23:16	6.8				14.7	70.0	423.4
5/6/2008	4:31	23:20	0:41	11.4	2:41	4.5	4:41	15.8	13:17	5.2	15:17	-3.1	17:17	9.1							4:41	13:17	8.6	17:17	23:20	6.1				14.7	84.6	438.1
5/7/2008	4:28	23:24	1:28	11.8	3:28	4.8	5:28	16.3	14:03	5.0	16:03	-3.2	18:03	8.9							5:28	14:03	8.6	18:03	23:24	5.4				14.0	98.6	452.0
5/8/2008	4:24	23:27	2:15	12.0	4:15	5.1	6:15	16.3	14:50	5.2	16:50	-2.7	18:50	8.8							6:15	14:50	8.6	18:50	23:27	4.6				13.2	111.8	465.2
5/9/2008	4:20	23:31	3:04	12.2	5:04	5.5	7:04	16.0	15:40	5.6	17:40	-1.5	19:40	9.2							7:04	15:40	8.6	19:40	23:31	3.9				12.5	124.3	477.7
5/10/2008	4:16	23:34	3:57	12.3	5:57	6.1	7:57	15.6	16:33	6.6	18:33	0.2	20:33	9.6							7:57	16:33	8.6	20:33	23:34	3.0				11.6	135.9	489.3
5/11/2008	4:13	23:38	4:57	12.4	6:57	6.7	8:57	15.0	17:32	7.7	19:32	1.9	21:32	10.1							4:13	4:57	0.0	8:57	17:32	0.0	21:32	23:38	0.0	0.0	135.9	489.3
5/12/2008	4:09	23:42	6:03	12.5	8:03	6.8	10:03	13.9	18:35	9.0	20:35	3.3	22:35	10.5							4:09	6:03	0.0	10:03	18:35	0.0	22:35	23:42	0.0	0.0	135.9	489.3
5/13/2008	4:05	23:46	7:12	12.4	9:12	6.1	11:12	12.3	19:39	10.1	21:39	4.0	23:39	10.7							4:05	7:12	0.0	11:12	19:39	0.0	23:39	23:46	0.0	0.0	135.9	489.3
5/14/2008	4:01	23:49	8:18	11.7	10:18	4.5	12:18	10.5	20:38	11.0	22:38	4.3	0:38	10.9							4:01	8:18	0.0	12:18	20:38	0.0				0.0	135.9	489.3
5/15/2008	3:57	23:53					0:38	10.9	9:17	10.7	11:17	2.7	13:17	9.2	21:31	11.7	23:31	4.6	1:31	11.5	3:57	9:17	0.0	13:17	21:31	0.0				0.0	135.9	489.3
5/16/2008	3:54	23:57					1:31	11.5	10:08	9.7	12:08	1.2	14:08	8.3	22:19	12.3					3:54	10:08	0.0	14:08	22:19	0.0				0.0	135.9	489.3
5/17/2008	3:50	0:01	22:19	12.3	0:19	5.1	2:19	12.4	10:54	8.9	12:54	0.2	14:54	8.1	23:03	12.9					3:50	10:54	0.0	14:54	23:03	0.0				0.0	135.9	489.3
5/18/2008	3:46	0:05	23:03	12.9	1:03	5.8	3:03	13.6	11:37	8.3	13:37	-0.2	15:37	8.4	23:45	13.3					3:46	11:37	7.9	15:37	23:45	8.1				16.0	151.9	505.3
5/19/2008	3:42	0:09	23:45	13.3	1:45	6.7	3:45	14.8	12:17	7.7	14:17	-0.2	16:17	9.0							3:45	12:17	8.5	16:17	23:59	7.7				16.3	168.1	521.6
5/20/2008	3:38	0:13	0:25	13.5	2:25	7.3	4:25	15.9	12:55	7.2	14:55	0.0	16:55	9.6							4:25	12:55	8.5	16:55	23:59	7.1				15.6	183.7	537.2
5/21/2008	3:34	0:17	1:03	13.5	3:03	7.8	5:03	16.6	13:31	6.7	15:31	0.3	17:31	9.9							5:03	13:31	8.5	17:31	23:59	6.5				15.0	198.7	552.1
5/22/2008	3:30	0:22	1:40	13.3	3:40	7.9	5:40	16.8	14:06	6.2	16:06	0.5	18:06	10.1							5:40	14:06	8.4	18:06	23:59	5.9				14.3	213.0	566.4
5/23/2008	3:26	0:26	2:17	12.8	4:17	7.8	6:17	16.5	14:41	5.8	16:41	0.8	18:41	9.9							6:17	14:41	8.4	18:41	23:59	5.3				13.7	226.7	580.2
5/24/2008	3:22	0:30	2:54	12.5	4:54	7.6	6:54	15.8	15:15	5.9	17:15	1.2	19:15	9.4							6:54	15:15	8.4	19:15	23:59	4.8				13.1	239.8	593.3
5/25/2008	3:18	0:35	3:34	12.2	5:34	7.6	7:34	15.0	15:53	6.3	17:53	1.9	19:53	9.2							3:18	3:34	0.0	7:34	15:53	8.3	19:53	23:59	4.1	12.4	252.2	605.7
5/26/2008	3:13	0:39	4:20	11.9	6:20	7.7	8:20	14.3	16:36	7.0	18:36	2.9	20:36	9.1							3:13	4:20	1.1	8:20	16:36	8.3	20:36	23:59	3.4	12.8	265.0	618.5
5/27/2008	3:09	0:44	5:18	11.4	7:18	7.8	9:18	14.1	17:32	7.7	19:32	4.1	21:32	10.1							3:09	5:18	2.2	9:18	17:32	8.2	21:32	23:59	2.5	12.9	277.9	631.3
5/28/2008	3:05	0:48	6:26	10.8	8:26	7.4	10:26	13.8	18:38	8.4	20:38	5.1	22:38	11.5							3:05	6:26	3.4	10:26	18:38	8.2	22:38	23:59	1.4	12.9	290.8	644.2
5/29/2008	3:00	0:53	7:35	10.1	9:35	6.1	11:35	13.0	19:46	9.2	21:46	5.7	23:46	12.9							3:00	7:35	4.6	11:35	19:46	8.2	23:46	23:59	0.0	12.8	303.6	657.0
5/30/2008	2:55	0:58	8:39	9.1	10:39	4.1	12:39	11.7	20:48	10.1	22:48	5.9	0:48	13.9							2:55	8:39	5.7	12:39	20:48	8.2				13.9	317.4	670.9
5/31/2008	2:50	1:03					0:48	13.9	9:36	8.0	11:36	1.8	13:36	10.4	21:45	11.0	23:45	6.0	1:45	14.7	2:50	9:36	6.8	13:36	21:45	8.2				14.9	332.4	685.8



TYPICAL SECTION D-D

Represents the low tide window for June 12, 2008



Civil Twilight window

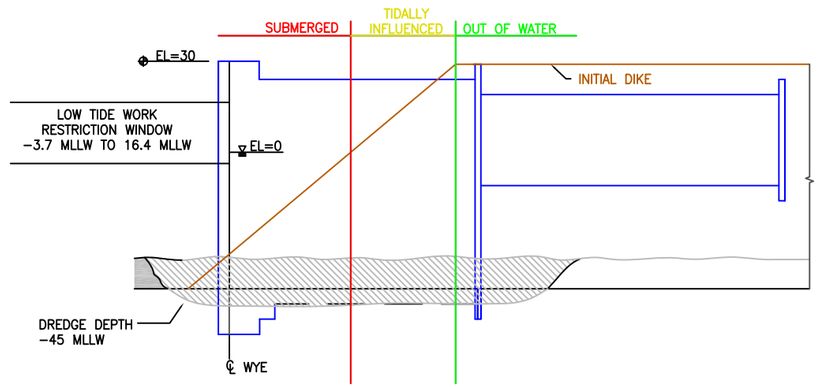
Low Tide window

Unrestricted Work window

Submerged Piledriving

Tidally Influenced Piledriving

Out of Water Piledriving

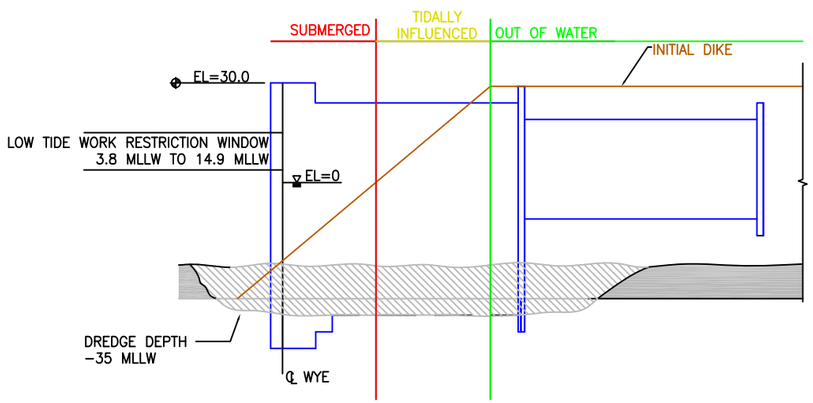


TYPICAL SECTION E-E

Represents the low tidal range for the entire month of June 2008

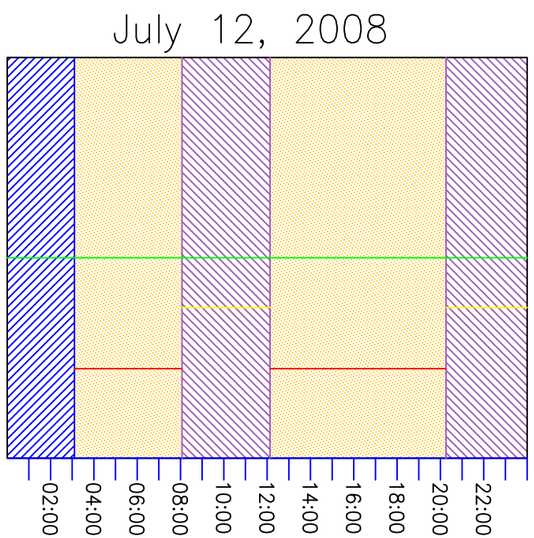
June 22 through June 28 reflect Ship Creek smolt release projections, during which time no piledriving may be performed.

Date	Civil Twilight		2 Hours Before		Actual Low Tide		2 Hours After		2 Hours Before		Actual Low Tide		2 hours After		2 Hours Before		Actual Low Tide		2 Hours After		Unrestricted Work Window 1			Unrestricted Work Window 2			Unrestricted Work Window 3			Hourly Totals		
	Begin	End	Time	MLLW	Time	MLLW	Time	MLLW	Time	MLLW	Time	MLLW	Time	MLLW	Time	MLLW	Time	MLLW	Time	MLLW	Start	End	Hours	Start	End	Hours	Start	End	Hours	Daily	Monthly	Yearly
6/1/2008	2:45	1:09					1:45	14.7	10:30	6.8	12:30	-0.2	14:30	9.3	22:39	11.7					2:45	10:30	7.8	14:30	22:39	8.2				15.9	15.9	701.7
6/2/2008	2:40	1:15	22:39	11.7	0:39	6.0	2:39	15.4	11:22	5.8	13:22	-1.9	15:22	8.7	23:32	12.2					2:40	11:22	8.7	15:22	23:32	8.2				16.9	32.8	718.6
6/3/2008	2:34	1:21	23:32	12.2	1:32	5.9	3:32	16.0	12:12	5.3	14:12	-3.0	16:12	8.3							3:32	12:12	8.7	16:12	23:59	7.8				16.5	49.2	735.0
6/4/2008	2:27	1:28	0:24	12.5	2:24	5.6	4:24	16.4	13:01	5.1	15:01	-3.6	17:01	8.2							4:24	13:01	8.6	17:01	23:59	7.0				15.6	64.8	750.6
6/5/2008	2:18	1:37	1:14	12.7	3:14	5.2	5:14	16.3	13:48	5.2	15:48	-3.7	17:48	8.2							5:14	13:48	8.6	17:48	23:59	6.2				14.8	79.6	765.4
6/6/2008	2:01	1:54	2:04	12.5	4:04	4.8	6:04	16.0	14:36	5.5	16:35	-3.1	18:35	8.5							2:01	2:04	0.0	6:04	14:36	8.5	18:35	23:59	5.4	13.9	93.5	779.3
6/7/2008	1:58	1:58	2:52	12.3	4:52	4.6	6:52	15.2	15:22	6.0	17:22	-2.0	19:22	9.0							1:58	2:52	0.0	6:52	15:22	8.5	19:22	23:59	4.6	13.1	106.7	792.5
6/8/2008	1:58	1:58	3:43	11.9	5:43	4.6	7:43	14.5	16:10	6.7	18:10	-0.4	20:10	9.6							1:58	3:43	1.8	7:43	16:10	8.5	20:10	23:59	3.8	14.0	120.7	806.5
6/9/2008	1:58	1:58	4:36	11.6	6:36	4.9	8:36	13.6	17:00	7.7	19:00	1.6	21:00	10.4							1:58	4:36	2.6	8:36	17:00	8.4	21:00	23:59	3.0	14.0	134.7	820.5
6/10/2008	1:59	1:59	5:35	11.3	7:35	5.1	9:35	12.8	17:54	9.0	19:54	3.7	21:54	11.2							1:59	5:35	3.6	9:35	17:54	8.3	21:54	23:59	2.1	14.0	148.8	834.6
6/11/2008	1:59	1:59	6:38	11.0	8:38	5.0	10:38	11.6	18:53	10.3	20:53	5.3	22:53	12.1							1:59	6:38	4.7	10:38	18:53	8.3	22:53	23:59	1.1	14.0	162.8	848.6
6/12/2008	1:59	1:59	7:42	10.5	9:42	4.2	11:42	10.2	19:53	11.6	21:53	6.5	23:53	12.8							1:59	7:42	5.7	11:42	19:53	8.2	23:53	23:59	0.0	13.9	176.7	862.5
6/13/2008	1:59	1:59	8:42	9.8	10:42	2.9	12:42	9.0	20:51	12.6	22:51	7.1	0:51	13.3							1:59	8:42	6.7	12:42	20:51	8.2				14.9	191.6	877.3
6/14/2008	1:59	1:59					0:51	13.3	9:37	8.9	11:37	1.6	13:37	8.1	21:44	13.3	23:44	7.5	1:44	13.9	1:59	9:37	7.6	13:37	21:44	8.1				15.8	207.3	893.1
6/15/2008	2:00	2:00					1:44	13.9	10:26	8.2	12:26	0.6	14:26	7.8	22:34	13.8					2:00	10:26	8.4	14:26	22:34	8.1				15.6	223.9	909.7
6/16/2008	2:00	2:00	22:34	13.8	0:34	7.7	2:34	14.5	11:11	7.8	13:11	0.0	15:11	7.8	23:20	14.1					2:34	11:11	8.6	15:11	23:20	8.2				16.8	240.6	926.4
6/17/2008	2:00	2:00	23:20	14.1	1:20	7.9	3:20	15.1	11:53	7.5	13:53	-0.3	15:53	8.2							3:20	11:53	8.6	15:53	23:59	8.1				16.7	257.3	943.1
6/18/2008	2:00	2:00	0:04	14.1	2:04	7.9	4:04	15.7	12:34	7.1	14:34	-0.3	16:34	8.8							4:04	12:34	8.5	16:34	23:59	7.4				15.9	273.2	959.0
6/19/2008	2:01	2:01	0:46	13.9	2:46	7.7	4:46	16.2	13:12	6.8	15:12	-0.2	17:12	9.3							4:46	13:12	8.4	17:12	23:59	6.8				15.2	288.5	974.3
6/20/2008	2:01	2:01	1:25	13.4	3:25	7.3	5:25	16.2	13:49	6.4	15:49	-0.1	17:49	9.8							5:25	13:49	8.4	17:49	23:59	6.2				14.6	303.0	988.8
6/21/2008	2:01	2:01	2:03	12.8	4:03	6.8	6:03	16.0	14:23	6.0	16:23	0.1	18:23	9.9							2:01	2:03	0.0	6:03	14:23	8.3	18:23	23:59	5.6	14.0	317.0	1002.8
6/22/2008	2:01	2:01	2:41	11.9	4:41	6.3	6:41	15.5	14:57	5.8	16:57	0.4	18:57	9.8							2:01	2:41	0.0	6:41	14:57	8.0	18:57	23:59	0.0	0.0	317.0	1002.8
6/23/2008	2:01	2:01	3:19	11.2	5:19	5.9	7:19	14.6	15:30	6.1	17:30	0.9	19:30	9.4							2:01	3:19	0.0	7:19	15:30	8.0	19:30	23:59	0.0	0.0	317.0	1002.8
6/24/2008	2:02	2:02	4:00	10.5	6:00	5.7	8:00	13.6	16:06	6.9	18:06	1.9	20:06	9.2							2:02	4:00	0.0	8:00	16:06	8.0	20:06	23:59	0.0	0.0	317.0	1002.8
6/25/2008	2:02	2:02	4:48	9.9	6:48	5.6	8:48	12.7	16:50	7.9	18:50	3.4	20:50	9.8							2:02	4:48	0.0	8:48	16:50	8.0	20:50	23:59	0.0	0.0	317.0	1002.8
6/26/2008	2:02	2:02	5:47	9.2	7:47	5.4	9:47	12.2	17:46	9.0	19:46	5.2	21:46	11.1							2:02	5:47	0.0	9:47	17:46	8.0	21:46	23:59	0.0	0.0	317.0	1002.8
6/27/2008	2:02	2:02	6:56	8.4	8:56	4.7	10:56	11.7	18:57	9.9	20:57	6.7	22:57	13.2							2:02	6:56	0.0	10:56	18:57	8.0	22:57	23:59	0.0	0.0	317.0	1002.8
6/28/2008	2:02	2:02	8:05	7.8	10:05	3.3	12:05	10.8	20:10	11.0	22:10	7.6	0:10	14.9							2:02	8:05	0.0	12:05	20:10	8.0				0.0	317.0	1002.8
6/29/2008	2:03	2:03					0:10	14.9	9:09	7.1	11:09	1.4	13:09	9.6	21:18	12.0	23:18	7.6	1:18	15.8	2:03	9:09	7.1	13:09	21:18	8.2				15.3	332.3	1018.1
6/30/2008	2:03	2:03					1:18	15.8	10:08	6.4	12:08	-0.5	14:08	8.5	22:19	12.7					2:03	10:08	8.1	14:08	22:19	8.2				16.3	348.6	1034.3



TYPICAL SECTION D-D

Represents the low tide window for July 12, 2008



Civil Twilight window

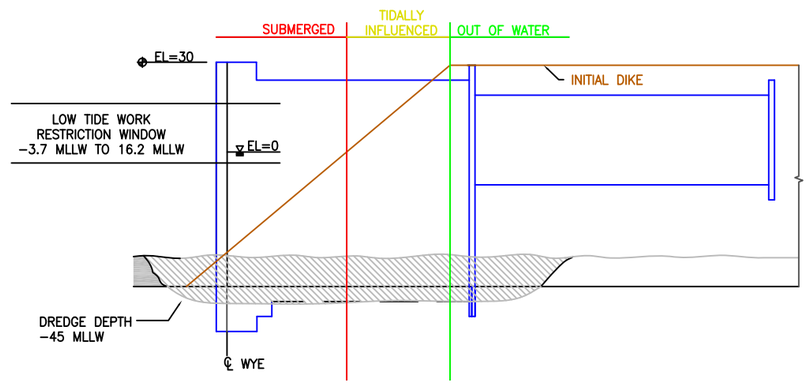
Low Tide window

Unrestricted Work window

Submerged Piledriving

Tidally Influenced Piledriving

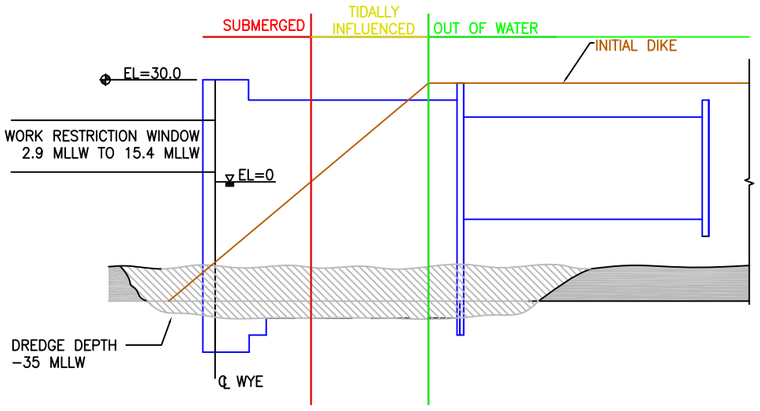
Out of Water Piledriving



TYPICAL SECTION E-E

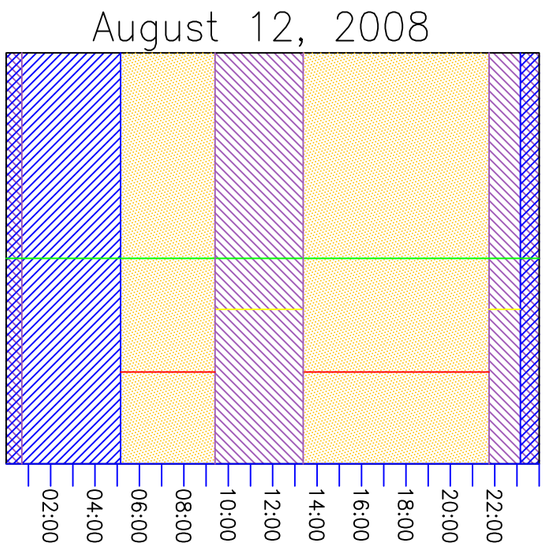
Represents the low tidal range for the entire month of July 2008

Date	Civil Twilight		2 Hours Before		Actual Low Tide		2 Hours After		2 Hours Before		Actual Low Tide		2 hours After		2 Hours Before		Actual Low Tide		2 Hours After		Unrestricted Work Window 1			Unrestricted Work Window 2			Unrestricted Work Window 3			Hourly Totals		
	Begin	End	Time	MLLW	Time	MLLW	Time	MLLW	Time	MLLW	Time	MLLW	Time	MLLW	Time	MLLW	Time	MLLW	Time	MLLW	Start	End	Hours	Start	End	Hours	Start	End	Hours	Daily	Monthly	Yearly
7/1/2008	2:03	2:03	22:19	12.7	0:19	7.2	2:19	16.0	11:03	5.9	13:03	-2.1	15:03	7.8	23:16	13.0					2:19	11:03	8.7	15:03	23:16	8.2				17.0	17.0	1051.3
7/2/2008	2:03	2:03	23:16	13.0	1:16	6.4	3:16	16.0	11:55	5.7	13:55	-3.1	15:55	7.5							3:16	11:55	8.7	15:55	23:59	8.1				16.7	33.7	1068.0
7/3/2008	2:03	2:03	0:10	13.0	2:10	5.4	4:10	15.7	12:45	5.6	14:45	-3.7	16:45	7.7							4:10	12:45	8.6	16:45	23:59	7.3				15.8	49.5	1083.9
7/4/2008	2:04	2:04	1:00	12.8	3:00	4.5	5:00	15.2	13:31	5.9	15:31	-3.6	17:31	8.0							5:00	13:31	8.5	17:31	23:59	6.5				15.0	64.5	1098.9
7/5/2008	2:22	1:45	1:49	12.2	3:49	3.7	5:49	14.7	14:16	6.2	16:16	-3.0	18:16	8.6							5:49	14:16	8.5	18:16	23:59	5.7				14.2	78.7	1113.0
7/6/2008	2:32	1:36	2:36	11.6	4:36	3.2	6:36	14.0	14:58	6.7	16:58	-1.8	18:58	9.3							2:32	2:36	0.0	6:36	14:58	8.4	18:58	23:59	5.0	13.4	92.1	1126.4
7/7/2008	2:39	1:29	3:22	11.0	5:22	3.1	7:22	13.3	15:40	7.3	17:40	0.0	19:40	10.3							2:39	3:22	0.0	7:22	15:40	8.3	19:40	23:59	4.3	12.6	104.7	1139.1
7/8/2008	2:46	1:23	4:09	10.4	6:09	3.4	8:09	12.6	16:23	8.1	18:23	2.2	20:23	11.3							2:46	4:09	1.4	8:09	16:23	8.2	20:23	23:59	3.6	13.2	118.0	1152.3
7/9/2008	2:51	1:17	5:00	10.0	7:00	3.9	9:00	12.0	17:09	9.2	19:09	4.6	21:09	12.4							2:51	5:00	2.2	9:00	17:09	8.2	21:09	23:59	2.9	13.2	131.1	1165.4
7/10/2008	2:57	1:12	5:57	9.6	7:57	4.4	9:57	11.4	18:02	10.6	20:02	6.8	22:02	13.5							2:57	5:57	3.0	9:57	18:02	8.1	22:02	23:59	2.0	13.1	144.2	1178.5
7/11/2008	3:02	1:07	6:59	9.5	8:59	4.4	10:59	10.6	19:04	12.0	21:04	8.6	23:04	14.5							3:02	6:59	4.0	10:59	19:04	8.1	23:04	23:59	0.0	12.0	156.2	1190.5
7/12/2008	3:07	1:02	8:02	9.2	10:02	3.8	12:02	9.6	20:09	13.2	22:09	9.3	0:09	14.9							3:07	8:02	4.9	12:02	20:09	8.1				13.0	169.2	1203.6
7/13/2008	3:12	0:58					0:09	14.9	9:02	8.8	11:02	2.7	13:02	8.6	21:11	14.0	23:11	9.3	1:11	14.9	3:12	9:02	5.8	13:02	21:11	8.2				14.0	183.2	1217.5
7/14/2008	3:17	0:53					1:11	14.9	9:56	8.3	11:56	1.5	13:56	7.9	22:07	14.2					3:17	9:56	6.7	13:56	22:07	8.2				14.8	198.0	1232.4
7/15/2008	3:21	0:49	22:07	14.2	0:07	8.7	2:07	14.7	10:45	7.8	12:45	0.6	14:45	7.7	22:57	14.2					3:21	10:45	7.4	14:45	22:57	8.2				15.6	213.6	1248.0
7/16/2008	3:26	0:45	22:57	14.2	0:57	8.0	2:57	14.6	11:30	7.5	13:30	-0.1	15:30	7.9	23:43	14.0					3:26	11:30	8.1	15:30	23:43	8.2				16.3	229.9	1264.3
7/17/2008	3:30	0:40	23:43	14.0	1:43	7.3	3:43	14.7	12:12	7.3	14:12	-0.4	16:12	8.4							3:43	12:12	8.5	16:12	23:59	7.8				16.3	246.2	1280.5
7/18/2008	3:34	0:36	0:26	13.5	2:26	6.5	4:26	14.9	12:51	7.1	14:51	-0.5	16:51	9.1							4:26	12:51	8.4	16:51	23:59	7.2				15.6	261.8	1296.1
7/19/2008	3:39	0:32	1:07	12.8	3:07	5.8	5:07	15.1	13:27	6.8	15:27	-0.4	17:27	9.8							5:07	13:27	8.3	17:27	23:59	6.6				14.9	276.7	1311.0
7/20/2008	3:43	0:28	1:45	12.0	3:45	5.1	5:45	15.0	14:01	6.5	16:01	-0.3	18:01	10.3							5:45	14:01	8.3	18:01	23:59	6.0				14.3	290.9	1325.2
7/21/2008	3:47	0:24	2:22	10.9	4:22	4.4	6:22	14.5	14:34	6.3	16:34	0.1	18:34	10.5							6:22	14:34	8.2	18:34	23:59	5.4				13.6	304.5	1338.9
7/22/2008	3:51	0:20	2:59	9.8	4:59	3.9	6:59	13.7	15:05	6.7	17:05	0.8	19:05	10.3							6:59	15:05	8.1	19:05	23:59	4.9				13.0	317.6	1351.9
7/23/2008	3:55	0:16	3:37	9.0	5:37	3.5	7:37	12.5	15:38	7.5	17:38	2.0	19:38	10.1							7:37	15:38	8.0	19:38	23:59	4.4				12.4	329.9	1364.3
7/24/2008	3:59	0:12	4:20	8.3	6:20	3.5	8:20	11.4	16:17	8.8	18:17	3.8	20:17	10.5							3:59	4:20	0.0	8:20	16:17	8.0	20:17	23:59	3.7	11.7	341.6	1376.0
7/25/2008	4:03	0:09	5:14	7.8	7:14	3.7	9:14	10.8	17:07	10.2	19:07	5.9	21:07	11.6							4:03	5:14	1.2	9:14	17:07	7.9	21:07	23:59	2.9	11.9	353.6	1387.9
7/26/2008	4:06	0:05	6:23	7.3	8:23	3.8	10:23	10.8	18:21	11.1	20:21	8.0	22:21	14.0							4:06	6:23	2.3	10:23	18:21	8.0	22:21	23:59	1.7	11.9	365.5	1399.8
7/27/2008	4:10	0:01	7:38	7.3	9:38	3.1	11:38	10.4	19:46	12.2	21:46	9.0	23:46	16.0							4:10	7:38	3.5	11:38	19:46	8.1	23:46	23:59	0.0	11.6	377.1	1411.4
7/28/2008	4:14	23:57	8:48	7.3	10:48	1.6	12:48	9.3	21:00	13.2	23:00	8.6	1:00	16.2							4:14	8:48	4.6	12:48	21:00	8.2				12.8	389.8	1424.2
7/29/2008	4:18	23:53					1:00	16.2	9:51	7.0	11:51	-0.2	13:51	8.2	22:05	13.5					4:18	9:51	5.6	13:51	22:05	8.2				13.8	403.6	1437.9
7/30/2008	4:21	23:50	22:05	13.5	0:05	7.3	2:05	15.5	10:47	6.7	12:47	-1.8	14:47	7.5	23:03	13.2					4:21	10:47	6.4	14:47	23:03	8.3				14.7	418.3	1452.6
7/31/2008	4:25	23:46	23:03	13.2	1:03	5.7	3:03	14.7	11:39	6.6	13:39	-2.8	15:39	7.4	23:56	12.7					4:25	11:39	7.2	15:39	23:46	8.1				15.4	433.7	1468.0



TYPICAL SECTION D-D

Represents the low tide window for August 12, 2008



Civil Twilight window

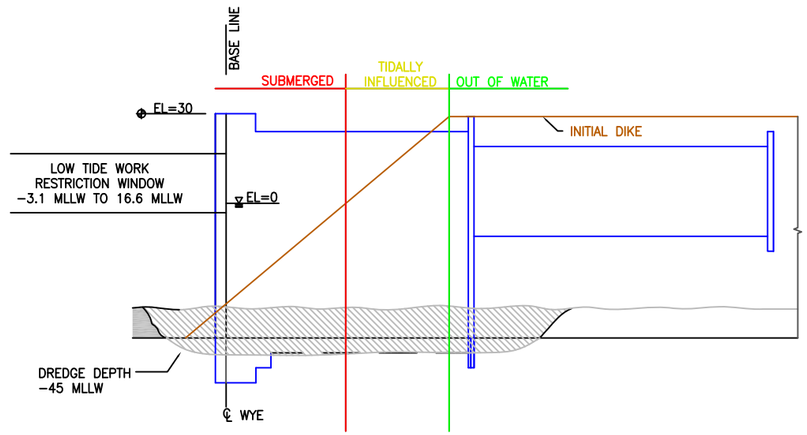
Low Tide window

Unrestricted Work window

Submerged Piledriving

Tidally Influenced Piledriving

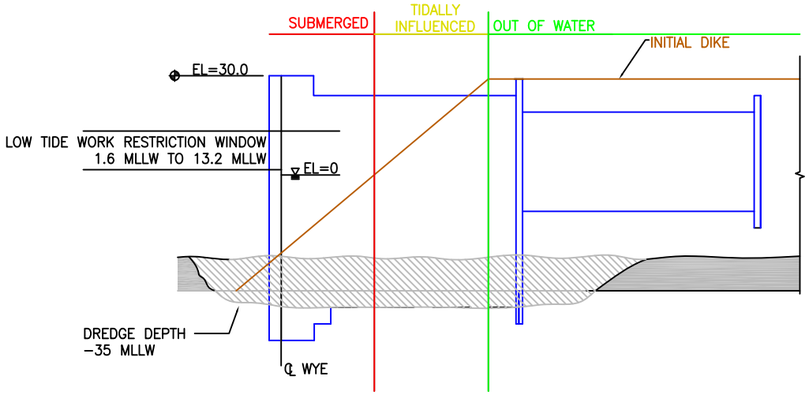
Out of Water Piledriving



TYPICAL SECTION E-E

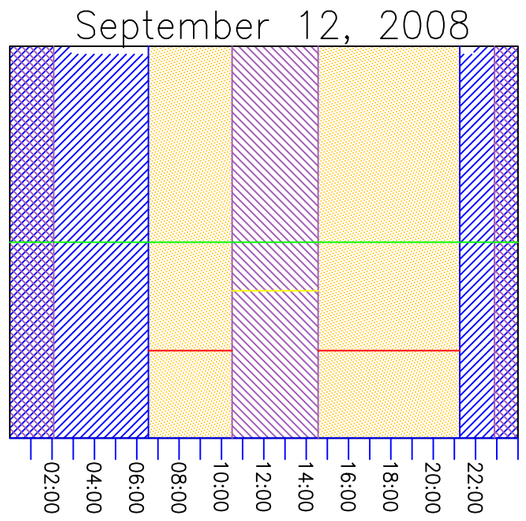
Represents the low tidal range for the entire month of August 2008

Date	Civil Twilight		2 Hours Before		Actual Low Tide		2 Hours After		2 Hours Before		Actual Low Tide		2 hours After		2 Hours Before		Actual Low Tide		2 Hours After		Unrestricted Work Window 1			Unrestricted Work Window 2			Unrestricted Work Window 3			Hourly Totals		
	Begin	End	Time	MLLW	Time	MLLW	Time	MLLW	Time	MLLW	Time	MLLW	Time	MLLW	Time	MLLW	Time	MLLW	Time	MLLW	Start	End	Hours	Start	End	Hours	Start	End	Hours	Daily	Monthly	Yearly
8/1/2008	4:29	23:42	23:56	12.7	1:56	4.2	3:56	14.1	12:26	6.8	14:26	-3.1	16:26	7.7							4:29	12:26	8.0	16:26	23:42	7.3				15.2	15.2	1483.2
8/2/2008	4:32	23:38	0:45	12.1	2:45	3.0	4:45	13.6	13:11	7.0	15:11	-2.8	17:11	8.6							4:45	13:11	8.4	17:11	23:38	6.5				14.9	30.1	1498.1
8/3/2008	4:36	23:35	1:31	11.4	3:31	2.2	5:31	13.2	13:52	7.4	15:52	-1.8	17:52	9.7							5:31	13:52	8.4	17:52	23:35	5.7				14.1	44.2	1512.2
8/4/2008	4:39	23:31	2:15	10.7	4:15	1.8	6:15	12.9	14:31	7.8	16:31	-0.4	18:31	10.9							6:15	14:31	8.3	18:31	23:31	5.0				13.3	57.5	1525.5
8/5/2008	4:43	23:27	2:57	9.9	4:57	1.9	6:57	12.5	15:08	8.3	17:08	1.5	19:08	12.0							6:57	15:08	8.2	19:08	23:27	4.3				12.5	70.0	1538.0
8/6/2008	4:46	23:24	3:38	9.2	5:38	2.4	7:38	12.1	15:44	9.1	17:44	3.6	19:44	12.8							7:38	15:44	8.1	19:44	23:24	3.7				11.8	81.8	1549.8
8/7/2008	4:50	23:20	4:21	8.8	6:21	3.2	8:21	11.6	16:21	10.1	18:21	5.9	20:21	13.4							8:21	16:21	8.0	20:21	23:20	3.0				11.0	92.8	1560.8
8/8/2008	4:53	23:16	5:10	8.5	7:10	4.2	9:10	11.3	17:06	11.4	19:06	8.2	21:06	14.2							4:53	5:10	0.0	9:10	17:06	7.9	21:06	23:16	2.2	10.1	102.9	1570.9
8/9/2008	4:56	23:13	6:09	8.6	8:09	4.9	10:09	11.1	18:10	12.5	20:10	10.1	22:10	15.4							4:56	6:09	1.2	10:09	18:10	8.0	22:10	23:13	1.1	10.3	113.2	1581.2
8/10/2008	5:00	23:09	7:17	8.8	9:17	5.0	11:17	10.6	19:27	13.7	21:27	10.9	23:27	16.0							5:00	7:17	2.3	11:17	19:27	8.2				10.5	123.7	1591.7
8/11/2008	5:03	23:05	8:24	9.0	10:24	4.2	12:24	9.6	20:38	14.4	22:38	10.4	0:38	15.4							5:03	8:24	3.4	12:24	20:38	8.2				11.6	135.2	1603.3
8/12/2008	5:06	23:02					0:38	15.4	9:24	8.8	11:24	2.9	13:24	8.7	21:40	14.3	23:40	9.0	1:40	14.5	5:06	9:24	4.3	13:24	21:40	8.3				12.6	147.8	1615.8
8/13/2008	5:09	22:58					1:40	14.5	10:17	8.4	12:17	1.5	14:17	8.2	22:33	13.8					5:09	10:17	5.1	14:17	22:33	8.3				13.4	161.2	1629.2
8/14/2008	5:13	22:55	22:33	13.8	0:33	7.5	2:33	13.9	11:03	8.1	13:03	0.5	15:03	8.2	23:20	13.2					5:13	11:03	5.8	15:03	22:55	7.9				13.7	174.9	1642.9
8/15/2008	5:16	22:51	23:20	13.2	1:20	6.1	3:20	13.6	11:45	7.9	13:45	-0.1	15:45	8.7							5:16	11:45	6.5	15:45	22:51	7.1				13.6	188.5	1656.5
8/16/2008	5:19	22:47	0:03	12.5	2:03	5.0	4:03	13.7	12:24	7.7	14:24	-0.2	16:24	9.6							5:19	12:24	7.1	16:24	22:47	6.4				13.5	202.0	1670.0
8/17/2008	5:22	22:44	0:43	11.7	2:43	4.0	4:43	13.7	13:01	7.5	15:01	-0.1	17:01	10.6							5:22	13:01	7.7	17:01	22:44	5.7				13.4	215.4	1683.4
8/18/2008	5:25	22:40	1:22	10.7	3:22	3.2	5:22	13.8	13:35	7.4	15:35	0.3	17:35	11.4							5:25	13:35	8.2	17:35	22:40	5.1				13.3	228.7	1696.7
8/19/2008	5:28	22:37	1:59	9.5	3:59	2.4	5:59	13.3	14:08	7.5	16:08	0.9	18:08	11.9							5:59	14:08	8.2	18:08	22:37	4.5				12.7	241.3	1709.3
8/20/2008	5:31	22:33	2:36	8.4	4:36	1.8	6:36	12.5	14:40	8.0	16:40	1.9	18:40	12.0							6:36	14:40	8.1	18:40	22:33	3.9				12.0	253.3	1721.3
8/21/2008	5:34	22:30	3:14	7.4	5:14	1.6	7:14	11.4	15:14	8.9	17:14	3.2	19:14	12.0							7:14	15:14	8.0	19:14	22:30	3.3				11.3	264.6	1732.6
8/22/2008	5:37	22:26	3:56	7.0	5:56	1.8	7:56	10.4	15:54	10.1	17:54	5.1	19:54	12.4							7:56	15:54	8.0	19:54	22:26	2.6				10.5	275.1	1743.1
8/23/2008	5:40	22:23	4:49	6.8	6:49	2.6	8:49	10.1	16:47	11.4	18:47	7.4	20:47	13.5							8:49	16:47	8.0	20:47	22:23	1.6				9.6	284.7	1752.7
8/24/2008	5:43	22:19	5:59	7.0	7:59	3.4	9:59	10.6	18:05	12.3	20:05	9.3	22:05	15.6							5:43	5:59	0.0	9:59	18:05	8.1	22:05	22:19	0.0	8.1	292.8	1760.8
8/25/2008	5:46	22:16	7:17	7.6	9:17	3.3	11:17	10.5	19:33	13.3	21:33	9.8	23:33	16.6							5:46	7:17	1.5	11:17	19:33	8.3				9.8	302.6	1770.6
8/26/2008	5:49	22:12	8:30	8.1	10:30	2.2	12:30	9.4	20:49	13.9	22:49	8.5	0:49	15.6							5:49	8:30	2.7	12:30	20:49	8.3				11.0	313.6	1781.6
8/27/2008	5:52	22:09					0:49	15.6	9:34	8.1	11:34	0.5	13:34	8.3	21:53	13.6	23:53	6.4	1:53	14.0	5:52	9:34	3.7	13:34	21:53	8.3				12.0	325.6	1793.6
8/28/2008	5:55	22:05					1:53	14.0	10:30	7.9	12:30	-1.0	14:30	7.8	22:49	12.8					5:55	10:30	4.6	14:30	22:05	7.6				12.2	337.8	1805.8
8/29/2008	5:58	22:02	22:49	12.8	0:49	4.2	2:49	12.8	11:20	7.9	13:20	-1.8	15:20	8.0	23:40	11.9					5:58	11:20	5.4	15:20	22:02	6.7				12.1	349.8	1817.8
8/30/2008	6:01	21:58	23:40	11.9	1:40	2.5	3:40	12.1	12:05	8.2	14:05	-1.7	16:05	8.8							6:01	12:05	6.1	16:05	21:58	5.9				12.0	361.8	1829.8
8/31/2008	6:03	21:55	0:26	11.2	2:26	1.4	4:26	11.8	12:46	8.7	14:46	-0.9	16:46	10.0							6:03	12:46	6.7	16:46	21:55	5.2				11.9	373.7	1841.7



TYPICAL SECTION D-D

Represents the low tide window for September 12, 2008



Civil Twilight window

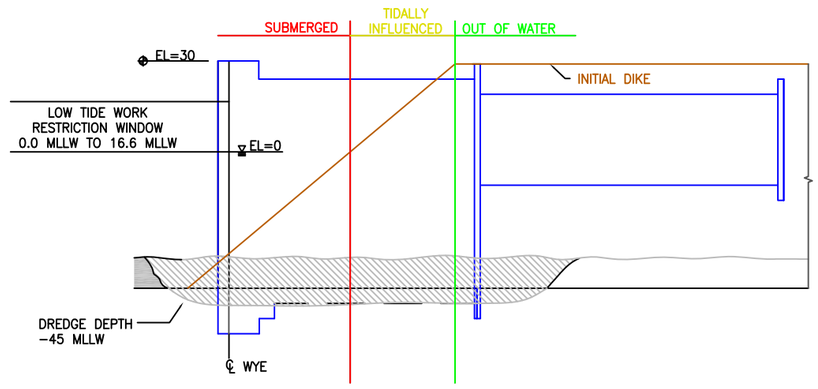
Low Tide window

Unrestricted Work window

Submerged Piledriving

Tidally Influenced Piledriving

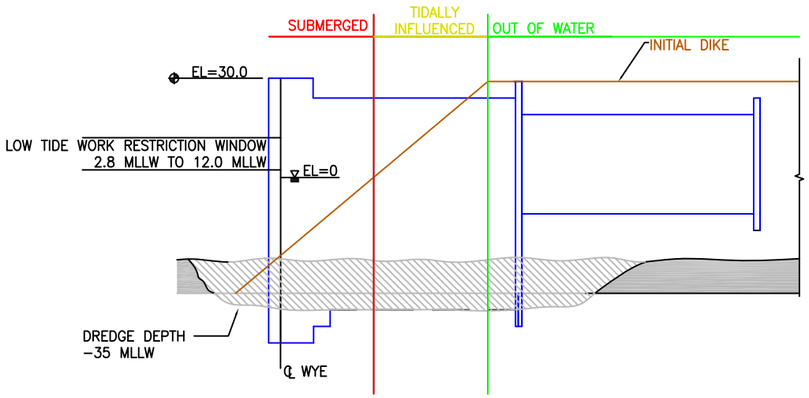
Out of Water Piledriving



TYPICAL SECTION E-E

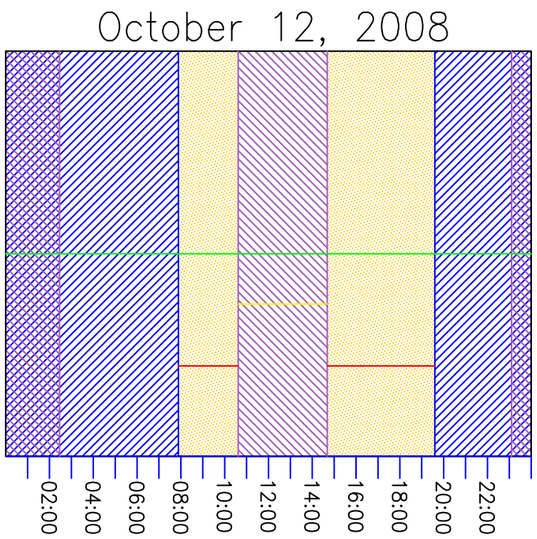
Represents the low tidal range for the entire month of September 2008

Date	Civil Twilight		2 Hours Before		Actual Low Tide		2 Hours After		2 Hours Before		Actual Low Tide		2 hours After		2 Hours Before		Actual Low Tide		2 Hours After		Unrestricted Work Window 1			Unrestricted Work Window 2			Unrestricted Work Window 3			Hourly Totals		
	Begin	End	Time	MLLW	Time	MLLW	Time	MLLW	Time	MLLW	Time	MLLW	Time	MLLW	Time	MLLW	Time	MLLW	Time	MLLW	Start	End	Hours	Start	End	Hours	Start	End	Hours	Daily	Monthly	Yearly
9/1/2008	6:06	21:51	1:09	10.5	3:09	1.0	5:09	11.7	13:25	9.1	15:25	0.4	17:25	11.6							6:06	13:25	7.3	17:25	21:51	4.5				11.8	11.8	1853.5
9/2/2008	6:09	21:48	1:50	9.7	3:50	1.0	5:50	11.9	14:01	9.5	16:01	2.1	18:01	13.0							6:09	14:01	7.9	18:01	21:48	3.8				11.7	23.4	1865.1
9/3/2008	6:12	21:44	2:28	9.0	4:28	1.3	6:28	11.8	14:34	10.0	16:34	3.8	18:34	13.9							6:28	14:34	8.1	18:34	21:44	3.2				11.3	34.7	1876.4
9/4/2008	6:15	21:41	3:05	8.2	5:05	1.9	7:05	11.6	15:06	10.6	17:06	5.6	19:06	14.3							7:05	15:06	8.0	19:06	21:41	2.6				10.6	45.3	1887.0
9/5/2008	6:17	21:38	3:42	7.7	5:42	2.8	7:42	11.2	15:39	11.5	17:39	7.3	19:39	14.4							7:42	15:39	8.0	19:39	21:38	2.0				10.0	55.3	1897.0
9/6/2008	6:20	21:34	4:23	7.6	6:23	3.9	8:23	10.9	16:18	12.6	18:18	9.1	20:18	14.5							8:23	16:18	7.9	20:18	21:34	1.3				9.2	64.5	1906.2
9/7/2008	6:23	21:31	5:16	7.9	7:16	5.1	9:16	10.9	17:19	13.4	19:19	10.8	21:19	15.5							9:16	17:19	8.1	21:19	21:31	0.0				8.1	72.5	1914.2
9/8/2008	6:25	21:27	6:27	8.5	8:27	5.9	10:27	11.3	18:45	13.9	20:45	11.6	22:45	16.4							6:25	6:27	0.0	10:27	18:45	8.3				8.3	80.9	1922.6
9/9/2008	6:28	21:24	7:41	9.2	9:41	5.6	11:41	10.8	20:05	14.3	22:05	10.8	0:05	15.7							6:28	7:41	1.2	11:41	20:05	8.4				9.6	90.5	1932.2
9/10/2008	6:31	21:21					0:05	15.7	8:47	9.4	10:47	4.3	12:47	9.9	21:10	14.0	23:10	8.9	1:10	14.2	6:31	8:47	2.3	12:47	21:10	8.4				10.7	101.1	1942.8
9/11/2008	6:33	21:17					1:10	14.2	9:43	9.1	11:43	2.8	13:43	9.3	22:05	13.2					6:33	9:43	3.2	13:43	21:17	7.6				10.8	111.9	1953.6
9/12/2008	6:36	21:14	22:05	13.2	0:05	6.8	2:05	13.2	10:30	8.9	12:30	1.6	14:30	9.3	22:52	12.3					6:36	10:30	3.9	14:30	21:14	6.8				10.7	122.5	1964.2
9/13/2008	6:39	21:11	22:52	12.3	0:52	4.9	2:52	12.7	11:13	8.7	13:13	1.0	15:13	9.9	23:36	11.3					6:39	11:13	4.6	15:13	21:11	6.0				10.6	133.1	1974.8
9/14/2008	6:41	21:07	23:36	11.3	1:36	3.4	3:36	12.6	11:53	8.6	13:53	0.9	15:53	11.0							6:41	11:53	5.2	15:53	21:07	5.3				10.5	143.5	1985.2
9/15/2008	6:44	21:04	0:17	10.2	2:17	2.2	4:17	12.6	12:30	8.8	14:30	1.2	16:30	12.1							6:44	12:30	5.8	16:30	21:04	4.6				10.4	153.9	1995.6
9/16/2008	6:47	21:01	0:56	9.1	2:56	1.3	4:56	12.4	13:07	8.9	15:07	1.8	17:07	13.2							6:47	13:07	6.3	17:07	21:01	3.9				10.3	164.1	2005.8
9/17/2008	6:49	20:57	1:35	7.9	3:35	0.5	5:35	12.0	13:42	9.2	15:42	2.6	17:42	13.8							6:49	13:42	6.9	17:42	20:57	3.3				10.2	174.3	2016.0
9/18/2008	6:52	20:54	2:14	6.8	4:14	0.0	6:14	11.4	14:19	9.7	16:19	3.6	18:19	14.3							6:52	14:19	7.5	18:19	20:54	2.6				10.1	184.3	2026.0
9/19/2008	6:54	20:51	2:54	6.2	4:54	0.0	6:54	10.6	14:57	10.5	16:57	4.9	18:57	14.3							6:54	14:57	8.1	18:57	20:51	1.9				10.0	194.3	2036.0
9/20/2008	6:57	20:47	3:39	6.0	5:39	0.6	7:39	10.1	15:42	11.4	17:42	6.6	19:42	14.6							7:39	15:42	8.1	19:42	20:47	1.1				9.2	203.5	2045.2
9/21/2008	7:00	20:44	4:33	6.4	6:33	1.8	8:33	10.1	16:41	12.3	18:41	8.5	20:41	15.5							8:33	16:41	8.1	20:41	20:44	0.0				8.1	211.6	2053.3
9/22/2008	7:02	20:41	5:41	7.2	7:41	3.1	9:41	10.7	17:59	13.2	19:59	9.7	21:59	16.6							9:41	17:59	8.3							8.3	219.9	2061.6
9/23/2008	7:05	20:38	6:57	8.3	8:57	3.5	10:57	10.6	19:22	13.9	21:22	9.4	23:22	16.0							10:57	19:22	8.4							8.4	228.3	2070.0
9/24/2008	7:07	20:34	8:09	9.1	10:09	2.7	12:09	9.6	20:36	13.8	22:36	7.4	0:36	14.1							7:07	8:09	1.0	12:09	20:34	8.4				9.5	237.8	2079.5
9/25/2008	7:10	20:31					0:36	14.1	9:13	9.3	11:13	1.4	13:13	8.8	21:38	13.0	23:38	4.9	1:38	12.1	7:10	9:13	2.1	13:13	20:31	7.3				9.4	247.1	2088.8
9/26/2008	7:12	20:28					1:38	12.1	10:08	9.2	12:08	0.3	14:08	8.6	22:33	11.8					7:12	10:08	2.9	14:08	20:28	6.4				9.3	256.4	2098.1
9/27/2008	7:15	20:25	22:33	11.8	0:33	2.6	2:33	10.9	10:56	9.5	12:56	0.0	14:56	9.2	23:21	10.9					7:15	10:56	3.7	14:56	20:25	5.5				9.2	265.6	2107.3
9/28/2008	7:17	20:22	23:21	10.9	1:21	1.0	3:21	10.3	11:39	10.0	13:39	0.6	15:39	10.3							7:17	11:39	4.4	15:39	20:22	4.7				9.1	274.7	2116.4
9/29/2008	7:20	20:18	0:05	10.2	2:05	0.2	4:05	10.3	12:20	10.5	14:20	1.8	16:20	12.1							7:20	12:20	5.0	16:20	20:18	4.0				9.0	283.7	2125.4
9/30/2008	7:22	20:15	0:46	9.5	2:46	0.1	4:46	10.6	12:57	11.1	14:57	3.3	16:57	13.7							7:22	12:57	5.6	16:57	20:15	3.3				8.9	292.6	2134.3



TYPICAL SECTION D-D

Represents the low tide window for October 12, 2008



Civil Twilight window

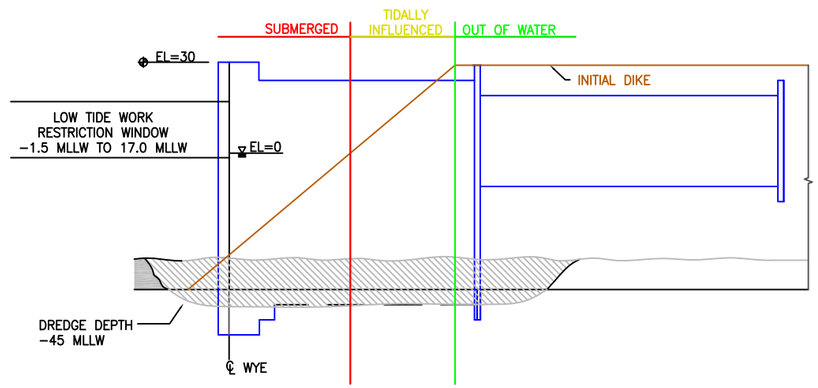
Low Tide window

Unrestricted Work window

Submerged Piledriving

Tidally Influenced Piledriving

Out of Water Piledriving



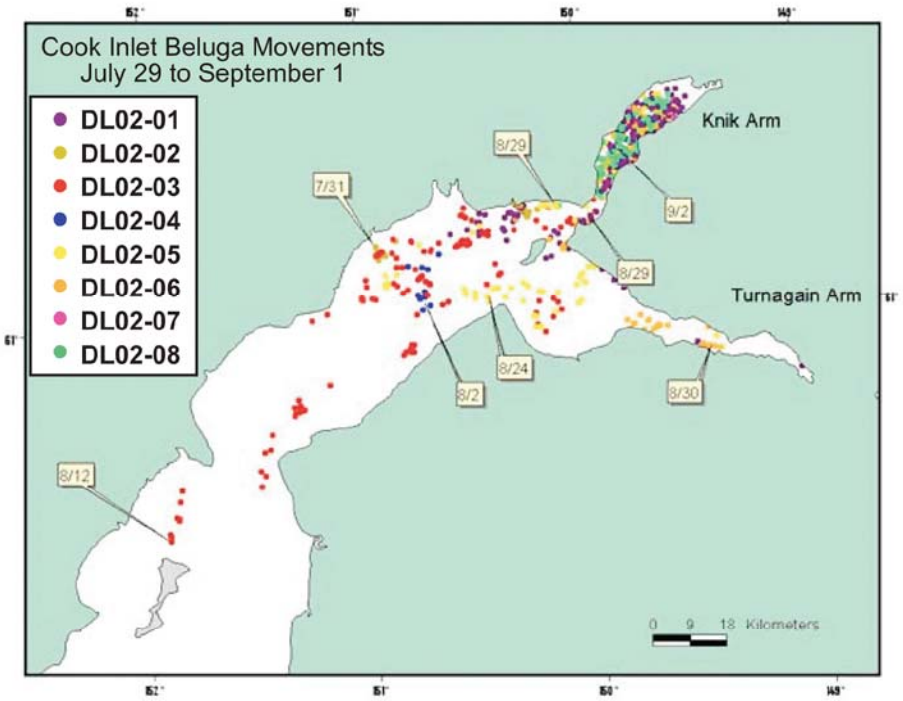
TYPICAL SECTION E-E

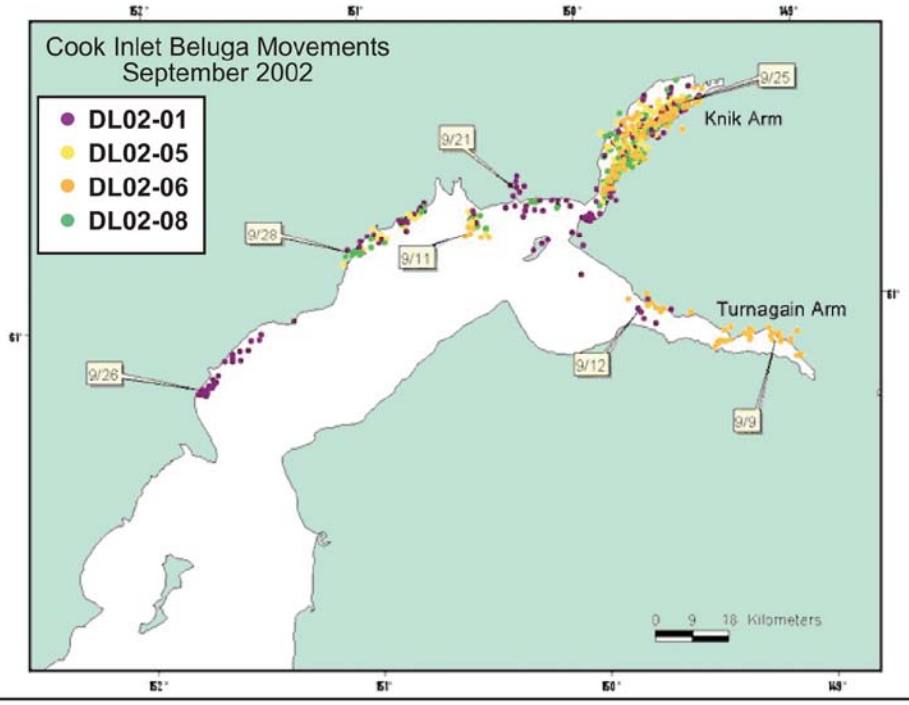
Represents the low tidal range for the entire month of October 2008

Date	Civil Twilight		2 Hours Before		Actual Low Tide		2 Hours After		2 Hours Before		Actual Low Tide		2 hours After		2 Hours Before		Actual Low Tide		2 Hours After		Unrestricted Work Window 1			Unrestricted Work Window 2			Unrestricted Work Window 3			Hourly Totals		
	Begin	End	Time	MLLW	Time	MLLW	Time	MLLW	Time	MLLW	Time	MLLW	Time	MLLW	Time	MLLW	Time	MLLW	Time	MLLW	Start	End	Hours	Start	End	Hours	Start	End	Hours	Daily	Monthly	Yearly
10/1/2008	7:25	20:12	1:25	8.8	3:25	0.4	5:25	11.1	13:32	11.5	15:32	4.8	17:32	15.0							7:25	13:32	6.1	17:32	20:12	2.7				8.8	8.8	2143.1
10/2/2008	7:27	20:09	2:01	8.0	4:01	1.0	6:01	11.4	14:05	11.7	16:05	6.2	18:05	15.8							7:27	14:05	6.6	18:05	20:09	2.1				8.7	17.5	2151.8
10/3/2008	7:30	20:06	2:35	7.3	4:35	1.6	6:35	11.3	14:37	12.0	16:37	7.4	18:37	15.9							7:30	14:37	7.1	18:37	20:06	1.5				8.6	26.1	2160.4
10/4/2008	7:32	20:03	3:09	6.9	5:09	2.4	7:09	10.9	15:09	12.6	17:09	8.4	19:09	15.4							7:32	15:09	7.6	19:09	20:03	0.0				7.6	33.8	2168.0
10/5/2008	7:35	20:00	3:44	7.0	5:44	3.4	7:44	10.3	15:48	13.3	17:48	9.5	19:48	15.1							7:44	15:48	8.1	19:48	20:00	0.0				8.1	41.8	2176.1
10/6/2008	7:37	19:57	4:28	7.6	6:28	4.6	8:28	10.1	16:44	13.7	18:44	10.6	20:44	15.4							8:28	16:44	8.3							8.3	50.1	2184.4
10/7/2008	7:40	19:53	5:35	8.1	7:35	5.8	9:35	11.1	18:05	13.7	20:05	11.2	22:05	16.2							9:35	18:05	8.5							8.5	58.6	2192.9
10/8/2008	7:42	19:50	6:53	8.9	8:53	6.1	10:53	11.6	19:27	13.8	21:27	10.4	23:27	15.6							10:53	19:27	8.6							8.6	67.2	2201.4
10/9/2008	7:45	19:47	8:03	9.5	10:03	5.4	12:03	11.3	20:35	13.3	22:35	8.5	0:35	14.1							7:45	8:03	0.0	12:03	19:47	7.8				7.8	74.9	2209.2
10/10/2008	7:47	19:44					0:35	14.1	9:01	9.7	11:01	4.3	13:01	10.9	21:31	12.4	23:31	6.1	1:31	12.8	7:47	9:01	1.2	13:01	19:44	6.7				8.0	82.9	2217.2
10/11/2008	7:50	19:41					1:31	12.8	9:51	9.7	11:51	3.3	13:51	11.0	22:21	11.1					7:50	9:51	2.0	13:51	19:41	5.9				7.9	90.7	2225.0
10/12/2008	7:52	19:38	22:21	11.1	0:21	3.9	2:21	12.0	10:37	9.6	12:37	2.8	14:37	11.8	23:06	9.9					7:52	10:37	2.8	14:37	19:38	5.0				7.8	98.5	2232.8
10/13/2008	7:55	19:35	23:06	9.9	1:06	2.1	3:06	11.5	11:19	9.8	13:19	2.8	15:19	12.8	23:49	8.6					7:55	11:19	3.4	15:19	19:35	4.3				7.7	106.2	2240.5
10/14/2008	7:57	19:32	23:49	8.6	1:49	0.7	3:49	11.2	11:59	10.2	13:59	3.2	15:59	13.9							7:57	11:59	4.0	15:59	19:32	3.6				7.6	113.8	2248.1
10/15/2008	8:00	19:30	0:31	7.4	2:31	-0.4	4:31	11.0	12:40	10.5	14:40	3.8	16:40	15.1							8:00	12:40	4.7	16:40	19:30	2.9				7.5	121.3	2255.6
10/16/2008	8:02	19:27	1:12	6.5	3:12	-1.2	5:12	10.6	13:20	11.0	15:20	4.5	17:20	15.7							8:02	13:20	5.3	17:20	19:27	2.1				7.4	128.8	2263.0
10/17/2008	8:05	19:24	1:55	5.7	3:55	-1.5	5:55	10.3	14:02	11.4	16:02	5.2	18:02	16.1							8:05	14:02	6.0	18:02	19:24	1.4				7.3	136.1	2270.4
10/18/2008	8:07	19:21	2:38	5.4	4:38	-1.3	6:38	9.9	14:47	11.8	16:47	6.1	18:47	16.2							8:07	14:47	6.7	18:47	19:21	0.0				6.7	142.8	2277.0
10/19/2008	8:10	19:18	3:26	5.6	5:26	-0.5	7:26	9.9	15:37	12.3	17:37	7.1	19:37	16.2							8:10	15:37	7.5							7.5	150.2	2284.5
10/20/2008	8:12	19:15	4:20	6.3	6:20	0.9	8:20	10.1	16:37	12.8	18:37	8.2	20:37	16.3							8:20	16:37	8.3							8.3	158.5	2292.8
10/21/2008	8:15	19:12	5:23	7.4	7:23	2.4	9:23	10.5	17:49	13.3	19:49	8.7	21:49	16.0							9:23	17:49	8.4							8.4	166.9	2301.2
10/22/2008	8:17	19:10	6:33	8.7	8:33	3.3	10:33	10.6	19:05	13.6	21:05	8.0	23:05	14.5							10:33	19:05	8.5							8.5	175.4	2309.7
10/23/2008	8:20	19:07	7:42	9.8	9:42	3.3	11:42	10.2	20:16	13.0	22:16	6.0	0:16	12.4							11:42	19:07	7.4							7.4	182.9	2317.2
10/24/2008	8:22	19:04					0:16	12.4	8:45	10.3	10:45	2.8	12:45	9.9	21:18	11.9	23:18	3.5	1:18	10.5	8:22	8:45	0.0	12:45	19:04	6.3				6.3	189.2	2323.5
10/25/2008	8:25	19:02					1:18	10.5	9:40	10.6	11:40	2.4	13:40	10.1	22:12	10.7					8:25	9:40	1.3	13:40	19:02	5.4				6.6	195.8	2330.1
10/26/2008	8:27	18:59	22:12	10.7	0:12	1.4	2:12	9.3	10:28	11.2	12:28	2.5	14:28	10.9	22:59	9.8					8:27	10:28	2.0	14:28	18:59	4.5				6.6	202.4	2336.7
10/27/2008	8:30	18:56	22:59	9.8	0:59	0.1	2:59	8.8	11:12	11.8	13:12	3.3	15:12	12.2	23:43	9.1					8:30	11:12	2.7	15:12	18:56	3.8				6.5	208.8	2343.1
10/28/2008	8:32	18:54	23:43	9.1	1:43	-0.4	3:43	9.0	11:53	12.4	13:53	4.5	15:53	13.8							8:32	11:53	3.4	15:53	18:54	3.0				6.4	215.2	2349.5
10/29/2008	8:34	18:51	0:23	8.6	2:23	-0.3	4:23	9.6	12:31	12.9	14:31	5.9	16:31	15.3							8:34	12:31	4.0	16:31	18:51	2.4				6.3	221.5	2355.8
10/30/2008	8:37	18:48	1:01	8.1	3:01	0.1	5:01	10.2	13:08	13.1	15:08	7.0	17:08	16.5							8:37	13:08	4.5	17:08	18:48	1.7				6.2	227.7	2362.0
10/31/2008	8:39	18:46	1:37	7.4	3:37	0.7	5:37	10.8	13:43	13.1	15:43	7.8	17:43	17.0							8:39	13:43	5.1	17:43	18:46	1.1				6.1	233.9	2368.1

APPENDIX C

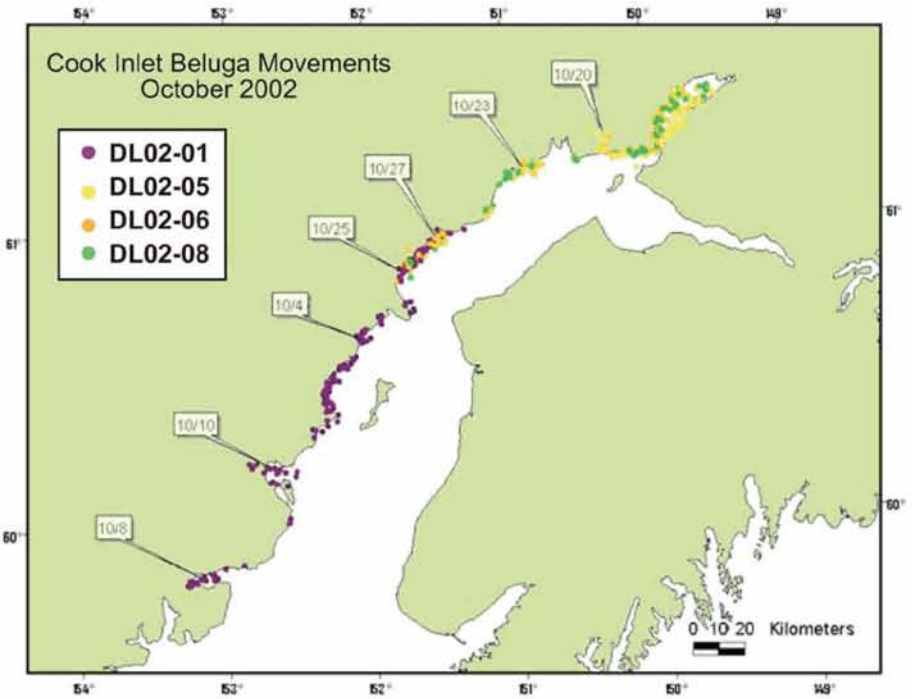
This page intentionally left blank.

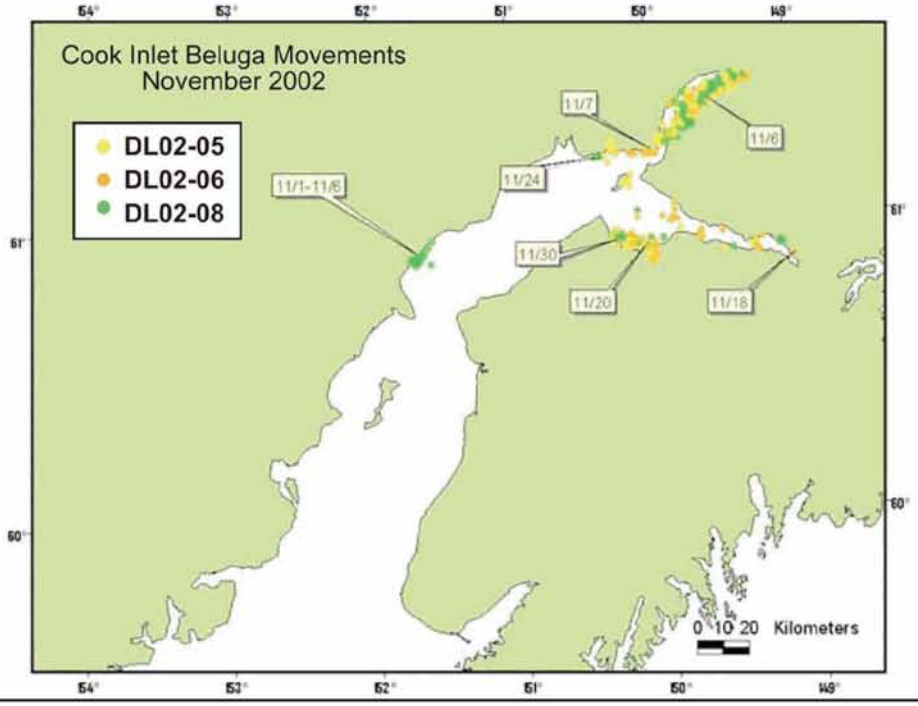




POA1-250-122304

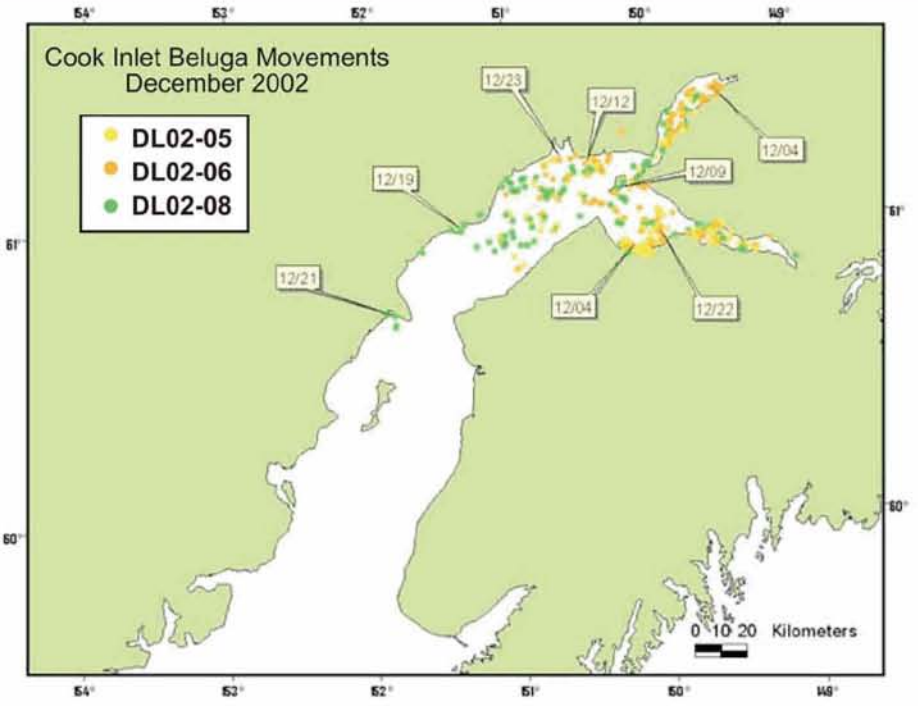
Figure A-1
July 2002 - September 2002
Beluga Movements from Satellite Tag Data

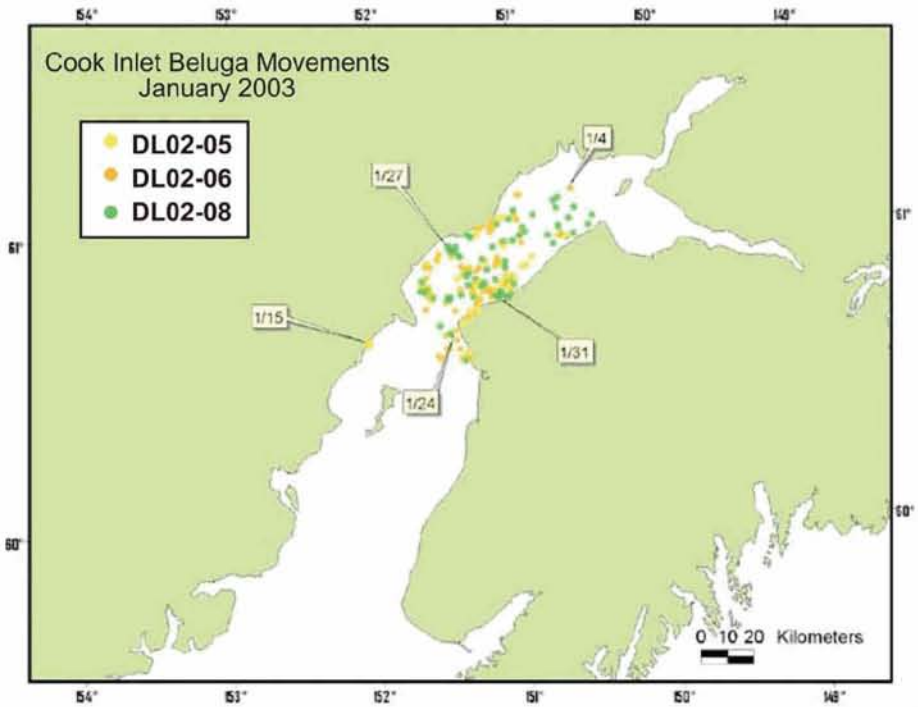




POA1-251-122304

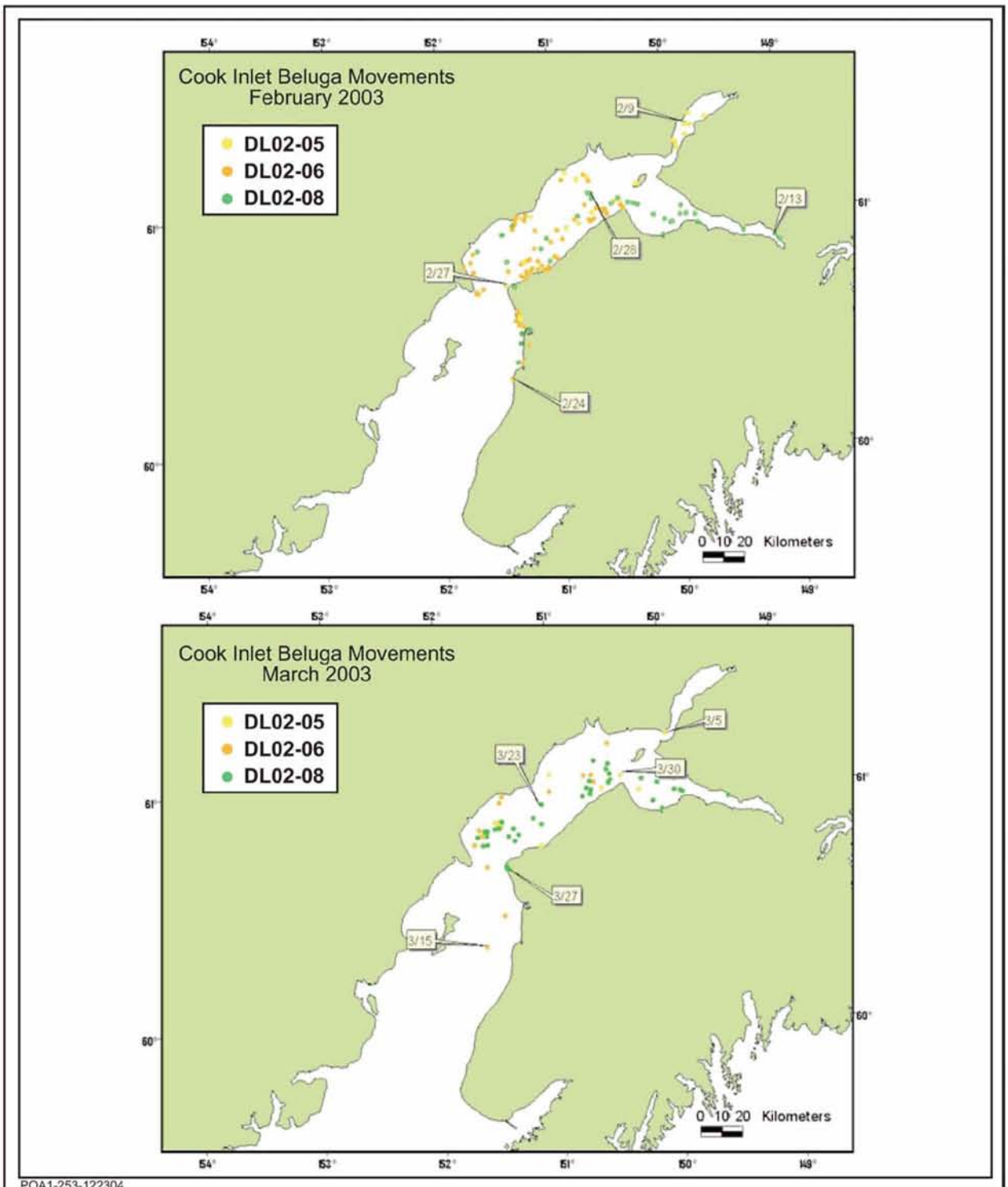
Figure A-2
October 2002 - November 2002
Beluga Movements from Satellite Tag Data





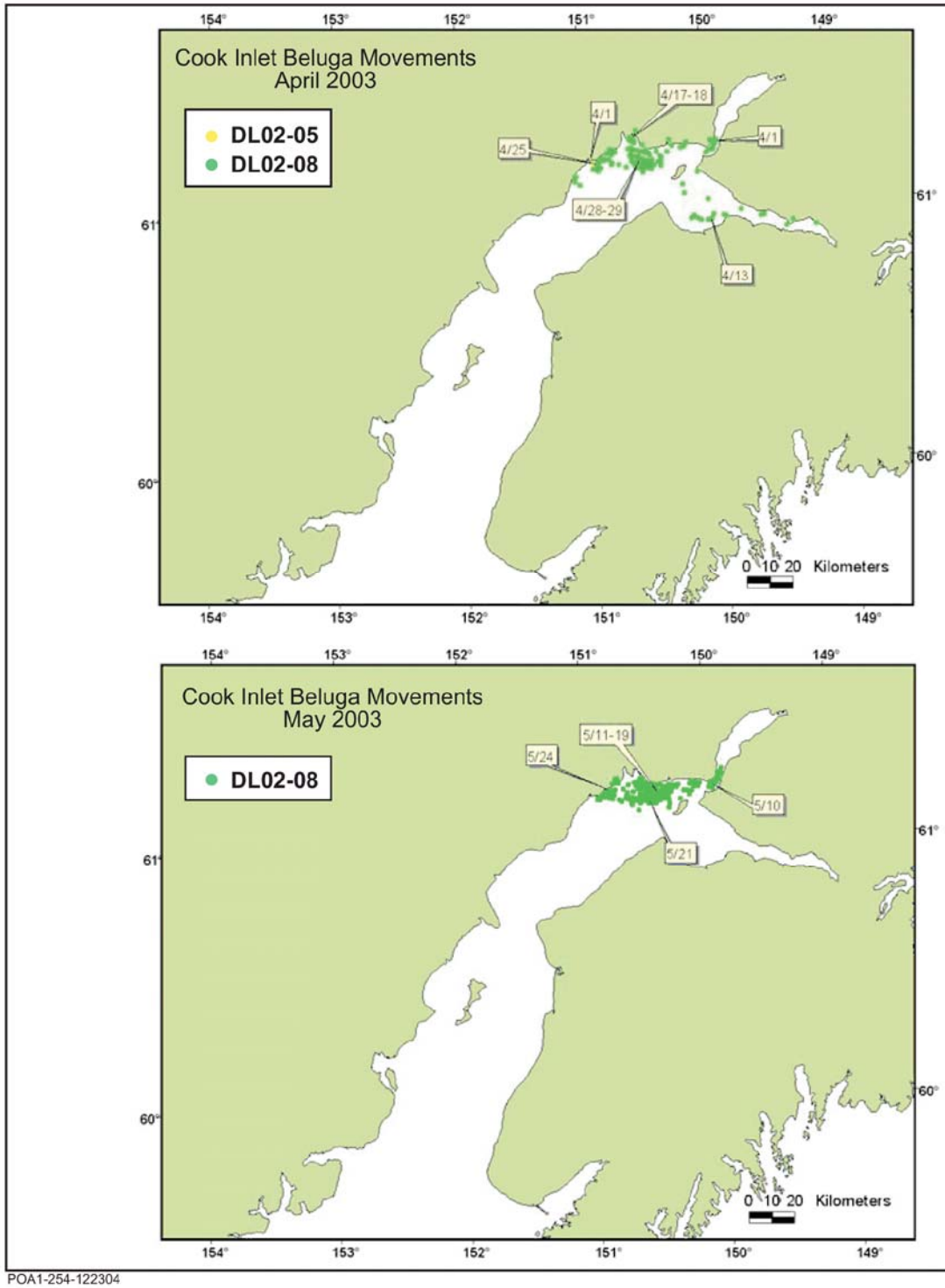
POA1-252-122304

Figure A-3
December 2002 - January 2003
Beluga Movements from Satellite Tag Data



POA1-253-122304

Figure A-4
February - March 2003
Beluga Movements from Satellite Tag Data



POA1-254-122304

Figure A-5
April - May 2003
Beluga Movements from Satellite Tag Data

APPENDIX D

Port of Anchorage Beluga Whale Sighting Notification Form

If you are a Port of Anchorage employee, tenant, contractor, or visitor, we request that you please complete this form every time you see a beluga whale (or any other marine mammal) in Cook Inlet.

Date:_____

Time : _____

Name of observer: _____ **Phone:** _____

Agency or company affiliation:_____

Number of whales: _____

Observer's location: _____

Distance of whale from observer: _____ **meters** **(or**_____ **miles)**

Whale behavior (mark with X):

( ) traveling in a straight line ( ) slow surfacing

( ) not traveling ( ) other behavior (describe)

( ) moving in multiple directions

To the best of your ability, please indicate your location at the time of the sighting and the approximate location of the whale(s) on the back of this form (site map).

Return completed form to POA: **Leo M. Carroll, Special Projects Administrator**
E-mail CarrollLM@muni.org - or - Fax: 277-5636

PORT OF ANCHORAGE
We've got the goods.

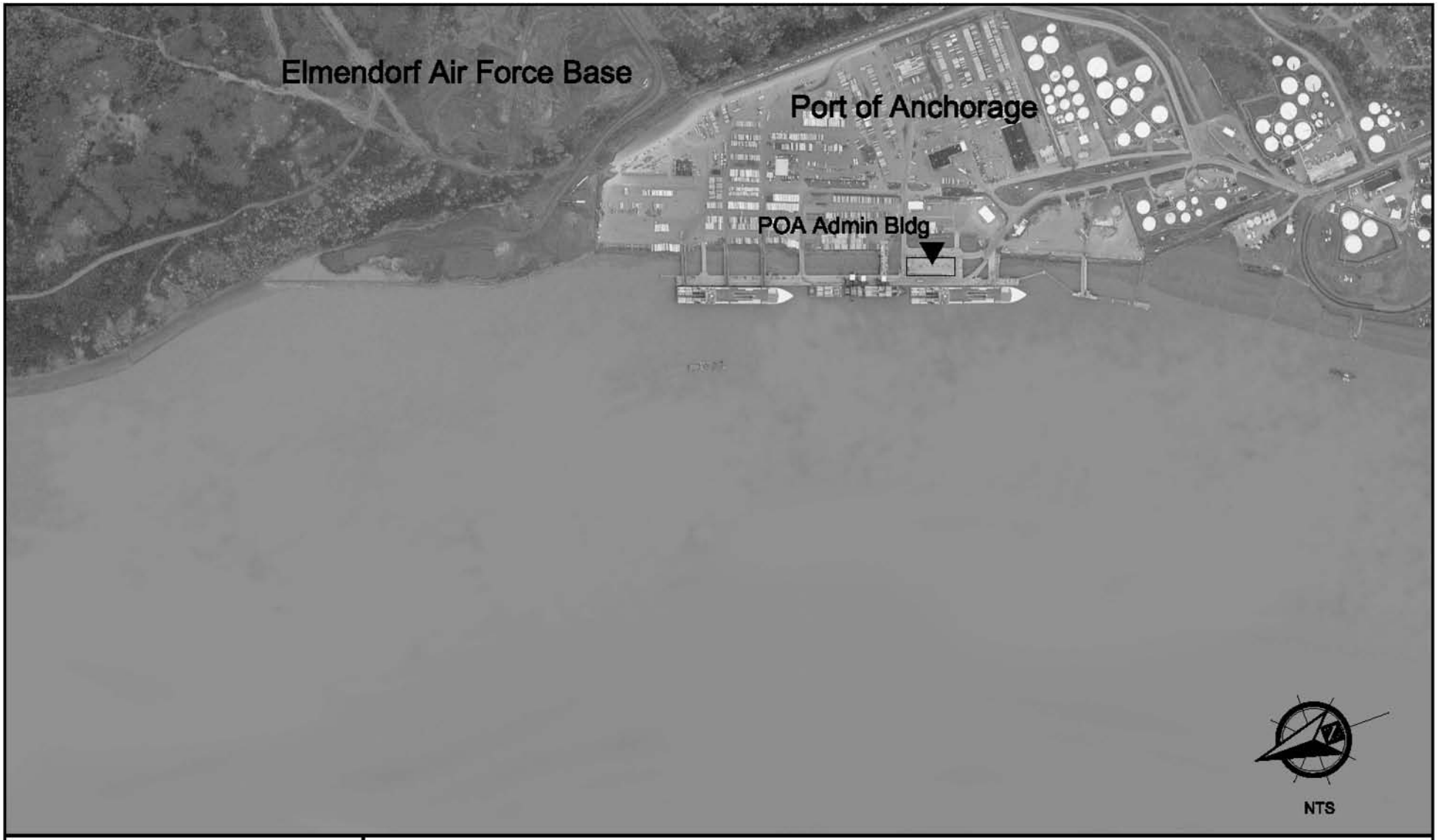
2000 Anchorage Port Road
Anchorage, Alaska 99501
(907) 343-6200

POA Sighting Control Number (*intentionally left blank*):_____

PORT OF ANCHORAGE
2007 BELUGA WHALE SIGHTING NOTIFICATION PROCEDURES

Personnel	**Action required:** Whale(s) approaching or within established safety zone	**Action required:** Whale(s) within established safety zone but no in-water work is being conducted	**Action required:** Whale(s) sighted within the MTR project footprint	**Action required:** Whale(s) sighted in the Inlet outside established safety zone
MARAD/ICRC Marine Mammal Observation Team →	**[1] Call Construction Person in Charge (PIC) 632-1190 to initiate temporary shut-down of in-water work.** [2] Record sighting on whale-sighting log. [3] Submit log each month to ICRC Environmental Manager.	[1] Log the sighting. [2] Provide monthly logs to ICRC Environmental Manager.	[1] Call Construction PIC: **632-1190** **[2] Initiate shut-down of in-water work.** [3] Log the sighting & provide logs to ICRC Environmental Manager.	[1] Log the sighting. [2] Call Construction PIC: **632-1190** give estimate of whale's direction of approach & estimated distance out. [3] Provide monthly logs to ICRC Environmental Manager.
MARAD/ICRC general construction subcontractors →	**[1] Shut down in-water work.** [2] Fill out notification form & promptly submit form to ICRC Construction Manager.	[1] Fill out notification form [2] Submit form to ICRC Construction Manager by end of day.	**[1] Shut down in-water work if whale is approaching construction site.** [2] Fill out notification form & promptly submit form to ICRC Construction Manager.	[1] Fill out notification form [2] Submit form to ICRC Construction Manager by end of day.
MARAD/ICRC non-construction subcontractors →	[1] Fill out notification form. [2] Call ICRC Environmental Manager: **264-8918 or cell 223-2769.**	[1] Fill out notification form. [2] Call ICRC Environmental Mgr within 24 hours: **264-8918 / 223-2769.**	[1] Fill out notification form. [2] Call ICRC Environmental Manager: **264-8918 or cell 223-2769.**	[1] Fill out notification form. [2] Call ICRC Environmental Manager: **264-8918 or cell 223-2769.**
MARAD/ICRC personnel →	[1] Fill out notification form. [2] Call ICRC Environmental Mgr within 24 hours: **264-8918 or cell 223-2769.** [3] Notify 3 CES CEV, EAFB of whales sighted by the observers at Cairn Pt.	[1] Fill out notification form. [2] Call ICRC Environmental Mgr within 24 hours: **264-8918 / 223-2769.** [3] Notify 3 CES CEV, EAFB of whales sighted by the observers at Cairn Pt.	[1] Fill out notification form. [2] Call ICRC Environmental Mgr within 24 hours: **264-8918 or cell 223-2769.** [3] Notify 3 CES CEV, EAFB of whales sighted by the observers at Cairn Pt	[1] Fill out notification form. [2] Call ICRC Environmental Mgr within 24 hours: **264-8918 or 223-2769.** [3] Notify 3 CES CEV, EAFB of whales sighted by the observers at Cairn Pt
POA personnel →	Report sighting to POA Operations Mgr: **343-6200**. POA will fill out whale sighting form, submit form to NOAA, & forward a copy to ICRC Environmental Manager.	Report sighting to POA Operations Mgr: **343-6200**. POA will submit form to NOAA & forward a copy to ICRC Environmental Manager.	Report sighting to POA Operations Mgr: **343-6200**. POA will submit form to NOAA & forward a copy to ICRC Environmental Mgr.	Report sighting to POA Operations Mgr: **343-6200**. POA will submit form to NOAA & forward copy to ICRC Environmental Manager.
Port of Anchorage tenants & operators, including pilots and captains →	Report sighting to POA Operations Mgr: **343-6200**. POA will fill out whale sighting form, submit form to NOAA, & forward a copy to ICRC Environmental Manager.	Report sighting to POA Operations Mgr: **343-6200**. POA will submit form to NOAA & forward a copy to ICRC Environmental Manager.	Report sighting to the POA Operations Mgr: **343-6200**. POA will submit form to NOAA & forward a copy to ICRC Environmental Mgr.	Report sighting to POA Operations Mgr: **343-6200**. POA will submit form to NOAA & forward a copy to ICRC Environmental Manager.
Port of Anchorage visitors →	Report sighting to POA Operations Manager: **343-6200**. POA will submit form to NOAA & forward a copy to ICRC Environmental Manager.	Report sighting to POA Operations Mgr: **343-6200**. POA will submit form to NOAA & forward a copy to ICRC Environmental Manager.	Report sighting to POA Operations Mgr: **343-6200**. POA will submit form to NOAA & forward a copy to ICRC Environmental Mgr.	Report sighting to POA Operations Mgr: **343-6200**. POA will submit form to NOAA & forward a copy to ICRC Environmental Manager.

Rev. 11/27/2007



PORT OF ANCHORAGE
We've got the goods.

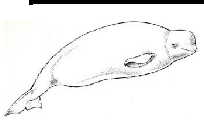
Port of Anchorage, Cook Inlet

LAND-BASED SURVEYS OF BELUGA WHALES: *CETACEANS*

Station:	Date (dd--mmm--yy): -- --	Observer:	This is Page______of______
Shift Start Time (hh:mm):	Shift End Time (hh:mm):		Optics:

Sheet #:
____
LOCYYMMDDINI
Ex: POA050802BBB

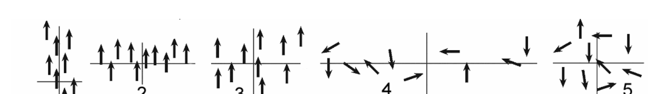
mpling Round	Best Sample ☒	Time (hh:mm)	Non-Beluga ☒	Count				Magnetic Compass Bearing 001-360°	Grid Cell	Group #	Group Code	Activity		Direction	Previously Counted Y/N/U		Comments	Comments on Reverse
				Adults	Sub-Adults	Calves	Unk					1	2		You	Other	Write additional comments on the reverse side of this sheet. Be sure to identify which record additional comments are associated with.	☒
	☐		☐															☐
	☐		☐															☐
	☐		☐															☐
	☐		☐															☐
	☐		☐															☐
	☐		☐															☐
	☐		☐															☐
	☐		☐															☐
	☐		☐															☐
	☐		☐															☐
	☐		☐															☐
	☐		☐															☐
	☐		☐															☐
	☐		☐															☐
	☐		☐															☐
	☐		☐															☐
	☐		☐															☐
	☐		☐															☐
	☐		☐															☐



Activity Codes

Traveling/Moving	1	Breaching	5
Diving	2	Feeding Observed	6
Motionless on surface	3	Feeding Suspected	7
Spy Hopping	4	Other(note in comments)	99

LGL



Group Codes

Additional Comments (back side)

Time	Comments

LAND-BASED SURVEYS OF BELUGA WHALES: *ENVIRONMENTAL CONDITIONS*

Sheet #: ____________
LOCYYMMDDINI
Ex: POA050802BBB

Station:	Date (dd--mmm--yy): -- --	Observer(s):	This is Page ____of_____

Time (hh:mm)	Air Temp (°C)	Precip Code 00-none 01-rain 02-fog 03-snow	Wind Dir. (99 if null)	Wind Speed (km/h)	Cloud Cover (%)	Vis. Dist. (km)	See Far Shore ☒	Glare ☒	Central Glare Bearing 001-360°	Swell	Sea State (Beaufort)	White-Caps ☒	Vessel Obstruction %coverage						Conditio Rating (worst) (best)	Commen on Rever ☒
													D9	E9	F9	G9	H9	I9		
							☐	☐				☐								☐
							☐	☐				☐								☐
							☐	☐				☐								☐
							☐	☐				☐								☐
							☐	☐				☐								☐
							☐	☐				☐								☐
							☐	☐				☐								☐
							☐	☐				☐								☐
							☐	☐				☐								☐
							☐	☐				☐								☐
							☐	☐				☐								☐
							☐	☐				☐								☐

Sea State	Description
0	Sea like a mirror
1	Ripples but without foam crests
2	Small wavelets. Crests do not break
3	Large wavelets. Perhaps scattered white horses
4	Small waves. Fairly frequent white horses

LAND-BASED SURVEYS OF BELUGA WHALES: *ENVIRONMENTAL CONDITIONS*

Time	Comments

LAND-BASED SURVEYS OF BELUGA WHALES: *VESSEL TRAFFIC*

Sheet #:
____
LOCYYMMDDINI
Ex. POA050801BBB

Station:	Date (dd--mmm--yy): -- --	Observer:	This is Page _____of______

Time	Vessel Type	In <100m	500m	1000m	Activity	Motor on?	Comments
:	SK TU TB MB CS TS MD CD OT				AN MV S DK DT D E	Y N UNK	
:	SK TU TB MB CS TS MD CD OT				AN MV S DK DT D E	Y N UNK	
:	SK TU TB MB CS TS MD CD OT				AN MV S DK DT D E	Y N UNK	
:	SK TU TB MB CS TS MD CD OT				AN MV S DK DT D E	Y N UNK	
:	SK TU TB MB CS TS MD CD OT				AN MV S DK DT D E	Y N UNK	
:	SK TU TB MB CS TS MD CD OT				AN MV S DK DT D E	Y N UNK	
:	SK TU TB MB CS TS MD CD OT				AN MV S DK DT D E	Y N UNK	
:	SK TU TB MB CS TS MD CD OT				AN MV S DK DT D E	Y N UNK	
:	SK TU TB MB CS TS MD CD OT				AN MV S DK DT D E	Y N UNK	
:	SK TU TB MB CS TS MD CD OT				AN MV S DK DT D E	Y N UNK	
:	SK TU TB MB CS TS MD CD OT				AN MV S DK DT D E	Y N UNK	
:	SK TU TB MB CS TS MD CD OT				AN MV S DK DT D E	Y N UNK	
:	SK TU TB MB CS TS MD CD OT				AN MV S DK DT D E	Y N UNK	
:	SK TU TB MB CS TS MD CD OT				AN MV S DK DT D E	Y N UNK	
:	SK TU TB MB CS TS MD CD OT				AN MV S DK DT D E	Y N UNK	
:	SK TU TB MB CS TS MD CD OT				AN MV S DK DT D E	Y N UNK	
:	SK TU TB MB CS TS MD CD OT				AN MV S DK DT D E	Y N UNK	
:	SK TU TB MB CS TS MD CD OT				AN MV S DK DT D E	Y N UNK	
:	SK TU TB MB CS TS MD CD OT				AN MV S DK DT D E	Y N UNK	

Vessel Code	Vessel Type	Activity Code	Activity Type
SK	Skiff	AN	Anchored/Moored
TU	Tug	MV	Moving
TB	Tug & Barge	S	Stationary
MB	Motorized Barge	DK	Docked
CS	Container Ship	DT	Drifting
TS	Tanker Ship	D	Dredging
MD	Motorized Dredge	E	Emptying
CD	Crane Dredge		
OT	Other (describe)		


Time	Comments

Sheet #: _____

LOCYYMMDDINI
Ex. POA05081BBB

Date: **Location:** **Observer:** **Group #:** **Ad:** **S-Ad:** **Ca:** **Un:**

Time	Card	Frames	Blanks	Notes

Start Observation: **Begin Sample:** **End Sample:** **End Observation:**

Behavior	2 minutes	4 minutes	6 minutes	8 minutes	10 minutes
State	T M R FS FC D	T M R FS FC D	T M R FS FC D	T M R FS FC D	T M R FS FC D
Heading	N S E W V	N S E W V	N S E W V	N S E W V	N S E W V
Spread	<1 1-3 4-7 8-12 13+	<1 1-3 4-7 8-12 13+	<1 1-3 4-7 8-12 13+	<1 1-3 4-7 8-12 13+	<1 1-3 4-7 8-12 13+
Formation	C P L E N	C P L E N	C P L E N	C P L E N	C P L E N
Lobtail					
Vocalize					

Dive Record (circle one): **Individual** **or** **Group**

Event	1	2	3	4	5	6	7	8	9	10
Dive										
Surface										

Behavior	12 minutes	14 minutes	16 minutes	18 minutes	20 minutes
State	T M R FS FC D	T M R FS FC D	T M R FS FC D	T M R FS FC D	T M R FS FC D
Heading	N S E W V	N S E W V	N S E W V	N S E W V	N S E W V
Spread	<1 1-3 4-7 8-12 13+	<1 1-3 4-7 8-12 13+	<1 1-3 4-7 8-12 13+	<1 1-3 4-7 8-12 13+	<1 1-3 4-7 8-12 13+
Formation	C P L E N	C P L E N	C P L E N	C P L E N	C P L E N
Lobtail					
Vocalize					

Event	11	12	13	14	15	16	17	18	19	20
Dive										
Surface										

Behavior	22 minutes	24 minutes	26 minutes	28 minutes	30 minutes
State	T M R FS FC D	T M R FS FC D	T M R FS FC D	T M R FS FC D	T M R FS FC D
Heading	N S E W V	N S E W V	N S E W V	N S E W V	N S E W V
Spread	<1 1-3 4-7 8-12 13+	<1 1-3 4-7 8-12 13+	<1 1-3 4-7 8-12 13+	<1 1-3 4-7 8-12 13+	<1 1-3 4-7 8-12 13+
Formation	C P L E N	C P L E N	C P L E N	C P L E N	C P L E N
Lobtail					
Vocalize					

Event	21	22	23	24	25	26	27	28	29	30
Dive										
Surface										

COMMENTS: _____

Beluga Whale Monitoring Plan

Phase Two Marine Terminal Redevelopment
Port of Anchorage Intermodal Expansion Project

Prepared by

Leslie A. Cornick, Ph.D.
Department of Environmental Science
Alaska Pacific University
4101 University Drive
Anchorage, Alaska 99508

September 2007

This plan was prepared under contract to Integrated Concepts and Research Corporation. Inquiries about this plan may be addressed to: **Integrated Concepts and Research Corporation, 421 West First Avenue, Suite 200, Anchorage, Alaska, 99501.**

1.0 Introduction

This document presents a plan for monitoring and collecting data on the beluga whale (*Delphinapterus leucas*) presence, habitat use, and behavior of the beluga whale during project activities associated with Phase II of the Marine Terminal Redevelopment (MTR) Project. The monitoring effort and data collection will be conducted in the Port of Anchorage area during the fall of 2007, during Marine Terminal Redevelopment (MTR) activities, to be conducted from September through November. In addition, whale observers will provide real-time information to the Port construction crews on the whale and proximity of whales to the construction site to supplement contractually required, shore-based observation programs maintained by the construction contractor. Whale sightings made by the construction contractor or others in the area of the port will be added to the overall information data base. This information will then be added to the existing data previously collected by LGL Alaska Research associates, Inc. (LGL), to establish patterns of beluga whale distribution, habitat use, and behavior in the area of Upper Cook Inlet surrounding the footprint of the MTR Project. During whale monitoring and data collection activities, the particular emphasis will be on documenting the frequency of presence within and near the construction area and the evaluation of potential responses of beluga whales to construction activities. Providing “real-time” information to construction crews so that mitigation measures can be swiftly implemented will enhance the shore based protection program managed by the construction contractor.

This monitoring plan has been developed in consultation with Integrated Concepts and Research Corporation (ICRC) and the Port of Anchorage (POA), based on the National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS) requirements under the Marine Mammal Protection Act. The plan is intended to meet the monitoring objectives set forth by NOAA/NMFS, within the project scope agreed upon by the POA, ICRC, NOAA/NMFS, and the U.S. Department of Transportation, Maritime Administration (MARAD). MARAD is the federal funding agency for all work associated with the Port of Anchorage Intermodal Project, including this monitoring program.

2.0 Program Objectives

The Beluga Whale Monitoring Plan addresses the following objectives:

1. Estimate the frequency at which beluga whales are present near the project footprint.

2. Characterize habitat use and behavior of beluga whales during ice free months in the Knik Arm of Upper Cook Inlet, near the Port of Anchorage.
3. Observe, analyze, and document potential changes in behavior in response to in-water construction work, including pile driving and fill placement. And observe, analyze and documents potential changes in behavior in response to other port activities.
4. During in-water construction activities, inform the Person-in-Charge (PIC) (of construction activities) of the proximity of beluga whales to the MTR construction area, so that construction activities may be shut down prior to beluga whales entering the safety zone of 650 meters (m) (2,145 feet) and from the construction site for pile driving activities and 50m (165 feet) from the construction site for in-water placement of fill materials. (note that the safety zone radius may be altered based on collection of acoustic data during construction activities)

APU will provide field technicians, under the supervision of Dr. Leslie Cornick, Associate Professor, APU, at a shore station to document beluga whale locations and behavior for, up to four days per week, six hours per day, from September through November, 2007.

3.0 Observation Station and Sampling Effort

Observations will be conducted by trained observer technicians stationed at an on-shore site overlooking the MTR construction area. An observation platform at the site, located at Cairn Point on Elmendorf Air Force Base (EAFB), will provide height above sea level near the shoreline. The added height of the platform will maximize the probability of detecting beluga whales in and around the Port area. Based on the results of the whale monitoring conducted in 2006, the Cairn Point monitoring location proved to be the best place for sighting whales in the construction area and associated safety zones. The POA has received a right of entry from EAFB to access Cairn Point for the purpose of conducting whale monitoring activities. APU monitoring technicians will cooperate with POA and EAFB personnel and undergo all necessary training to ensure compliance with Port and EAFB safety and security policies. The monitoring station may be changed in consultation with ICRC and POA should Cairn point become unavailable due to EAFB operational or security needs.

Monitoring will be conducted up to four days per week for six hours per day, covering the full range of tidal cycles as practicable during hours of access to the observation station.

Monitoring days will be scheduled to provide a sample of beluga whale use of the area under varying conditions (e.g., noise, vessel traffic, environmental conditions), while accommodating the logistical, safety and security concerns of POA, EAFB, ICRC and APU. Additional observations will be conducted on an opportunistic basis in consultation with ICRC to provide data covering high-tide cycles and non-construction periods.

4.0 Sampling Protocol and Techniques

4.1 Environmental Conditions

Environmental conditions pertaining to sighting conditions will be logged every 20 minutes during observation sessions. These conditions include wind speed, sea state (Beaufort Scale), swell height, glare, percent cloud cover, precipitation, and percent of view obstructed by vessels or other moving barriers.

4.2 Port of Anchorage Activities

The number, type, and activity of vessels at the Port will be documented during observation sessions throughout the observation period. A combination of interval sampling, continuous monitoring, and theodolite tracking will be used to monitor vessels. Project activities will be noted at regular intervals during all observation periods in order to facilitate examination of beluga whale occurrence and behavior with respect to these activities.

4.3 Beluga Whale Observations

In addition to basic sighting information (date, time, and number of whales), detailed data will be collected as feasible and practicable regarding the locations, movements, and behavior of beluga whales near the Port. A surveyor's theodolite linked to a laptop computer will be used to track group locations and movement patterns (Prevel Ramos et al. 2005). Using this technique, computer calculations can be used to provide accurate estimates of the distance of whales from the MTR construction site in real time. In the event of equipment failure or other logistical difficulties, a grid-cell mapping system will be used, with distances estimated by eye. Behavior of whales will be documented by focal group sample. In addition to this formal monitoring program, construction contractors conducting in-water work at the port are required to have

shore based observers to watch for marine mammals and implement shut-down procedures as necessary and the Port administration has requested that all port staff and port users report observations of marine mammal activity at the port. The extent practical and available, this information will be included in the monitoring data base.

4.4 Theodolite Tracking

To maximize the resolution of analyses of beluga whale occurrence and habitat use in the project footprint, position of groups (longitude and latitude), surface speed, linearity, and orientation of whale group movements will be monitored as feasible and practicable using a surveyor's theodolite (Prevel Ramos et al. 2006). A theodolite measures horizontal and vertical angles, which can be used to triangulate whale location. Distance of whales from MTR activities and vessels will be measured using this technique with a high level of accuracy in real time. Theodolite tracking data will also be used to detail whale movement patterns and habitat use. Theodolite tracking will be conducted in a manner consistent with the data collected by LGL during Phase I expansion activities (LGL 2006).

In short, horizontal (azimuth) and vertical (declination) readings from the theodolite will be used to calculate the position of whales and vessels. Accurate assessment of whale group locations will be facilitated by precise measurement of height and location of the station and input of tide tables to account for tidal variation during the sample. Measurement error generally decreases based on the following factors:

- An increase in the height of the observation station
- A decrease in the distance from the observation station to the object being fixed
- A decrease in short-term variation of sea surface height (Würsig et al. 1991).

Successive location fixes of moving objects will provide estimates of parameters related to movement patterns (e.g., speed, linearity, re-orientation rate, bearing). Fixes of multiple objects will provide information on distance between objects (e.g., whales and vessels) and orientation (toward, away, or neutral). A laptop computer will be linked to the theodolite to allow instantaneous download and time stamping of horizontal and vertical angle-fix information, input of other observations (e.g., group size, behavior, and environmental parameters), and rapid, real-time longitude-latitude position and movement pattern calculations. GIS-compatible whale tracks will facilitate the estimation of distances between whales and shore, and the sources of

noise and vessels, as well as increased analytical power for examining sighting data and whale responses to project activities.

Equipment to be used in theodolite tracking will include a tripod-mounted surveyor's theodolite (Sokkia DT5), a computer-download cable connecting the theodolite to a laptop computer, and a laptop computer with long-life batteries allowing 6 hours of continuous data collection. Data will be collected and collated using *Pythagoras* software (free download and information available at http://www.tamug.edu/mmrp/pythagoras/) to display position, movement, and distance in real time. This GIS-compatible software also allows input of sighting, environmental, and behavioral data for storage in a Microsoft Access database.

4.5 500m x 500m Grid

In order to maintain consistency in data collection and analysis across the entire life of the MTR Project, APU will continue to employ the grid system originally developed by LGL to monitor the locations and movements of beluga whales in Knik Arm (Funk et al. 2005). This system allows documentation of whale group location and movements on a coarse scale (500m x 500m or 1km x 1km grids) for analyses of patterns using GIS. Technicians will use a combination of compass bearings taken from binoculars and landmarks to place whale groups in grid cells at given observation times. Grid cell locations are updated as the whales move through the area. A location grid has already been developed and utilized for the Port area (Prevel Ramos et al. 2006). This technique is well-suited to analyses of habitat use on a broad scale.

4.6 Behavioral Sampling

Detailed focal group behavior (Mann 2000) will be sampled at regular intervals, including behavioral state (traveling, milling, resting, feeding), swimming formation, inter-individual distance/group spread, and noteworthy behavioral events (e.g., spy hopping, vocalizations, rapid chases). When feasible, dive durations and surface intervals of whales will be estimated using focal animal observations. Whale behavior within and outside the project footprint will be distinguished. Continuous and/or interval sampling (Martin and Bateson 1986) will be used to collect data on a laptop computer, paper datasheets, or a combination of the two.

5.0 Reporting

Beluga whale presence will be reported in real time to ICRC and/or POA-designated representatives upon initial sighting. Whale movements will be updated as deemed appropriate by the technician observers. Monthly progress reports will be submitted to ICRC within 10 business days of the month being summarized. A draft final report will be submitted to ICRC no later than January 31, 2008, and will be finalized once comments are received from ICRC.

6.0 Literature Cited

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

Mann, J. 2000. Unraveling the dynamics of social life: long-term studies and observational methods. Pages 45-64 in J. Mann, R.C. Connor, P.L. Tyack and H. Whitehead eds. Cetacean Societies: Field Studies of Dolphins and Whales. University of Chicago Press, Chicago.

Markowitz, T.M., D.W. Funk and M.R. Link. 2006. Beluga whale monitoring plan for Phase 1 Expansion at the port of Anchorage. Rep. from LGL Alaska Research Associates, Inc., Anchorage, AK, for Integrated Concepts and Research Corporation, the Port of Anchorage, and the U.S. Department of Transportation Maritime Administration.

Martin, P. and P. Bateson. 1986. Measuring Behaviour. Cambridge University Press, Cambridge. 222 Pages.

Prevel Ramos, A., T.M. Markowitz, Funk, D.W., and M.R. Link. 2006. Monitoring beluga whales at the Port of Anchorage: Pre-expansion observations, August-November, 2005. Rep. from LGL Alaska Research Associates, Inc., Anchorage, AK, for Integrated Concepts and Research Corporation, the Port of Anchorage, and the U.S. Department of Transportation Maritime Administration.

Würsig, B., F. Cipriano, and M. Würsig. 1991. Dolphin movement patterns: information from radio tracking and theodolite studies. Pages 79-112 in K. Pryor and K. S. Norris eds. Dolphin Societies: Discoveries and Puzzles. University of California Press: Berkeley, CA.