Environmental Resources Section

Public Notice

Alaska District
U.S. Army Corps of Engineers

MAR 10 2017

Date ________________ Identification No. ER-17-03
Please refer to the identification number when replying.

The U.S. Army Corps of Engineers, Alaska District (Corps) proposes to perform transition and maintenance dredging of the Anchorage Harbor basin to minus 35 feet mean lower low water (MLLW) and dispose of the dredged material in the Port of Anchorage open water disposal area located 3,000 feet abeam from the main terminals. Dredging would be conducted April through November. Maintenance dredging quantities are highly variable in the harbor, with the volumes fluctuating between 600,000 cubic yards and 1.8 million cubic yards in the decade between 2005 and 2015. The 5-year mean volume from 2010 to 2015 is 1.1 million cubic yards. Transition dredging in the southern extent of the harbor would generate up to an estimated 666,000 cubic yards of additional sediments bound for the Port of Anchorage open water disposal site in the year it is conducted. The planned maintenance dredging project is 52 acres smaller than the area that has been dredged since 2008 and has been reconfigured so that both the dredged area and the disposal site avoid Cook Inlet beluga whale critical habitat.

Information on the proposed action and anticipated environmental effects are discussed in the attached environmental assessment (EA) and unsigned Finding of No Significant Impact (FONSI), which are available for public review and comment at the following Corps' website: http://www.poa.usace.army.mil. Click on the "Reports and Studies" button and look under "Documents Available for Review, Operations and Maintenance." The comment period will close 15 days from the date of this notice. All comments received on or before this date will become part of the official record. The FONSI will be signed upon review of comments received and resolution of significant concerns.

Please send electronic comments on the EA to Matthew.W.Ferguson@usace.army.mil. Written comments may also be sent to the following address:

U.S. Army Corps of Engineers, Alaska District
ATTN: CEPOA-PM-C-ER (Ferguson)
P.O. Box 6898
Joint Base Elmendorf-Richardson, Alaska 99506-0898

No public meeting is scheduled for this action. If you believe a meeting should be held, please send a written request to the above address during the 15-day review period explaining why you believe a meeting is necessary.

On January 17, 2017, the Alaska Department of Environmental Conservation issued the Corps a Certificate of Reasonable Assurance under Section 401 of the Clean Water Act that the proposed action and any discharge that might result will comply with the Clean Water Act, Alaska Water Quality Standards, and other applicable State laws. The certification expires 5 years after the date of issuance.

Please contact Mr. Matthew Ferguson of the Environmental Resources Section via his email address (Mathew.W.Ferguson@usace.army.mil), phone (907-753-2711) or write to him at the Corps' address if you would like additional information concerning the proposed project.

Michael Noah
Chief, Environmental Resources Section

US Army Corps of Engineers
Alaska District

Environmental Assessment and Finding of No Significant Impact

Transition and Maintenance Dredging, Anchorage Harbor, Anchorage, Alaska

March 2017

FINDING OF NO SIGNIFICANT IMPACT

In accordance with the National Environmental Policy Act of 1969, as amended, the U.S. Army Corps of Engineers, Alaska District (Corps) has assessed the environmental effects of the following action:

Perform transitional and maintenance dredging to minus 35 feet mean lower low water in Anchorage Harbor and dispose of dredged material in the Anchorage Harbor open water disposal site

The Corps of Engineers March 2017 Transition and Maintenance Dredging, Anchorage Harbor, Anchorage, Alaska environmental assessment (EA) defined the proposed action and addressed the environmental effects of that action. The Corps of Engineers has dredged Anchorage Harbor annually since authorization in 1958 to maintain adequate depths for shipping. Dredging typically begins in May and ends in late summer or early autumn. Annual maintenance dredging volumes vary substantially and have approached 2 million cubic yards. Transitional dredging in the southern portion of the harbor could generate up to 666,000 cubic yards of additional dredged material bound for the Anchorage Harbor open water disposal area the year it is dredged.

Anchorage Harbor (the Port of Anchorage) is on Knik Arm near its junction with Turnagain Arm at the head of Cook Inlet in Southcentral Alaska. The proposed action will influence the spatial distribution of the sediment deposition in Anchorage Harbor, will alter the dredging footprint, and will reduce the areal extent of dredging in the northern portion of the Anchorage Harbor. The area of dredging around the North Extension will be reduced from the extent dredged since 2008 by about 52 acres. The limits of the dredging project from 2008-2016 included about 318 acres; the dredging project assessed in this EA is about 266 acres. The dredging project and disposal areas have been reconfigured to avoid Cook Inlet beluga whale critical habitat.

Principal resources of concern identified in the EA process were salmon, beluga whales, the species they prey on, and their habitat. These resources were evaluated in the Corps of Engineers February 2017 EA. Those assessments led to the following conclusions:

- Adult salmon are not substantially affected. They tend to migrate closer to the shore. Noise and activity comparable to that of dredging does not prevent them from reaching spawning habitat in Knik Arm or elsewhere.
- Juvenile salmon may be present in the Knik Arm for more than a month during the dredging period and feed successfully at the surface during their residence. All dredged material and overflow water from dredging will be discharged beneath the surface to avoid impacts on juvenile salmon feeding. Turbidity at the surface will be tested during dredging to determine whether additional adaptive measures should be incorporated to protect this resource.
- Sounds generated by dredging and related activities are similar in intensity to those associated with other harbor activities, and most are close to ambient noise levels. To protect beluga whales, dredging activities will be suspended any time beluga whales are within 50 meters of the activity.

- Activities at and near the Port of Anchorage, including dredging, do not prevent beluga whales from feeding actively near the Port. During the winter, beluga whales may feed on fish and invertebrates on and near the bottom that are not available in Knik Arm at other times. Dredging and dredged material disposal will affect a maximum of about 650 acres of Knik Arm bottom habitat that may be used by prey organisms. Alteration of habitat is unlikely to substantially affect beluga whale feeding because: (1) potential prey organisms are mobile and able to repopulate affected areas, (2) the affected area is a small part of available habitat in the Cook Inlet beluga whale winter range, and (3) because winter habitat in Cook Inlet belugas' range supported a much larger population just a few years ago.

A reduction in the areal extent of dredging, volume of dredged material generated, and general intensity of dredging activity is expected to have a less than significant impact on the resources present in the project area. Dredging at the Port may affect, but is not likely to adversely affect, Cook Inlet beluga whales, and waters and substrate necessary for the feeding, spawning, breeding, or rearing of federally managed fish species such as the five species of Pacific salmon. The National Marine Fisheries Service Habitat Division concurred with the Essential Fish Habitat determination on December 8, 2016, and the Alaska District has requested concurrence from the National Marine Fisheries' Protected Resource Division regarding the endangered species determination.

This Corps action complies with the National Historic Preservation Act, the Endangered Species Act, the Clean Water Act, the Magnuson-Stevens Fishery Conservation and Management Act, and the National Environmental Policy Act. The EA supports the conclusion that the action does not constitute a major Federal action significantly affecting the quality of the human and natural environment. An environmental impact statement is therefore not necessary for the maintenance dredging at the Port of Anchorage.

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Michael S. Brooks Colonel, U.S. Army Commanding	Date

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List of Acronyms

MOA……………………….……….…….Municipality of Anchorage
POA…………………………..……..Port of Anchorage
APMP………………………………….Anchorage Port Modernization Program
PIEP………………………..……….Port Intermodal Expansion Project
OCSP………………………………….Open Cell Sheet Pile
MARAD…………………………....Maritime Administration
USACE………………………………..United States Army Corps of Engineers
MLLW…………………..……………Mean Lower Low Water
EC………………………………………..Engineer Circular
ER…………………….…………….Engineer Regulation
USC……………………………………United States Code
ADFG…………………………………Alaska Department of Fish and Game
ADEC……….……………………..Alaska Department of Environmental Conservation
NAAQS………………………………National Ambient Air Quality Standards
CO……………………………………Carbon Monoxide
CFR……………………………………Code of Federal Regulations
CEQ…………………………..…….Council on Environmental Quality
EPA…………………………..….Environmental Protection Agency
PM_{10}……………………..…………Particulate Material smaller than 10 microns
$PM_{2.5}$……………………..…………Particulate Matter smaller than 2.5 microns
ANC…………………..…………Ted Stevens International Airport (Anchorage, AK)
AFB………………………..………Air Force Base
NTUs…………………………………Nephelometric Turbidity Units
GOA……………………………..…Gulf of Alaska
ESA……………………………….....Endangered Species Act
RHA………………………………...Rivers and Harbors Act of 1899
CWA…………………………………..Clean Water Act
DPS……………………………………..Distinct Population Segment
CZMA…………………………………Coastal Zone Management Act
MPRSA……………………………...Marine Protection, Research, and Sanctuaries Act
NEPA……………………………………National Environmental Policy Act
EIS……………………………………Environmental Impact Statement
SHPO……………………………………State Historic Preservation Act
APE……………………………….....Area of Potential Effect
EO………………………………………..Executive Order
CINC……………………………………Cook Inlet Navigation Channel
dB……………………………………….Decibel
RMS……………………………………..Root Mean Squared
SPL……………………………………Sound Pressure Level

1.0 Purpose and Need

1.1 Introduction

In accordance with the National Environmental Policy Act (NEPA) of 1969, this environmental assessment (EA) assesses the potential environmental impacts related to the proposed transitional and maintenance dredging of the Federal dredging project at the Port of Anchorage (Port) and the transit of dredged materials to the Anchorage in-water disposal area.

The Anchorage Harbor is located in the Municipality of Anchorage, Alaska, near the confluence of the Knik Arm and Turnagain Arm of Cook Inlet and is the state of Alaska's primary commercial port. The harbor's main Federal features are an authorized harbor depth of minus 45 feet mean lower low water (MLLW) along 10,860 feet of the Port. The project is currently maintained at minus 35 feet MLLW; as the funding for dredging to minus 45 feet mean lower low water has not been appropriated. Dredged materials are transported to the Anchorage in-water disposal site located 3,000 feet abeam the dock face. The Port of Anchorage is connected to lower Cook Inlet by the Cook Inlet Navigation Channel (CINC), a channel 11,000 feet long and 1,100 feet wide constructed to a depth of minus 38 feet MLLW in 2000.

This EA has been prepared in accordance with the NEPA of 1969, the implementing regulations of the Council on Environmental Quality (CEQ) (Title 40 *Code of Federal Regulations* [CFR] Parts 1500 through 1508), and the U.S. Army Corps of Engineers' (USACE) procedures for implementing NEPA, 33 CFR 230 and Engineer Regulation 200-2-2, Procedures for Implementing NEPA (USACE 1988).

Sediments in the proposed Anchorage Harbor dredging area were collected in 2016 and evaluated to determine their suitability for in-water disposal in accordance with protocols in the *Puget Sound Dredged Material Management Plan, 2016.* No analytes exceeded screening values.

1.2 Authority

The U.S. Army Corps of Engineers has been dredging the Port of Anchorage (Port) since 1965. The Secretary of the Army was directed by in 2005 by Section 118 of Public Law 108-447 to construct a harbor depth of minus 45 feet below Mean Lower Water (MLLW) in the modified Port of Anchorage.

> SEC. 118. COOK INLET, ALASKA. (a) ANCHORAGE HARBOR.—
>
> (1) HARBOR DEPTH.—The project for navigation improvements, Cook Inlet, Alaska (Anchorage Harbor, Alaska), authorized by section 101 of the River and Harbor Act of 1958 (72 Stat. 299) and modified by section 199 of the Water Resources Development Act of 1976 (90 Stat. 2944), is further modified to direct the Secretary of the Army to construct a harbor depth of minus 45 feet mean lower low water for a length of 10,860 feet at the modified Port of Anchorage intermodal marine facility at each phase of facility modification as such phases are completed and thereafter as the entire project is completed.

> (2) COST-SHARING.—If the Secretary determines that the modified Port of Anchorage will be used by vessels operated by the Department of Defense that have a draft of greater than 35 feet, the modification referred to in paragraph (1) shall be at full Federal expense.
> (3) TRANSITIONAL DREDGING.—Before completion of the project modification described in paragraph (1), the Secretary may conduct dredging to a depth of at least minus 35 feet mean lower low water in such locations as will allow maintenance of navigation and vessel access to the Port of Anchorage intermodal marine facility during modification of such facility. Such work shall be carried out by the Secretary in accordance with section 101 of the River and Harbor Act of 1958.
> (4) FACILITATING FACILITY MODIFICATION.—Before establishing the harbor depth of minus 45 feet mean lower low water, the Secretary may undertake dredging in accordance with section 101 of the River and Harbor Act of 1958 within the design footprint of the modified intermodal marine facility referred to in paragraph (1) to facilitate modification. The Secretary may carry out such dredging as part of operation and maintenance of the project modified by paragraph (1).
> (5) MAINTENANCE.—Federal maintenance shall continue for the existing project until the modified intermodal marine facility is completed. Federal maintenance of the modified project shall be in accordance with section 101 of the River and Harbor Act of 1958; except that the project shall be maintained at a depth of minus 45 feet mean lower low water for 10,860 feet referred to in paragraph (1).

In the interim, the Port has been the subject of two modification projects: the Port Intermodal Expansion Project (PIEP) and Anchorage Port Modernization Project (APMP). The size and shape of the dredged area has been in a state of flux since construction commenced on the PIEP, a project intended to remediate the deteriorated condition of Port facilities and increase throughput capacity. The first phase of the PIEP, a sheet pile bulkhead in the northern end of the Port known as the North Extension, encountered critical impediments to implementation in 2010 and construction was halted. The Municipality of Anchorage (MOA) has developed an alternate plan to modernize the Port, the APMP. The Alaska District, U.S. Army Corps of Engineers evaluated, under Section 408 of 33 CFR, a modification to the dredging project in the harbor to improve its usefulness to the newly redesigned harbor.

1.3 Purpose of the Action

The purpose of the maintenance dredging is to maintain authorized depths of the Federal entrance channel and harbor basin at Anchorage Harbor. The purpose of transition dredging is to construct access to a planned Petroleum and Concrete Terminal (PCT) approach and berth. The Anchorage Harbor is dredged annually between May and November in order to keep up with the rapid sedimentation rate of the Knik Arm. Sedimentation in some areas, such as the northern berth, limits the size of the vessels that can operate or the movement of those vessels. The Anchorage Harbor was designated as a Department of Defense National Strategic Seaport in 2006, one of 19 commercial seaports in the United States. The dredging limits would be changed from the size and shape evaluated in the 2008 Anchorage Harbor Dredging and Disposal Environmental Assessment (EA) conducted for the now defunct PIEP.

This EA considers the effects of maintenance and transition dredging for the Port for years 2017 through 2021; any required maintenance dredging beyond 2021 will be addressed in further NEPA analysis.

1.4 Scope of the Action

The scope of analysis for the NEPA and environmental compliance evaluations is the impacts associated with the transitional and maintenance dredging in the Anchorage Harbor basin and the in-water disposal of dredged material at the Port of Anchorage disposal area. The Municipality of Anchorage's application to do work in navigable waters and place fill materials into waters of the United States for the construction of the North Extension Stabilization Step-1 (NES Step-1) project and Petroleum and Concrete Terminal (PCT) under Section 10 of the Rivers and Harbors Act of 1899 (33 CFR Part 403) and Section 404 of the Clean Water Act (40 CFR Part 230) are not included in the scope of this environmental assessment. Those activities require Department of the Army authorization by the USACE Regulatory Division and are evaluated independently of the transitional and maintenance dredging project assessed here. The changes to the Federal dredging project to accommodate the construction of the PCT and NES Step-1 evaluated under Section 408 of 33 CFR are likewise not included in the scope of this EA. The impacts associated with the Section 408 permission request have been evaluated in other environmental assessments.

1.5 Issues and Concerns

Principal concerns are related to potential effects of dredging turbidity, suspended solids, noise, and potential mechanical damage to fish, beluga whales, and other organisms.

1.6 Description of the Project Area

The Port of Anchorage is in Southcentral Alaska at the upper end of Cook Inlet. It is adjacent to downtown Anchorage on the southeastern shoreline of Knik Arm at latitude 61º 13.3' N, longitude 149º 54.6' W (Figures 1 and 2). Anchorage, the state's largest city and center of transportation, is at the inlet's northeast end, between Knik and Turnagain Arms. Nearly half the state's population resides in Anchorage. The Cook Inlet Navigation Channel connects the Port to lower Cook Inlet and the Gulf of Alaska.

Cook Inlet is a large estuary on the south-central coast of Alaska, bordered on three sides by rugged mountains, tidal flats, marshlands, and rolling lowlands. Figure 1 shows the inlet and the topographic features that surround it. The inlet is approximately 200 miles long, from the upper ends of Knik Arm and Turnagain Arm in the north to the southern tip of the Kenai Peninsula. Both Knik Arm and Turnagain Arm, at the northern extreme of Cook Inlet near Anchorage, are more than 37 miles from their confluence to the limits of their tidelands.

The majority of fresh water that enters upper Cook Inlet is from three rivers at its northern end. The Matanuska, Susitna, and Knik Rivers contribute nearly 70 percent of the fresh water discharged annually into the inlet (Gatto, 1976). These glacier-fed rivers carry a heavy sediment load into Cook Inlet, particularly during summer. Rivers entering Turnagain Arm discharge nearly 3 million tons of sediment annually, while the rivers entering Knik Arm discharge about 20 million tons (Gatto, 1976). This sediment continues to fill the upper inlet. The finest material in this sediment is carried into the southern inlet and some of it is goes out into the Gulf of Alaska.

Upper Cook Inlet above the East and West Forelands is a shallow basin, with depths generally less than 65 feet. Knik Arm averages about 50 feet in depth for about half its length and then rapidly shoals to a tidal flat. Turnagain Arm shoals within the first 10 miles to a large tidal flat cut by many tidal channels.

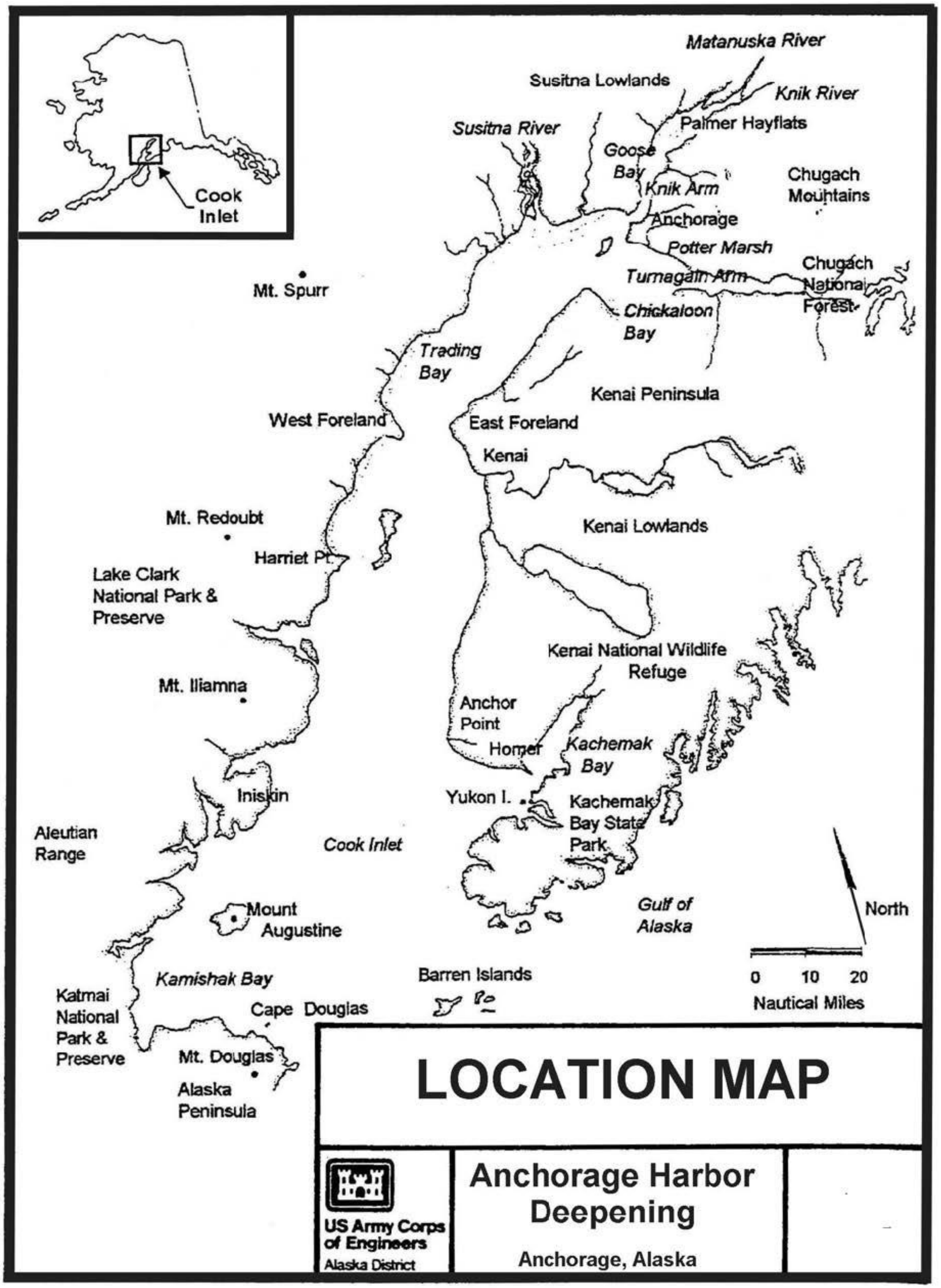

Figure 1. Port of Anchorage Location Map

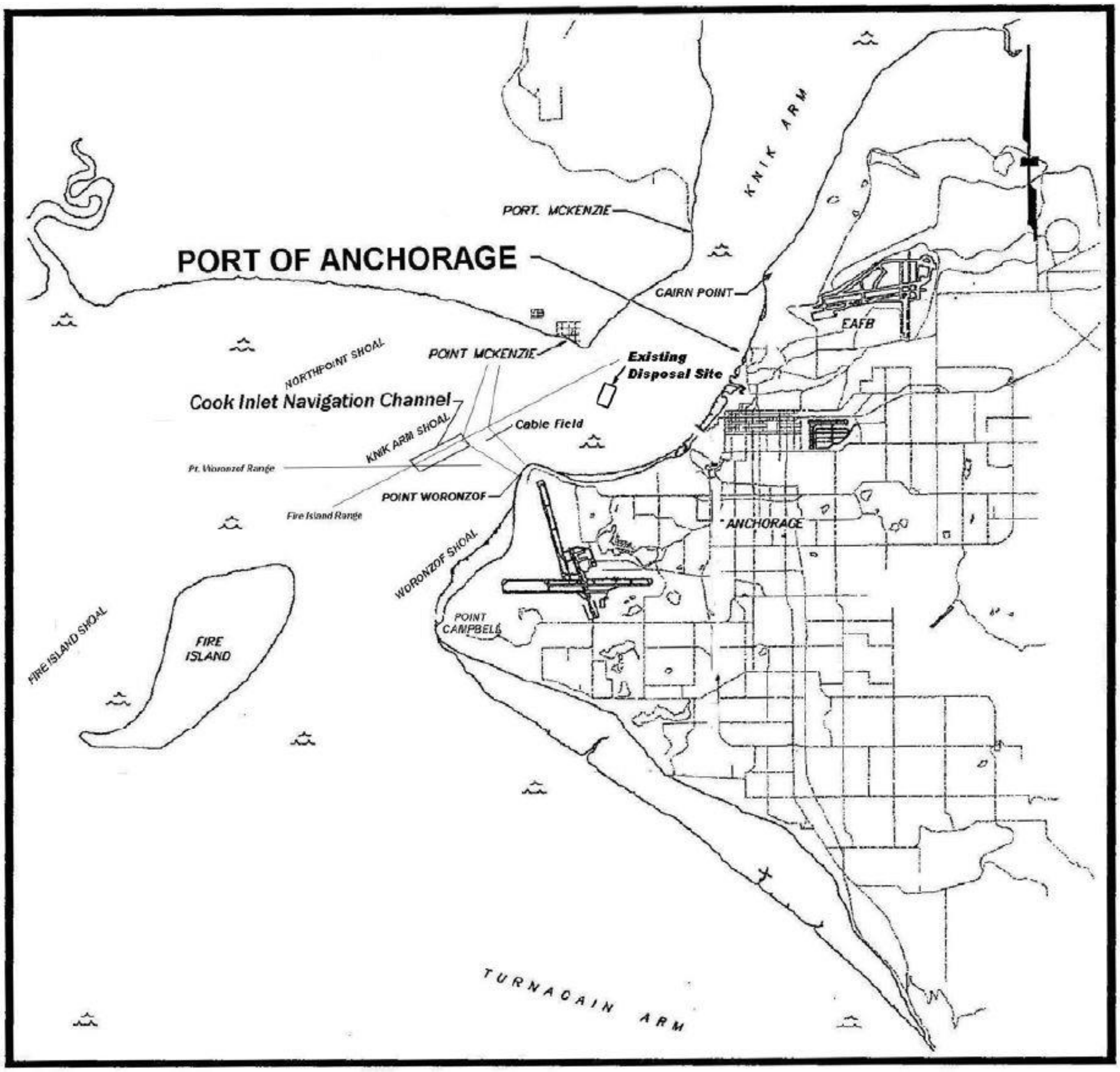

Figure 2. Port of Anchorage Vicinity Map

The Cook Inlet area is in a transition zone between Alaska's maritime and interior climates. The lower inlet has a more maritime climate, with cooler summers and milder winters than in the upper reaches of the inlet. A comparison of temperatures between two cities located at opposite ends of the inlet demonstrates the differing climates. Anchorage, at the head of the inlet, has an average winter temperature of 16 °F and a summer average of 55 °F, while Homer, near the southern end of the inlet, averages 19 °F in winter and 50 °F in the summer.

The mean daily tide range is about 30 feet at Anchorage. The tides are two unequal high tides and two unequal low tides per tidal day. A tidal (lunar) day is 24 hours and 50 minutes. The greatest tides are in the spring, with high and low tides exceeding the mean by more than 5 feet. Currents in the upper inlet are classified as reversing currents because the flow changes to the opposite direction and is briefly near zero velocity at each high and low tide. Extreme tides can cause currents in upper Cook Inlet to exceed 4 knots in some areas. Each tidal cycle in the upper inlet creates strong turbulence and vertical mixing, so water properties tend to be more uniform from the surface to the bottom in most areas.

The upper inlet is so shallow that wave heights seldom exceed 10 feet. Knik Arm waves are further constrained east of Fire Island by limited fetch. Strong tidal currents in Cook Inlet can oppose wind-generated waves. This can make waves steeper and more chaotic, a dangerous condition for small boats.

1.7 Current Operations

Port of Anchorage. Anchorage Harbor was authorized by Section 101 of the Rivers and Harbor Act of 1958, as modified by Section 199 of the Water Resources Development Act of 1976. The project accommodates three dry cargo berths and two petroleum handling facilities. The Port of Anchorage serves as Alaska's regional and a Department of Defense National Strategic Port providing services to approximately 80 percent of the total population of Alaska, including four military installations. Vessels with drafts up to 40 feet dock during high tide and offload their cargo. Annual maintenance dredging allows the minus 35 feet MLLW congressionally authorized depth to be available 90 percent of the time.

The U.S. Army Corps of Engineers has dredged the Port of Anchorage annually at full Federal expense to its authorized depth of minus 35 feet MLLW since the 1960's. Dredging limits run the length of the existing 3,000 foot dock face. Federal maintenance dredging starts 5 feet from the dock face and currently extends about 2,000 feet seaward. The annual maintenance dredging period has expanded from 3 months per year in earlier years to 7 months per year today. Figure 3 depicts the configuration of the current dredging project.

Section 118 of the 2005 Consolidated Appropriations Act directed the Secretary of the Army to construct a harbor depth of minus 45 feet mean lower low water for a length of 10,860 feet at the Port of Anchorage, to be phased with the completion of various components of the PIEP.

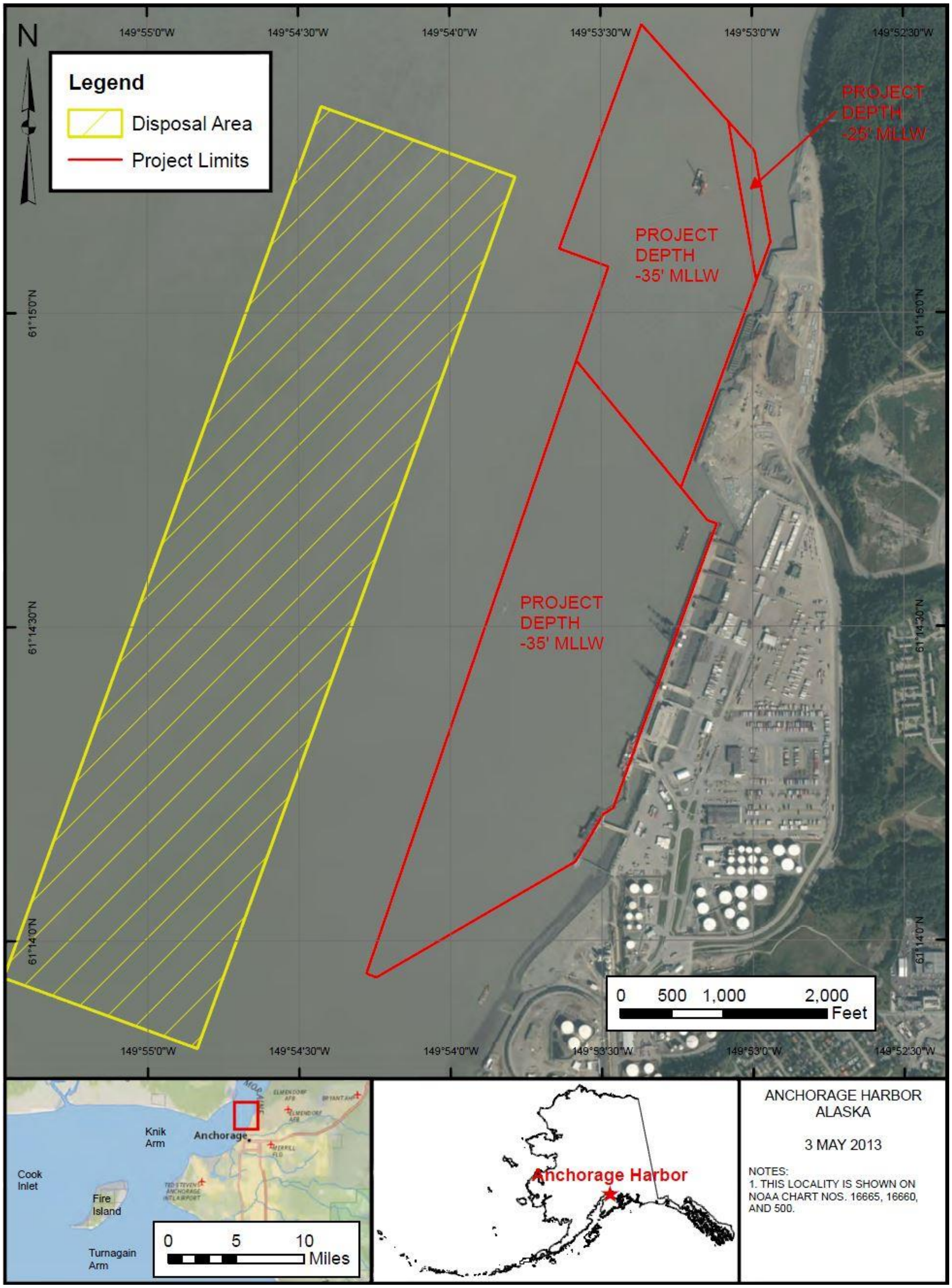

Figure 3. Configuration of current Anchorage Harbor dredging project and disposal area

Dredging quantities in Anchorage Harbor are unpredictable. Annual amounts have ranged between 450,000 and 2,500,000 cubic yards per year since the current Port configuration was completed with the construction of the POL-2 dock in 1992. Associated dredging costs have ranged from $7 to $18 million per year. The variability in sedimentation seems to be caused by one or more natural occurrences. For example, increases may result from unusually warm winters in which glacial-fed rivers do not freeze for the normal length of time leading to shoaling in the late November through January timeframe. Increased sedimentation can also result from exceptionally warm summers where the Matanuska and Knik glaciers discharge abnormally large amounts of silt into upper Knik Arm where the Port is located. Table 1 contains dredging quantities from 2005 to 2015. (USACE, Alaska District, 2016)

Table 1. Port of Anchorage Dredging Quantities

Year	Cubic Yards Dredged
2005	1,832,610
2006	1,749,385
2007	1,766,357
2008	1,338,281
2009	702,366
2010	619,506
2011	944,462
2012	1,067,684
2013	1,021,088
2014	1,117,886
2015	1,206,151

As a result of the partially completed construction of the North Extension segment of the PIEP, an increase in shoaling was experienced because of the altered hydrodynamic process in front of the Port. The seaward protrusion of fill created a pocket of heavy siltation at Terminal 3 of the existing dock, which now requires more repetitive dredging than before. In addition, excessive shoaling is occurring at Terminal 3 during winter periods when floating dredges are not able to operate due to ice conditions. In 2010, dredging from the dock with a clamshell was attempted during the winter, but it could not keep up with the infill.

In 2013, annual maintenance dredging started in April, which at the time, was the earliest start date for Anchorage dredging. In 2014 and 2015, the high rate of shoaling between November and March resulted in additional costs to mobilize a clamshell dredge in mid-March to dredge until normal operations with the contract hopper dredge could begin in late April. In 2016, early dredging was also required due to shoaling at Terminal 3, but the 2015-2016 winter was warmer than normal and ice conditions allowed for early mobilization of the summer hopper dredge in mid-March in lieu of mobilizing a separate clamshell dredge. The cost to perform "winter dredging" in advance of normal summer maintenance dredging has ranged from $1.2 to $2 million per year.

2.0 Alternatives

2.1 Range of Alternatives

Based on the needs described in Section 1, the objective of the project is to provide safe navigation and access to the Port of Anchorage. In addition, 40 CFR 1508.25(b)(1) requires that an environmental assessment evaluate a full range of reasonable alternatives based on the stated project purpose and need, including a no-action alternative.

Based on the project purpose, the following suite of alternatives were considered:

- No-Action alternative
- Perform transitional and maintenance dredging to the authorized project depth in Anchorage Harbor and dispose of dredged material in the Anchorage Harbor open water disposal site.

2.2 Alternatives

2.2.1 No-Action Alternative

Section 1502.14(d) of the President's Council on Environmental Quality (CEQ) NEPA Regulations requires an analysis of the no-action alternative, as does the U.S. Army Corps of Engineers' Engineer Regulation (ER) 1105-2-100 and ER 200-2-2. The no-action alternative for a proposed action, where ongoing operations and activities initiated under existing legislation and regulations are expected to continue, "No-Action" is interpreted as "No-Change" from current operations or level of intensity. The "No-Action" alternative is therefore the continuation of the present course of action. Consequently, projected impacts of alternative operations or conditions are to be compared to those impacts projected for existing operations.

Under the no-action alternative, neither dredging of the Port nor disposal of dredged material would occur. The Anchorage Harbor would be silted in, beginning at terminal 3 and progressing towards the southwest. Vessel access would be restricted and eventually precluded due to draft requirements. The accumulated sediments that currently restrict deep draft navigational access would not be removed, and no window would be provided within which additional materials could accumulate before additional negative impacts to navigational access occurred. Shoaling would likely continue at the current rate and lead to additional shipping restriction in terms of timing and eventually lack of access at all tide stages for larger vessels.

2.2.2 Perform transitional and maintenance dredging to authorized depth in Anchorage Harbor and dispose of dredged material in the Anchorage Harbor open water disposal site (Preferred Alternative)

The Alaska District proposes to perform transition and maintenance dredging of the Anchorage Harbor basin to minus 35 feet MLLW and dispose of dredged material in the Port of Anchorage open water disposal area located 3,000 feet abeam of the main terminals. Dredging would be conducted April through November. Maintenance dredging quantities are highly variable in the harbor, with the volumes fluctuating between 600,000 cubic yards and 1.8 million cubic yards in the decade between 2005 and 2015. The 5-year mean volume from 2010 to 2015 is 1.1 million cubic yards. Transition dredging in the southern extent of the harbor would generate up to an estimated 666,000 cubic yards of additional sediments bound for the Anchorage Harbor open water disposal site in the year it is conducted. This amount would be reduced if the Alaska District elects not to dredge the foreslope between the PCT and shoreline, estimated to contain approximately 68,000 cubic yards of sediment.

The dredging prism in the Port is a roughly trapezoidal shape occupying 266 acres with the shorter parallel segment extending in the east along 3,600 feet of pile supported dock and another 1,100 feet of North Extension bulkhead. The western margin of the dredging project is 8,000 feet long and lies about 1,800 feet from the face of the main terminal. Figure 4 depicts the proposed project footprint.

Transitional dredging would be performed in Area D; this is the only area that has not been dredged annually and would produce up to an estimated 666,000 cubic yards of additional material, if the foreslope behind the PCT is included in the project, the first year it is dredged.

The Port of Anchorage open water disposal site is a rectangular area of 320 acres beginning 1,200 feet beyond the western edge of the dredging prism. The water over the site is 70 to 100 feet deep and is subject to powerfully dispersive tidal currents. Surveys of the disposal area demonstrate dredged material does not accumulate.

Dredged material would be transported to the disposal site by tug and barge, or by the dredger in the case of a hopper dredge, in increments of approximately 1,500 cubic yards. Two to four daily transits would be required for normal operations.

The size and shape of the Federal project in the Port of Anchorage were modified by two requests by the Municipality of Anchorage under Section 408 of 33 CFR in order to conform the dredged area to the planned PCT and NES Step-1 projects. These modifications reduced the footprint of the project by about 52 acres, from 318 acres to 266 acres.

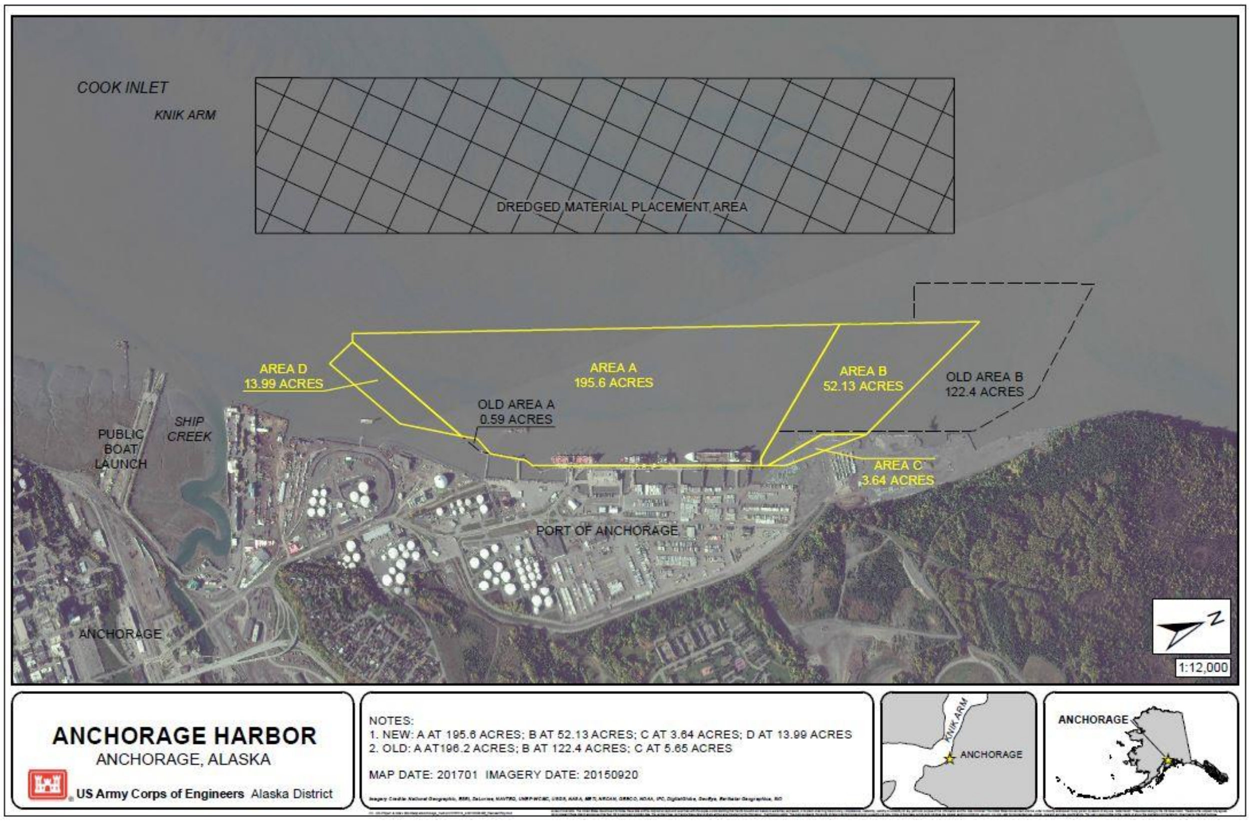

Figure 4. Proposed transitional and maintenance dredging in the Anchorage Harbor; yellow lines delineate areas to be dredged and the broken black lines are the areas removed from the dredging prism.

3.0 Affected Environment

The affected environment section succinctly describes the existing environmental resources that would be affected in the Port of Anchorage project area if any of the alternatives were implemented. This section describes only those environmental resources that are relevant to the decision to be made. It does not describe the entire existing environment, but only those environmental resources that would affect or be affected by the alternatives if they were implemented. This section, in conjunction with the description of the no-action alternative, forms the baseline conditions for determining potential environmental impacts of the proposed action and reasonable alternatives.

3.1 Air Quality

The Port of Anchorage is approximately one-half mile north of downtown Anchorage. Overall, Anchorage enjoys very clean air, with an Air Quality Index rating of “good” on 92 percent of monitored days in 2007 (EPA 2007). The city maintains levels of regulated pollutants within the National Ambient Air Quality Standards (NAAQS) established under the Clean Air Act. The air quality standards include concentration limits on the “criteria pollutants” carbon monoxide (CO), ozone, sulfur dioxide, nitrogen oxides, lead, and particulate matter.

Anchorage has historically experienced elevated CO concentrations during the winter, when cold temperatures and the nearby mountains can result in temperature inversions that trap pollutants close to the ground. As in most urban areas, carbon monoxide emissions are generated primarily by vehicles, with cars and trucks accounting for around three-quarters of the annual CO emissions in Anchorage (ADEC 2004). Monitoring indicated that the majority of the CO originated in residential areas of the city, presumably a result of morning commuters cold-starting vehicles and idling them to operating temperature. A large part of metropolitan Anchorage was designated a “non-attainment” area for CO in November 1990. The Port of Anchorage is not within the boundaries of this non-attainment area, but is within a half-mile of its northwest corner.

Anchorage has been in compliance with the National Ambient Air Quality Standards (NAAQS) for carbon monoxide since 1997, and the city was re-designated from “non-attainment” to “maintenance” status for CO in July 2004, largely through a program of vehicle inspection and emission control. The state maintenance plan specifies measures the state will take to maintain compliance with air quality standards. The EPA requires a demonstration of maintenance for 10 years following re-designation.

In the period between 2000 and 2010, Anchorage exceeded the (NAAQS) promulgated by the U.S. Environmental Protection Agency (EPA) for carbon monoxide once, particulate matter smaller than 10 microns (PM_{10}) four times, and particulate matter smaller than 2.5 microns ($PM_{2.5}$) once. The American Lung Association ranked Anchorage fourth on the list of cleanest U.S. cities for year-round $PM_{2.5}$ pollution in their annual report published in 2010. (ADEC, 2012)

3.2 Noise

The Port of Anchorage is an area of relatively high ambient noise levels, a result of both natural and anthropogenic sources. Ice, tides, waves, precipitation, and currents are the main sources of natural ambient noise; while vessels, dredging, oil and gas platforms, sonar, and aircraft create the bulk of anthropogenic ambient noise.

The following sections and figures related to underwater noise have been adapted from Blackwell and Greene (2002), sometimes verbatim. The section on dredging noise was adapted from Dickerson *et al.* (2001). It is uncommon for a project to have such a wealth of recent and applicable underwater noise data, so it was utilized extensively in this document. Both documents are cited and are available on the internet.

Underwater noise was measured at five locations in Cook Inlet and Knik Arm in 2001 to document naturally occurring underwater sounds. Some sites selected are known to harbor beluga whales at certain times of the year (recording locations are shown as red inverted triangles in Figure 5). Those locations were not in the immediate vicinity of industrial activities and are more representative of “natural” ambient sound levels in the study area.

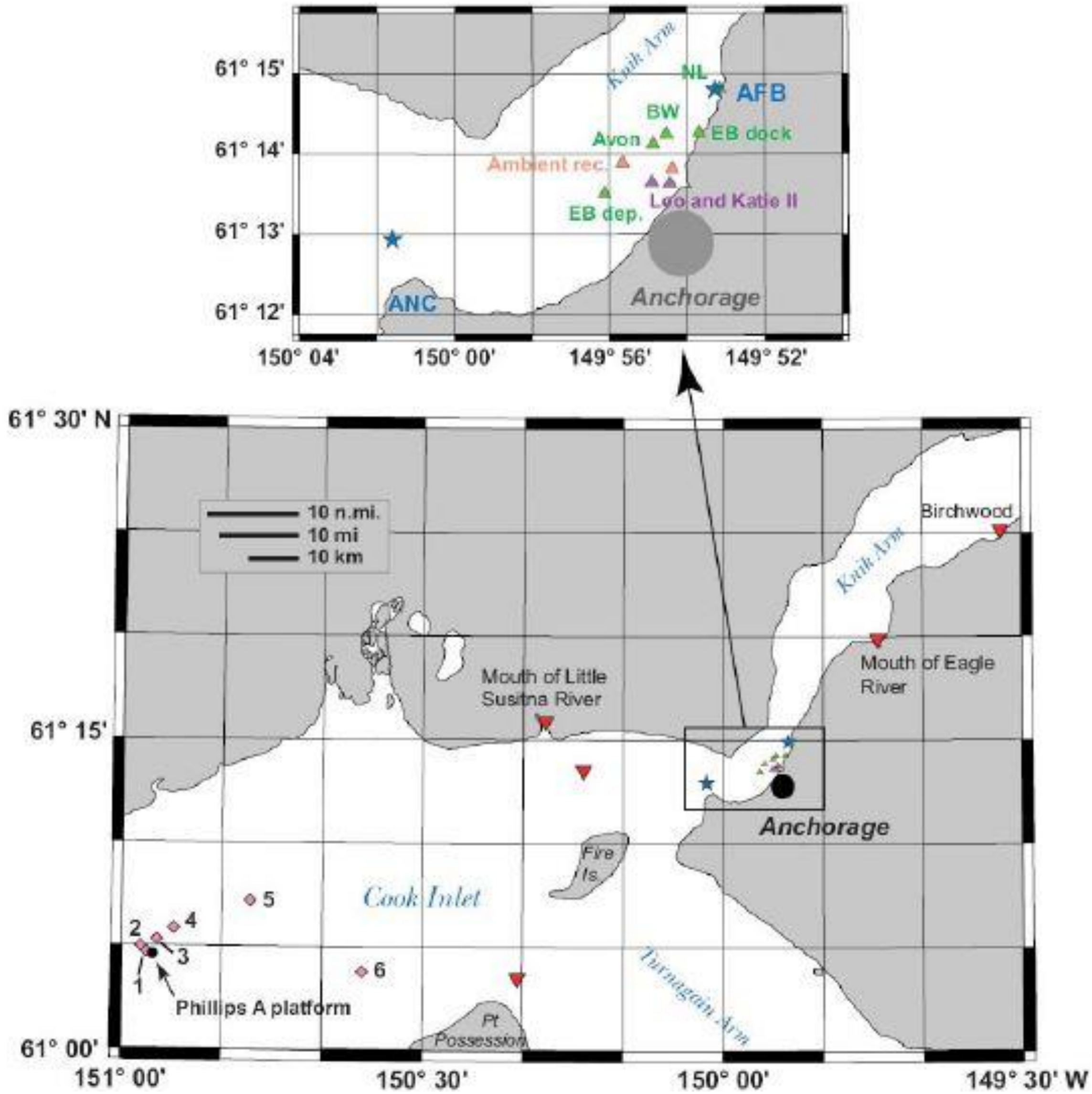

Figure 5. Map of Cook Inlet, Alaska, illustrating the August 2001 recording locations

Locations marked in the Figure 4 inset show where over flights were recorded seaward of the Ted Stevens Anchorage International Airport (ANC) and Joint Base Elmendorf-Richardson (JBER-Elmendorf) (blue stars); recording stations 1-6 for measurement of the Phillips A platform (pink diamonds); vessels in Anchorage harbor (purple, green, and orange triangles); and ambient sound level recordings (red inverted triangles). NL = *Northern Lights*, EB = *Emerald Bulker*, BW = Boston Whaler. Locations of the Phillips A platform and the small vessel (Avon and Boston Whaler) recording sites are presented on the figure, but are not discussed in this report (Blackwell and Greene, 2002).

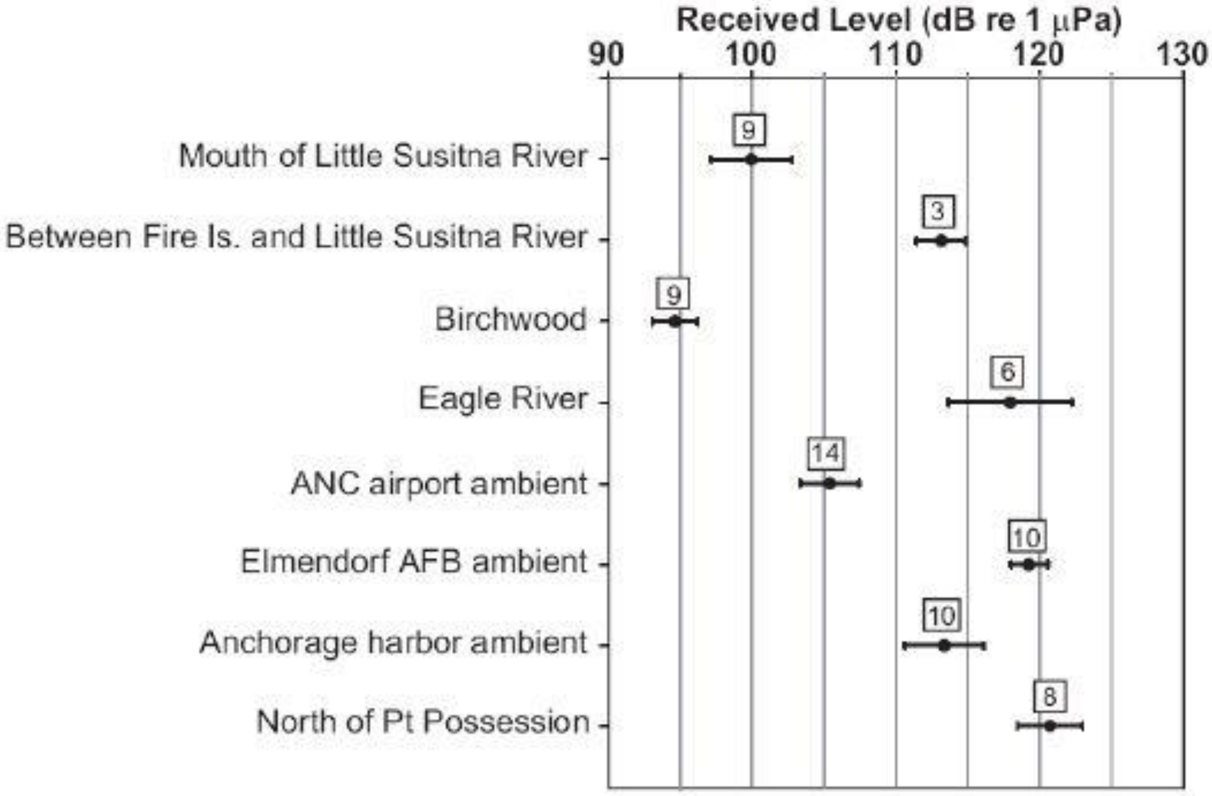

Figure 6. Broadband noise levels of the August 2001 recording locations

Underwater broadband (10 - 20,000 Hz) SPLs are presented in Figure 6 for the locations shown in Figure 4. In addition, three ambient levels from the general area are shown for comparison. They include ambient levels at the Anchorage airport and JBER-Elmendorf locations (recorded while no airplanes were landing or taking off; blue stars in Figure 5), and the Anchorage Harbor ambient recordings.

The mean ambient underwater broadband levels shown in Figure 5 span a fairly wide range, from 95 to 120 dB re 1 µPa. The variation within each recording, however, was generally small. The two quietest locations (Little Susitna River and Birchwood) were in areas removed from the proximity of industrial activity, but so was the loudest (north of Point Possession), where elevated broadband levels were attributed to the incoming tide. Broadband levels for the location between Fire Island and Little Susitna River were probably artificially inflated as there was a fair amount of wave slap noise on the recording vessel. It is not surprising that the recording location seaward of Ted Stevens Anchorage International Airport was the quietest of the "industrial" locations, as it is somewhat removed from Anchorage itself and the harbor. The ambient Port recording was from farther off shore than the JBER-Elmendorf ambient (which was also in the harbor area); this could explain the lower values.

3.3 Water Quality

The waters of Knik Arm are brackish, with salinities ranging from 10 to 12 practical salinity units (PSU, equivalent to grams of dissolved solids per kilogram of seawater) at Fire Island (Gatto 1976) and 4 to 6 PSU north of Cairn Point. Water temperatures range from freezing (about 31°F) to 63°F or more (in surface pockets observed during the summer months). Measurements of suspended sediment at several locations near the river mouths tend to be similar, showing concentrations of up to 1,000 mg/L between water surface and depths of 15 feet, then increasing to more than 4,000 mg/L at greater depths (Smith et al. 2005). The average natural turbidity of Upper Cook Inlet and Knik Arm typically ranges from 400 to 600 nephelometric turbidity units (NTU's). The turbulent nature of the system mixes the water and maintains relatively high dissolved oxygen concentrations through the entire water column.

At the mouths of the streams and rivers that flow into Knik Arm, fresh water interacts with the sea water to create an identifiable zone. Since the sea water is more dense, the fresh water will float on top until it is mixed by tides and currents, creating a freshwater lens that is sometimes less turbid than the sea water. The lenses extend relatively short distances out from the river mouths and in the direction of the current and may provide important fish habitat.

The significant streams flowing into the Knik Arm near the Port include Ship Creek, Chester Creek, Campbell Creek, Fish Creek, and Little Campbell Creek. All these streams flow through urban areas and are identified as CWA Section 303(d) impaired water bodies (ADEC 2008).

Ship Creek is the closest stream to the Port. It is a non-glacial stream that originates at Ship Lake in the Chugach Mountains. Water is diverted from Ship Creek at several locations as it flows through Joint Base Elmendorf-Richardson, and Anchorage before it discharges into Cook Inlet about a mile south of the Port. Chester Creek, Campbell Creek and Little Campbell Creek pass through other highly urbanized watersheds before discharging farther south of Ship Creek.

Annual maintenance dredging and disposal activities at the Port generally begin in mid-May, shortly after the ice is out of the inlet, and continue into November. The sediments dredged by existing annual maintenance operations and the sediment that would be dredged from the proposed dredging footprint have been evaluated to determine the presence of contaminants (USACE 2008). Samples were collected and tested for volatile and semi-volatile organic compounds, total recoverable petroleum hydrocarbons, PCBs, pesticides, cadmium, mercury, selenium, silver, arsenic, barium, chromium, and lead.

Contaminant concentrations in the samples were below screening levels (State of Washington, Department of Ecology, Sediment Management Standards Minimum Cleanup Levels-Chemical Criteria) and have been determined to be suitable for in-water discharge. Although the sediment does not contain significant contaminant concentrations, dredging and disposal activities create localized increases in suspended sediment concentrations and turbidity and slightly lower dissolved oxygen concentrations at the dredging and disposal sites.

3.4 Water Circulation Patterns and Sedimentation

The primary hydrodynamic mechanism in the Knik Arm is the bidirectional flow of the largest tidal range in the United States. The ebb tide appears to have the greatest impact on the Anchorage Harbor project; Cairn Point and the North Extension influence sediment deposition in localized regions within the harbor area. Figure 7 is a depiction of dredging intensity during the 2016 dredging season; the yellow pixels represent higher intensity of the dredging operation.

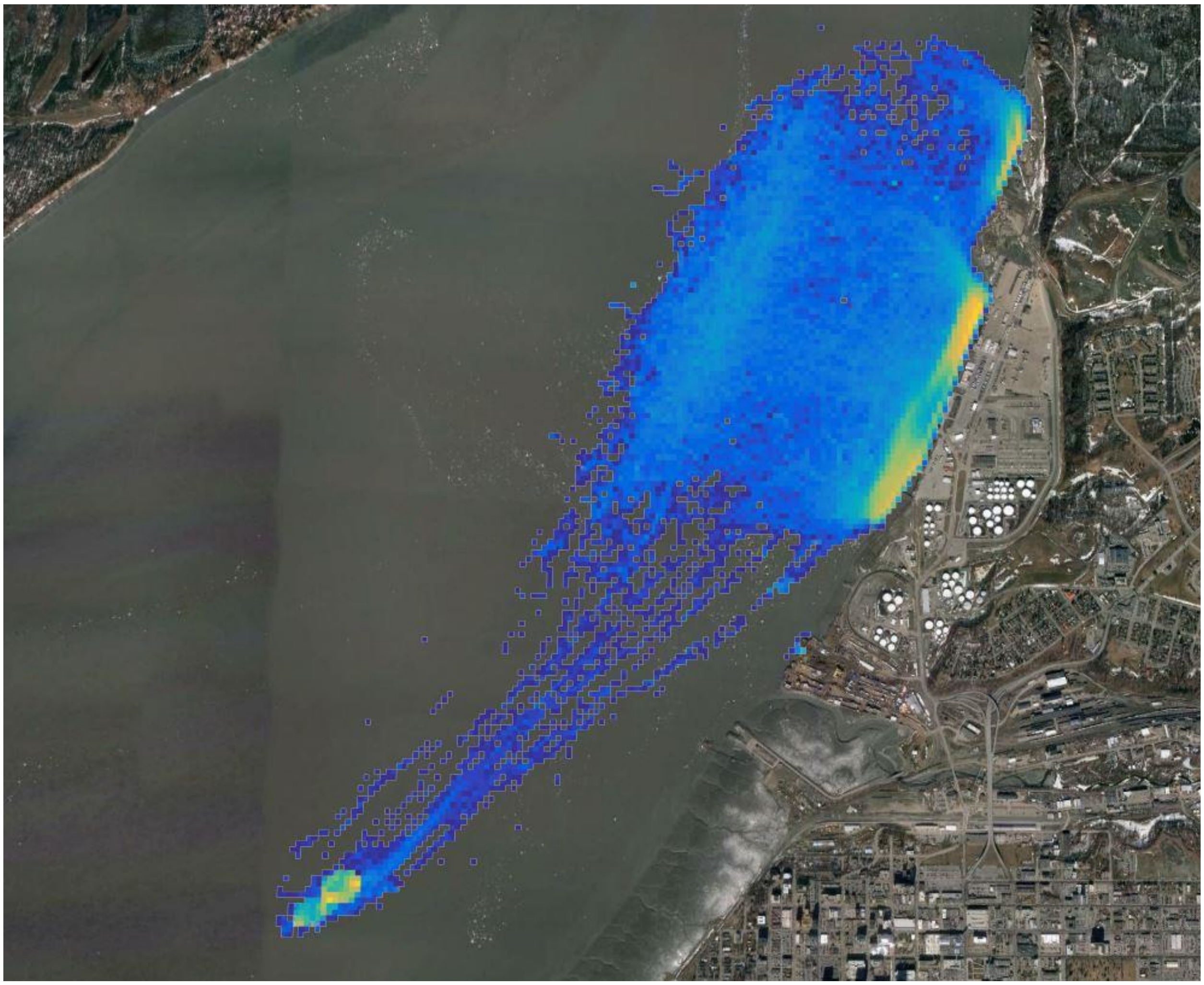

Figure 7. Dredge intensity during the 2016 dredging season at the Port of Anchorage. The high intensity area in the southwestern quadrant of the figure is the dredger's standby location.

The USACE dredges sediment every year to maintain the minus 35-foot MLLW authorized Federal depth in the approach channel and in the berthing areas of the Port. Dredging starts in the spring along the existing dock, progressively moving seaward to the extent of the dredged area; approximately 800 feet seaward of the dock face. Dredged material is transported to the in-water disposal site, approximately 3,000 feet abeam the dock face. The dredged material is very cohesive; the bulk of the material reaches the seafloor 70 feet below MLLW in the disposal area rather than being dispersed as it moves through the water column. The deposited dredged material is dispersed through Knik Arm by the strong tidal currents over the course of the year. Contractor surveys of the area and bathymetric measurements conducted every year show material has not remained at the disposal site. The volumes of material that have been dredged from the Port between 2005 and 2015 are shown in Table 1 in Section 1.6.

The current configuration of the North Extension creates a gyre off the south western corner of the bulkhead, which results in the accretion of large amounts of sediment at Terminal 3. This infill has required the early mobilization of the dredge contractor to remove the infill. Warm winters have reduced the extent and duration of ice in rivers flowing into Cook Inlet in recent years, likely exacerbating the accretion problem at the Port. In 2010, shoaling at Terminal 3 reached the extent that winter dredging was required to retain the use of the terminal, but ice in Cook Inlet prevented the mobilization of water based dredging. These conditions prompted a land-based attempt to remove the shoal. A crane was stationed on the dock to remove sediment for upland disposal, but the crane was not able to keep up with the infill nor able to achieve project depth 100 feet from the dock face.

3.5 Cultural Resources

This project will dredge material from the seabed and dispose the material farther off shore in deeper water. Initial data review identified a sunken anomaly that eventually was determined to be concrete connected with rebar. In 2008, the Corps determined that the feature is not an historic property, and the State Historic Preservation Officer concurred. In 2010 the dredge contractor removed two 120-ton World War II era concrete pillboxes and placed them in the disposal area below 109 feet of water. Prior consultation with the State Historic Preservation Office had addressed the possibility that a pillbox might be discovered, but determined that it would not be eligible for the National Register of Historic Places because the pillbox would be out of its original context and no longer retain historic integrity. No other resources of potentially historic value were identified in the areas proposed for dredging or dredged material disposal.

3.6 Vegetation

Grasses, sedges, and other vascular plants in the estuarine Port area do not survive at elevations much below the upper tidal range. Arrow grass, silverweed, and salt grass are reported growing on upper mud beaches (Pentec 2005) along with clumps of vegetation eroded from adjacent shorelines. Macrophytes (seaweed) assemblages are sparse in the muddy intertidal zone of Knik Arm, but some types of seaweed, including green algae (*Enteromorpha linza, E. intestinalis, E. prolifera*) and rockweed (*Fucus gradneri*) are reported on hard substrates of the rockier shores of western Knik Arm within a few miles of the Port of Anchorage (Pentec 2005, Nemeth et al. 2007). Hard substrates are uncommon near the Port of Anchorage except for man-made structures and debris, and attached seaweed is rare. Nowhere in Knik Arm has living, attached seaweed been reported at depths below the intertidal zone. The highly turbid waters of Knik Arm would keep sunlight from reaching seaweed, so they could not manufacture food through photosynthesis and could not survive.

Marine phytoplankton (unattached algae) are present throughout Cook Inlet. Phytoplankton in upper Cook Inlet are primarily diatoms (Pentec 2005). Diatoms are single-cell algae that are particularly well adapted to surviving in turbid waters and other difficult environments. They are among the most adaptive of the algae's. Some are capable of surviving transition from fresh to salt water, and rivers can be a source of diatoms in estuaries. As could be expected in very turbid waters, none of the studies conducted in Knik Arm have reported substantial phytoplankton biomass. Phytoplankton would have the greatest chance of survival and reproduction near the surface, where they can absorb sunlight for photosynthesis.

3.7 Marine Invertebrates

Knik Arm has often been described as a "sterile" environment, almost devoid of fish and invertebrates except for anadromous fish moving through the Arm to and from spawning habitat. The Knik Arm studies did not find as many invertebrates as might be found in central and southern Cook Inlet, but did find more invertebrate numbers than might have been expected. Collections in a net towed through two transects in deeper water near the Corps' historically used dredged material disposal site collected an average of about 250 invertebrates per tow. They were mostly small, almost clear, crustaceans (Table 2). Many of the little amphipods that made up most of the collection were so small that, if given time, they could crawl through the ¼ - inch mesh of the net bag.

Marine invertebrates include forms like polychaete worms that burrow into the bottom, snails, and bottom-dwelling crustaceans that live on the top of the seafloor, and the many forms of sea life in the water column like shrimp, smaller crustaceans, and the sub-adults forms of bottom-living species. Diversity of marine invertebrates in Kink Arm is extremely limited. Pentec (2005) summarizing extensive studies between 1982 and 2004 for a Knik Arm bridge, identified fewer than a dozen species of marine invertebrates from both the bottom and the water column. The collections also were unusual because most of the same species were collected both from the bottom and from the water column.

The Pentec report suggested that severe scouring, mixing, and sediment transport may carry normally bottom-dwelling polychaete worms, mysid and crangonid shrimp, and amphipods up into the water column. Densities of these small organisms were about the same in most places sampled, which also indicates an unusual degree of mixing. The only notable stratification in the deeper waters was by one species of amphipod that was unusually abundant just beneath the surface in pockets and lenses of water with less suspended sand and silt than most Knik Arm water.

Kink Arm collection data suggest that in the spring, summer, and autumn periods when invertebrates were collected, the numbers of invertebrates present in Knik Arm are low for marine waters and the diversity is extremely low. There are, however, invertebrates that could be prey for birds and fish. The most promising habitat for predators that might feed on the little amphipods is in the small pockets of surface water with comparatively little sediment where sight-feeding birds and fish might be able to locate them. While marine invertebrates are relatively limited in availability to predators, terrestrial insects are apparently relatively abundant on the surface of Kink Arm waters. Aphids, dipterans (flies, mosquitoes, midges, and associated flying insects), and other insects are predominant terrestrial insects.

Table 2. Marine invertebrate species collected in Knik Arm net transects

Common Name	Species Name
California Bay shrimp	Crangon franciscorum
Blacktail Bay shrimp	Crangon nigricauda
Bay Shrimp	Crangon spp.
Baltic macoma (Clam)	Macoma baltica
Gammarid amphipod	Lagunogammarus setosus
Aquatic sow bug	Saduria entomon
Mysid shrimp	Mysis litoralis
Opossum shrimp	Neomysis mercedis
Mysid shrimp	Neomysis rayii
Gammarid amphipod	Onisimus spp.
Nereid polychaete worm	Neanthes limnicola

3.8 Fish

Five species of Pacific salmon and two species of smelt migrate through Knik Arm to and from spawning habitat. Recent studies by Pentec (2005) reported other species that are occasionally or seasonally present, including herring larvae drifting in the water column as plankton. Table 3 lists the species identified in Knik Arm by those studies.

Knik Arm has long been identified as habitat for migrating anadromous fish, but only more recently have biologists shown that juvenile salmon can survive and grow in Upper Cook Inlet including Knik Arm (Moulton 1997, Pentec 2005) at rates that may not be too different from those in Prince William Sound.

Juvenile salmon were not substantially more abundant close to shore in Knik Arm, which is somewhat unusual. Pentec (2005) attributed this to the cover provided by the turbid water, which protected them from predators. The same source also noted that juveniles did not school in Knik Arm, presumably because they did not need the protection from predation or because they could not see each other well enough to maintain a cohesive school.
All the juvenile salmon reported in Knik Arm literature were collected within 10 feet of the water surface. Seasonal abundance matched well with times when juvenile salmon typically

migrate out from their home streams and occupy nearby marine waters. Collections in Knik Arm and nearby waters show that pink and chum salmon juveniles, which out-migrate in their first year, are seasonally abundant, but move rapidly through the area, presumably to clearer waters farther south in Cook Inlet and eventually the Pacific Ocean. The juveniles of those species are not particularly well-adapted to feeding on surface prey and are too small to eat most of the available marine invertebrates, so they need to get to waters where food is available farther south in Cook Inlet. Chinook, sockeye, and coho salmon, however are adapted to feed on surface prey and apparently survive and grow well in the waters around Anchorage, including Knik Arm. The most common food organisms in their stomachs were terrestrial insects, particularly aphids and dipterans. They also consumed other insects, herring larvae, polychaete worms, and a variety of other invertebrates. Those juvenile salmon were collected from the time they out-migrated into Knik Arm until well into the autumn. They were reported to be well fed and growing.

Adult salmon returning to spawning streams in the Knik Arm drainage may be in Upper Cook Inlet and Knik Arm for days or weeks before entering their spawning streams. Pentec (2005) reported that adults tended to remain close to shore, often in less than 2 feet of water. They suggested this near-shore orientation was to avoid beluga whales, which prey on adult salmon.

The most common fish in Knik Arm collections were sticklebacks. Both three-spined and nine-spined were collected, but three-spined sticklebacks were far more numerous. These small and extremely hardy little fish are abundant in the fresh and brackish marshes around Knik Arm and may do well in estuarine waters. They, like the juvenile salmon, were widely distributed in both near-shore and deeper waters.

Pacific herring were present both as adults in the spring and as juveniles throughout the seasons sampled. They were most abundant as small larvae drifting as plankton with the tide and currents and were not abundant as larger juveniles. No important habitat was identified. Two smelt species were seasonally abundant. Eulachon return to the area each spring to spawn in coastal beaches, and longfin smelt return to spawn in the autumn. Both migrate through the general project area but the only identified important habitats are the coastal streams and nearby beaches. Bering cisco are whitefish that are generally associated with coastal waters with less than marine salinity. Several species of marine fishes move into near-shore or estuarine waters when conditions are favorable. Among them are saffron cod, Pacific tom cod, ringtail snailfish, Pacific staghorn sculpin, starry flounder, walleye pollack, and snake prickleback that were occasionally collected in Knik Arm or nearby waters. Most were collected in relatively small numbers and were most abundant during the winter or at least were most abundant in collections after sediment loads had begun to drop in early autumn. Saffron cod was the most abundant of these fish and were reported to be in spawning condition and well-fed.

Dolly Varden and rainbow trout can be freshwater fish or can be anadromous. Since they were not collected in any abundance, they probably were passing through Knik Arm to or from freshwater habitat.

Table 3. Fish species collected in Knik Arm transects

Common Name	Species Name
Pink salmon	Oncorhynchus gorbuscha
Chum salmon	Oncorhynchus keta
Coho salmon	Oncorhynchus kisutch
Chinook salmon	Oncorhynchus tshawytscha
Sockeye salmon	Oncorhynchus nerka
Rainbow trout	Oncorhynchus mykiss
Dolly Varden	Salvelinus malma
Saffron cod	Eleginus gracilis
Longfin smelt	Spirinchus thaleichthys
Threespine stickleback	Gasterostreus aculeatus
Ninespine stickleback	Pungitius pungitius
Bering cisco	Coregonus laurettae
Pacific herring	Clupea pallasii
Ringtail snailfish	Liparis rutteri
Pacific Staghorn sculpin	Leptocottus armatus
Starry flounder	Platichthys stellatus
Eulachon	Thaleichthys pacificus
Pacific Tom cod	Microgadus proximus
Walleye pollock	Theragra chalcogramma
Snake prickleback	Lumpenus sagitta
Unidentified flatfish	
Unidentified larval fish	

3.9 Birds

Bird habitat involved with the dredging and disposal activities is aquatic. Corps activities would be offshore in water that has suspended sediment concentrations as high as 2,400 mg/L in the summer and early fall when dredging and disposal would take place. Corps biologists surveyed the intertidal and shallow subtidal habitat from the Anchorage boat launch ramp (i.e. about 300 meters south of the mouth of Ship Creek) from one to four times per month from spring through late fall in 2006. The survey area extended from the boat ramp to approximately one-half mile south. One sector which covered approximately the lowest 300 feet of intertidal habitat and the nearest 300 feet of subtidal aquatic habitat (both distances measured horizontally) was routinely surveyed during this period, although depending on the tide level, the entire sector was sometimes completely submerged or nearly completely exposed. Bird activity observed in this survey sector provides insight into the near-shore bird habitat near the Port. Other than a single observation of 78 Canada geese, most birds observed were mew gulls (36 total in 10 surveys), followed by Bonaparte's gulls (13 in 10 surveys), and followed by lesser numbers of herring gulls, mallards, arctic terns and a single western sandpiper. Many of the gulls counted were flying, and the Canada geese and mallards were foraging on either the exposed mudflats or at the tide line.

3.10 Marine Mammals

Fourteen species of marine mammals are reported to occur at least occasionally in Cook Inlet, but only harbor seal (*Phoca vitulina*) and beluga whale (*Delphinapterus leucas*) are commonly observed in Upper Cook Inlet (NOAA Fisheries 2003a, Sheldon *et al.* 2003, NMML 2004). Marine mammals observed in Cook Inlet are listed in Table 4. (Calkins and Curatolo, 1979)

Beluga Whale. In western U.S. waters, beluga whales comprise five distinct stocks: Beaufort Sea, Eastern Chukchi Sea, Eastern Bering Sea, Bristol Bay, and Cook Inlet (Angliss and Outlaw, 2006). Belugas in upper Cook Inlet are of the Cook Inlet stock. This population stays in Cook Inlet and is geographically separated from others (Hobbs et al., 2006). A small population (probably numbering 10 to 20 animals) is present year-round in Yakutat Bay but are believed to be demographically and genetically isolated from the Cook Inlet stock. (Lowry et al., 2006)

The Cook Inlet beluga's range is believed to be largely confined to Cook Inlet with a high occurrence of animals in the upper Inlet and Knik Arm during the spring, summer, and fall seasons. These whales demonstrate site fidelity to regular summer concentration areas (Seaman *et al.*, 1985), typically near river mouths and associated shallow, warm, low-salinity waters (Moore *et al.*, 2000).

Table 4. Marine mammals observed in Cook Inlet

Common Name	Species Name
Steller Sea Lion	*(Eumetopias jubatus)*
Northern Fur Seal	*(Callorhinus ursinus)*
Beluga Whale	*(Delphinapterus leucas)*
Harbor Porpoise	*(Phocoena phocoena)*
Humpback Whale	*(Megaptera novaeangliae)*
Fin Whale	*(Balaenoptera physalus)*
North Pacific Right Whale	*(Eubalaena japonica)*
Gray Whale	*(Eschrichtius robustus)*
Killer Whale	*(Orcinus orca)*
Sea Otter	*(Enhydra lutris)*
Harbor Seal	*(Phoca vitulina)*
Minke Whale	*(Balaenoptera acutorostrata)*
Sei Whale	*(Balaenoptera borealis)*
Dall Porpoise	*(Phocoenoides dalli)*

Fourteen belugas were satellite-tagged in upper Cook Inlet and Knik Arm between late July and early September 2000–2002. The tags provided location and movement data through the autumn and winter and into May. During summer and autumn, belugas were concentrated in river and bays in Upper Cook Inlet, traveling back and forth between Knik Arm, Chickaloon Bay, and upper Turnagain Arm, although some also spent time offshore. When in those areas, belugas often remained in one area for many weeks followed by rapid movement to another area. Those movements often were between distinct bays or river mouths (moving either to the east or to the west of Fire Island, past Pt. Woronzof and the Port of Anchorage). One beluga tracked in 2001 moved back and forth between those three bodies of water seven times in three months. Area use in August was the most limited of all months. Approximately 50 to 75 percent of the recorded August locations were in Knik Arm and were concentrated near Eagle River. In September they continued to use Knik Arm and increased use of the Susitna delta, Turnagain Arm and Chickaloon Bay, and also extended use along the west coast of the upper Inlet to Beluga River. In October, beluga whales ranged widely down the Inlet in coastal areas, reaching Chinitna Bay and Tuxedni Bay, and continued to use Knik Arm, Turnagain Arm, Chickaloon Bay, and Trading Bay (MacArthur River). November use was similar to September. In December, belugas moved offshore with locations distributed throughout the upper to mid-inlet. In January, February, and March, they used the central offshore waters moving as far south as Kalgin Island and slightly beyond. Belugas also ranged widely during February and March with excursions to Knik and Turnagain Arms, in spite of greater than 90 percent ice coverage. Average daily travel distance ranged from about 7 to 19 miles. Belugas were not tracked by satellite tags from April through mid-July. (Hobbs et al., 2005)

Beluga whales are opportunistic feeders. They eat octopus, squid, crabs, shrimp, clams, mussels, snails, sandworms, and fish such as capelin, cod, herring, smelt, flounder, sole, sculpin, lamprey, lingcod, and salmon (Perez, 1990; Haley, 1986; Klinkhart, 1966). Belugas capture and swallow their prey whole, using their blunt teeth only to grab. They often feed cooperatively. Hazard (1988) hypothesized that beluga whales were more successful feeding in rivers where prey were concentrated than in bays where prey were dispersed. Concentrations of Cook Inlet belugas offshore from several important salmon streams in the upper Cook Inlet are assumed to be a feeding strategy that takes advantage of the bathymetry. The fish are funneled into the channels formed by the rivers where they are more vulnerable to the waiting belugas. At the Port, belugas have been observed to position one whale along a rip-rap dock, while a second whale herded salmon along the structure toward the stationary beluga.

Cook Inlet beluga distribution has narrowed as their population declined (Rugh *et al.*, 2000); however, there is obvious and repeated use of certain habitats. From April through November, whales concentrate at river mouths and tidal flat areas, moving in and out with the tides. The timing and location of eulachon and salmon runs affect beluga whale feeding behavior and have a strong influence on their summer movements. Beluga and prey distribution are heavily influenced by tides in Knik Arm. Monitoring data in 2006 reported approximately 70 percent of sightings at POA were around low tide.

NMFS has estimated the relative value of four habitats as part of the management and recovery strategy in the ‘‘*Draft Conservation Plan for the Cook Inlet Beluga Whale* (*Delphinapterus leucas*)’’ (Federal Register, 2008). These are sites where beluga whales are most consistently observed, where feeding behavior has been documented, and where dense numbers of whales use a relatively confined area of the Inlet. Type 1 habitat is termed ‘‘High Value/ High Sensitivity’’ and includes what NMFS believes to be the most important and sensitive areas of the Inlet for beluga whales. Type 2 is termed ‘‘High Value,’’ and includes summer feeding areas and winter habitats in waters where whales typically are in lesser densities or in deeper waters. Type 3 habitat is in the offshore areas of the mid and upper Inlet and also includes wintering habitat. Type 4 habitat describes the remaining areas of their range in Cook Inlet. The habitat that would be dredged used for disposal at the Port is considered to be Type 2 habitat. The area surrounding the Port is Type 1.

Beluga peak hearing sensitivity underwater is between 10 and 100 kHz (summarized in Richardson *et al.* 1995); at the most sensitive frequencies within that range their hearing threshold approaches 42 dB re 1 μPa. The bandwidth of their hearing extends to as high as 150 kHz , but above 100 kHz their sensitivity drops off rapidly (Au 1993). Below 8 kHz, the decrease in sensitivity is more gradual, approximately 11 dB per octave (Awbrey *et al.* 1988). Beluga whales are able to hear frequencies as low as 40-75 Hz (Johnson *et al.* 1989), but at those frequencies their sensitivity is quite poor (the threshold level at 40 Hz is on the order of 140 dB re 1 μPa). For comparison, humans with the keenest hearing have a bandwidth about one-eighth that of beluga whales (Au 1993).

This type of information is obtained from behavioral audiograms on trained captive animals. Audiograms represent the lowest levels of sound that an animal can detect in a quiet environment, which is usually different from conditions animals are subjected to in the wild. Critical ratios express the amount (in dB) by which a pure tone signal must exceed the spectrum level background noise (in dB re 1 $\mu Pa^2/Hz$) to be audible. In belugas, critical ratios are on average below 20 dB (re 1 Hz) up to frequencies of about 3 kHz; at higher frequencies the critical ratios continue increasing exponentially, reaching 25 to 30 dB at 20 kHz and 40 to 50 dB at 100 kHz (Johnson *et al.* 1989). Depth (i.e., pressure) has no effect on beluga hearing sensitivity (Ridgway *et al.* 2001). The same study also found that threshold levels for 500 Hz were 16 to 21 dB lower than previously published numbers (i.e., Awbrey *et al.* 1988, Johnson *et al.* 1989) and hypothesized that this difference may be attributable to differences in methodology (Schusterman 1974).

The Cook Inlet beluga whale stock may once have numbered as many as 1,300 individuals but declined dramatically during the 1990's. Population abundance surveys indicated a decline of 47 percent between 1994 and 1998. Annual population abundance surveys from 1999 to 2014 estimated abundance ranging between 278 and 435 belugas, with a 2014 estimated abundance of 340 individual beluga whales. Since 1999, the population has declined by 1.3 percent annually with a 10-year decline (2004-2014) of 0.4 percent annually. Effective 2013, and based upon an analysis of the ability to detect changes in population trends using alternative aerial survey schedules, NMFS decided to switch from conducting abundance aerial surveys every year to conducting them every other year. The first year with no aerial survey was in 2013. The next aerial survey was in 2016; population estimates from that survey are not yet published.

In response to the significant population decline, NOAA's NMFS designated the Cook Inlet stock of beluga whales as depleted under the Marine Mammal Protection Act on May 31, 2000. Subsistence harvests have been severely restricted, with only five whales harvested between 1999 and 2005. Due to the lack of recovery and the low population abundance, no subsistence harvest has been allowed since 2006. On October 22, 2008, NMFS listed this Distinct Population Segment of beluga whale found in Cook Inlet as endangered under the Endangered Species Act of 1973, as amended (ESA). On April 11, 2011, NMFS designated critical habitat for the Cook Inlet beluga whale under the ESA. Two areas comprising 3,016 square miles (7,809 square kilometers) of marine and estuarine environments considered to be essential for the whales' survival and recovery were designated as critical habitat. NMFS excluded both the Port of Anchorage and the Eagle River Flats Range on Joint Base Elmendorf-Richardson from critical habitat for reasons of national security, and the benefit to beluga whales under the existing Department of Defense Integrated Natural Resource Management Plan, respectively. In 2010, NMFS began developing a Recovery Plan for the Cook Inlet beluga whales, as required by the ESA. Prior to final approval of a Recovery Plan for the Cook Inlet beluga whales, NMFS will publish a draft version for public review and comment. NMFS published a notice in the Federal Register on May 15, 2015, announcing the availability of the draft Recovery Plan for public review and to solicit comments. NMFS will take public comments into consideration when making revisions to the draft recovery plan before releasing a final version of the recovery plan. NMFS remains concerned about the recovery of this stock and the habitat necessary to lead to their recovery (NMFS, 2016).

Harbor Seal. Harbor seals are important upper trophic marine predators that occupy a broad range in Alaska, from approximately 130ºW to 172ºE (more than 2,000 miles east to west) and from 61ºN to 51ºN (more than 600 miles north to south). Harbor seals in Alaska are in three stocks: Bering Sea, Gulf of Alaska (GOA), and Southeast Alaska.

While new genetic information may lead to a reassessment of this delineation, harbor seals in upper Cook Inlet belong to the GOA stock. Based on aerial GOA and Aleutian Islands surveys in 1996 and 1999, the current abundance estimate for this stock is 45,975 (CV = 0.04), with a minimum population estimate of 44,453 (Federal Register, 2008).

Harbor seals haul out on rocks, reefs, beaches, and drifting glacial ice. They feed in marine, estuaries, and occasionally fresh waters. They are generally non-migratory, with local movements associated with tides, weather, season, food availability, and reproduction; however, some long-distance movements have been recorded from tagged animals (mostly juveniles). The major haul-out sites for harbor seals are in lower Cook Inlet. The identified harbor seal haul-out closest to the Port is approximately 25 miles south along Chickaloon Bay in southern Turnagain Arm. They sometimes are observed around the Port. From 2004 to 2005, 22 harbor seal sightings were reported over a 13-month period comprising of 14,000 survey hours. From these surveys, it is estimated that about 1.7 harbor seals are in Knik Arm per month (LGL unpubl. data).

3.11 Essential Fish Habitat

In accordance with the Magnuson-Stevens Act, the National Oceanographic and Aeronautics Administration (NOAA) Fisheries Division establishes Essential Fish Habitat (EFH) for federally managed species; describing all waters and substrate necessary for fish spawning, breeding, feeding, or growth to maturity. Nearly 1,000 species, at multiple life stages, have an EFH description. Section 305(b)(2) of the Magnuson-Stevens Act requires all Federal agencies to consult with the Secretary on all actions or proposed actions authorized, funded, or undertaken by the agency that may adversely affect EFH. Sections 305(b)(3) and (4) direct the Secretary and the Councils to provide comments and EFH Conservation Recommendations to

Federal or state agencies on actions that affect EFH. Such recommendations may include measures to avoid, minimize, mitigate, or otherwise offset adverse effects on EFH resulting from actions or proposed actions authorized, funded, or undertaken by that agency. Section 305(b)(4)(B) requires Federal agencies to respond in writing to such comments. NMFS Essential Fish Habitat online mapping utility indicated the following fish species with Federal Management Plans (FMP) are present in the project area for at least part of their life cycle. (Table 5)

Table 5. Federally managed fish species present in the project area

Common Name	**Species Name**
Chinook Salmon	*Oncorhynchus tshawytscha*
Chum Salmon	*Oncorhynchus keta*
Coho Salmon	*Oncorhynchus kisutch*
Sockeye Salmon	*Oncorhynchus nerka*
Pink Salmon	*Oncorhynchus gorbusha*

3.12 Threatened and Endangered Species

The NMFS considers the Cook Inlet beluga whale¸ *Delphinapterus leucas,* to be one of the eight most at-risk endangered species under the NMFS jurisdiction because this declining population of small whales shares Cook Inlet with Alaska's human population center, transportation hub, and largest concentration of industrial activity. The population has declined by about 75 percent since 1979, from about 1,300 whales to an estimated 340 whales in 2014. The NMFS *Cook Inlet Beluga Whale 5-Year Action Plan* was promulgated in 2015 in order to highlight the actions that can be taken by Federal and state agencies, environmental organizations, Native American tribes, and other entities to turn the trend around for this species from a declining trajectory to a trajectory towards recovery. Detailed information regarding the Cook Inlet beluga whale is located in Section 3.10 of this EA.

The Cook Inlet stock of beluga whale is the only organism within the project area listed in the Endangered Species Act (ESA). In accordance with the ESA, NMFS was required to designate critical habitat for the Cook Inlet beluga whale; the NMFS proposed two areas consisting of a combined 3,013 square miles in December 2009. In April 2011, NMFS published their final rule designating critical habitat, stratifying the area according to importance to the whales, and defining areas of Cook Inlet excluded from critical habitat.

50 CFR 226.220 Critical habitat for the Cook Inlet beluga whale (Delphinapterus leucas).

Critical habitat includes two specific marine areas in Cook Inlet, Alaska. These areas are bounded on the upland by Mean High Water (MHW) datum, except for the lower reaches of four tributary rivers. Critical habitat shall not extend into the tidally-influenced channels of tributary waters of Cook Inlet, with the exceptions noted in the descriptions of each critical habitat area.

(1) *Area 1.* All marine waters of Cook Inlet north of a line from the mouth of Threemile Creek (61°08.5′ N., 151°04.4′ W.) connecting to Point Possession (61°02.1′ N., 150°24.3′ W.), including waters of the Susitna River south of 61°20.0′ N., the Little Susitna River south of 61°18.0′ N., and the Chickaloon River north of 60°53.0′ N.
(2) *Area 2.* All marine waters of Cook Inlet south of a line from the mouth of Threemile Creek (61°08.5′ N., 151°04.4′ W.) to Point Possession (61°02.1′ N., 150°24.3′ W.) and north of 60°15.0′ N., including waters within 2 nautical miles seaward of MHW along the western shoreline of Cook Inlet between 60°15.0′ N. and the mouth of the Douglas River (59°04.0′ N., 153°46.0′ W.); all waters of Kachemak Bay east of 151°40.0′ W.; and waters of the Kenai River below the Warren Ames Bridge at Kenai, Alaska.

A map of the designated critical habitat for Cook Inlet beluga whale follows (Figure 8)

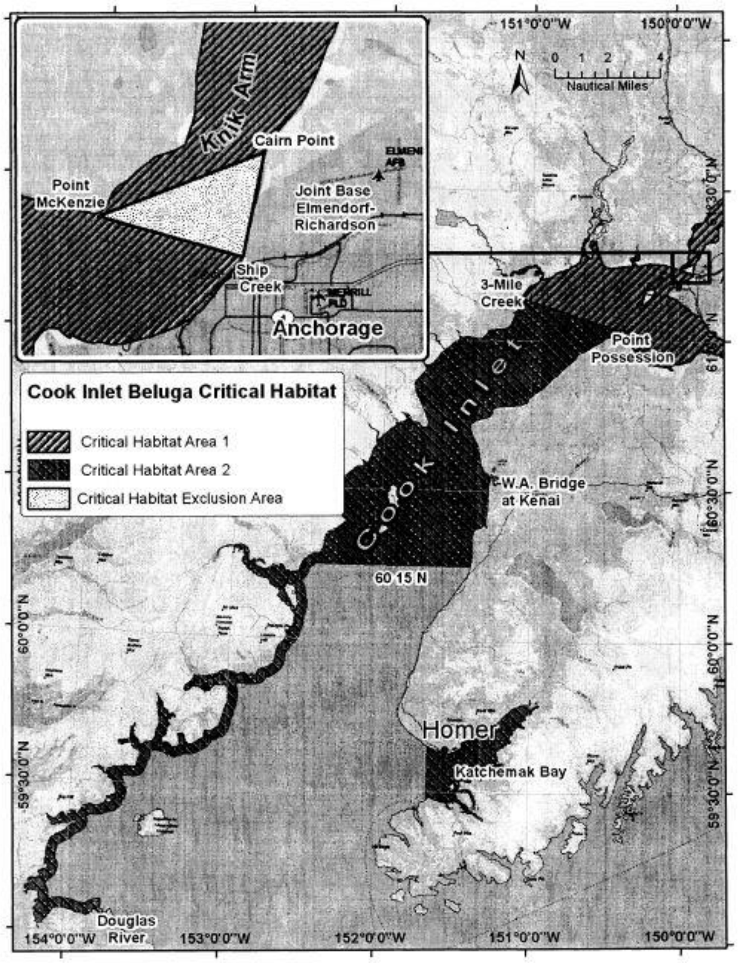

Figure 8. Map depicting Cook Inlet beluga whale habitat and the Port of Anchorage exclusion (inset)

In response to comments received during the public notice period, the NMFS withdrew two areas within the Cook Inlet from the critical habitat designation. The exclusion of these areas was determined to be in the interest of national security and the benefits of exclusion were determined to outweigh the benefits of inclusion. The excluded areas are depicted in Figure 8 and described as:

> (1) All property and overlying waters of Joint Base Elmendorf-Richardson between Mean Higher High Water and Mean High Water; and
> (2) All waters off the Port of Anchorage which are east of a line connecting Cairn Point (61°15.42 N., 149°52.82 W.) and Point MacKenzie (61°14.32 N., 149°59.22 W.) and north of a line connecting Point MacKenzie and the north bank of the mouth of Ship Creek (61°13.62 N., 149°53.8′ W.).

Notwithstanding the exclusion of the Port of Anchorage from critical habitat, Cook Inlet beluga extensively utilize the Port area. More information on the behavior and characteristics of beluga whales can be found in section 3.3.5 of this EA.

4.0 Environmental Consequences

Table 6. Depiction of environmental consequences of the considered alternatives on the resources assessed in this EA

Resource	Preferred Alternative	No Action Alternative
Air Quality	Less Than Significant Impact	Less Than Significant Impact
Noise	Less Than Significant Impact	Beneficial Impact
Water Quality	Less Than Significant Impact	Less Than Significant Impact
Water Circulation Patterns	Less Than Significant Impact	Beneficial Impact
Cultural Resources	No Effect	No Effect
Vegetation	No Effect	No Effect
Marine Invertebrates	Less Than Significant Impact	Beneficial Impact
Fish	Less Than Significant Impact	Less Than Significant Impact
Birds	Less Than Significant Impact	Less Than Significant Impact
Marine Mammals	Less Than Significant Impact	Less Than Significant Impact
Essential Fish Habitat	Less Than Significant Impact	Beneficial Impact
Threatened and Endangered Species	Less Than Significant Impact	Less Than Significant Impact
Cumulative Impacts	Less Than Significant Impact	Less Than Significant Impact
Climate Change	Less Than Significant Impact	Beneficial Impact

4.1 Air Quality

Preferred Alternative. The operation of any dredge emits air pollutants; however, the vessel would not contribute to a violation of Federal or state ambient air quality standards and would not be distinguishable for other vessel emissions in the project area. The Port has been dredged annually for decades and Anchorage has still been able to maintain very good air quality.

Because the Port has been dredged annually since 1965 while Anchorage enjoys very good air quality and because the dredge's air emissions would not be distinguishable from other commercial vessels using the harbor, the impact of the preferred alternative on air quality would be less than significant.

No Action Alternative. Under the No Action Alternative, the USACE would not dredge the area. Anchorage Harbor would be unable to accommodate deep draft vessels, and large vessel activity in the harbor would be impacted. Deposition at the face of the terminal would prevent access at lower tidal stages, requiring deeper draft vessels to pull away at low tide. Acceleration away from the dock face would load engines and produce higher air emission levels than idling during cargo offload currently produces. The No Action Alternative would have a less than significant impact on air quality.

4.2 Noise

Preferred Alternative. Suction dredging and clamshell dredging can produce sound pressure levels high enough to injure and drive marine organisms away from the project area, reducing their ability to use resources and potentially increasing mortality. The high levels of ambient noise in the Port and the recurring nature of dredging indicate that biological resources present in the project area are habituated or adapted to the levels of noise produced by dredging operations. Additional information regarding the impacts of subsurface noise on marine organisms is located in the pertinent sections of this chapter.

The preferred alternative would not generate sub-surface noise levels exceeding those produced every year and would not appreciably increase super-surface noise levels.

No Action Alternative. Under the No Action Alternative, the USACE would not dredge the area. Anchorage Harbor would be unable to accommodate deep draft vessels and anthropogenic activity in the harbor would decline. The presence of small craft may increase in order to support offload, but would likely represent a reduction in noise and produce a beneficial impact on noise levels.

4.3 Water Quality

Preferred Alternative. Dredging in the Port would temporarily increase turbidity by suspending additional sediments in the water column and could mobilize contaminants and establish additional pathways for harmful chemicals to impact biological resources. The Knik Arm is subject to sediment concentrations of up to 4,000 mg/l, turbidity up to 600 NTU, and sediment conducted during the 2016 dredging season indicated no chemicals of concern above screening levels.

The high turbidity and suspended sediment load present in the Knik Arm, and lack of detected contamination, would allow the transitional and maintenance dredging to occur with less than significant impacts to water quality.

No Action Alternative. Under the No Action Alternative, the USACE would not dredge the area. Energetic, bidirectional tidal currents would naturally suspend sediments and thoroughly mix the water column. Anchorage Harbor would be unable to accommodate deep draft vessels and anthropogenic activity in the Harbor would be impacted. Cargo could be lightered ashore, creating conditions for accidents and spills of hazardous materials. Safe operation of additional small vessels would be more difficult to enforce and unsafe conditions could be more prevalent due to the difficulty of inspecting more vessels. The No Action Alternative would have a less than significant impact on water quality.

4.4 Water Circulation Patterns and Sedimentation

Preferred Alternative. Water circulation patterns and changes to sedimentation are subject to the construction of the North Extension Stabilization Step-1 project in the north end of the dredging project and the installation of a pile supported Petroleum and Concrete Terminal in the south. Transitional and maintenance dredging is not expected to appreciably impact water circulation patterns and sedimentation.

USACE permission under Section 408 is required for the North Extension Stabilization Step-1 project, which would remove and replace the existing Open Cell Sheet Pile (OCSP) bulkhead in the northern portion of the Port of Anchorage. Authorization of the construction project is contingent upon approval by the USACE Regulatory Division for the placement of dredged material in waters of the United States and work in navigable waters, regulated by Section 404 of the Clean Water Act (CWA) and Section 10 of the Rivers and Harbors Act (RHA), respectively. The portion of Area B that would be removed from the dredging project is subject to the most intense dredging in Area B (Figure 7); removing it from the project should lessen the volume of material requiring disposal. Sedimentation modeling results indicate deposition would be confined to a smaller area, immediately off the terminal 3 dock face, and volume would be sustained as a result of the reconfiguration of the North Extension.

Figure 9 is a depiction of the sediment transport modeling results contrasting the existing bulkhead configuration on the left and the impact of the proposed North Extension realignment on the right. The new bulkhead would reduce the size of the ebb tide subordinate gyre responsible for premature shoaling at terminal 3, but is not expected to alleviate the need for early mobilization of the dredge contractor or other contingency measures that might be activated in order to maintain access to the terminal. This modeling event was conducted using the winter flow rates in the Knik Arm to predict changes in harbor bathymetry over a predefined, multi-month temporal period.

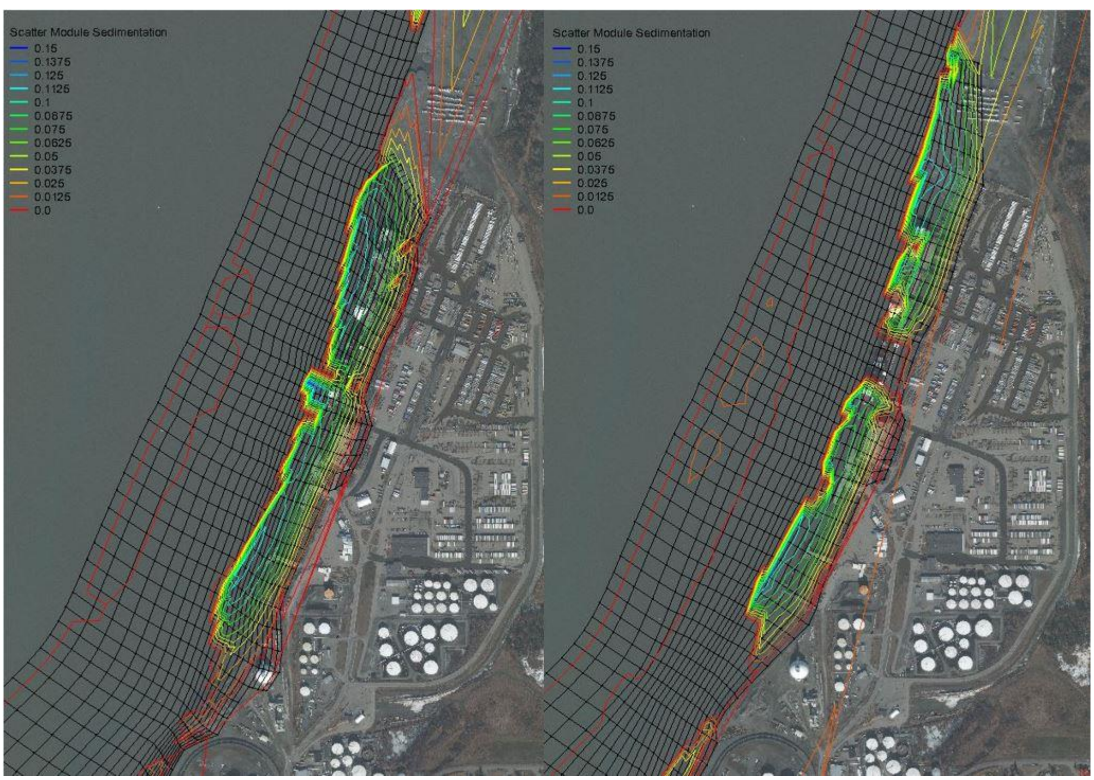

Figure 9. Contrasting views of the existing sediment transport condition (left) and the proposed North Extension Stabilization Step-1 post-project hydrodynamic condition (right)

The preferred alternative would reduce the areal extent of dredging by 52 acres, resulting in less substrate disturbance and lower dredged quantities requiring disposal. These reductions may contribute to a slightly less turbid marine environment and a less than significant impact to water circulation patterns and sedimentation.

No Action Alternative. Under the No Action Alternative, the USACE would not dredge the area. Energetic, bi-directional tidal currents would naturally suspend sediments and thoroughly mix the water column. There would be a reduction of anthropogenic sediment suspension and the subsequent deposition of material, resulting in a beneficial impact on sedimentation. The Knik Arm is highly turbulent and shoals unpredictably, with significant variability from year to year. The No Action Alternative would not have a measureable impact on water circulation patterns.

4.5 Cultural Resources.

Preferred Alternative. Maintenance dredging of the Port of Anchorage would not affect cultural resources because the loose sediment of the substrate has been removed and redeposited in the disposal area annually for many decades. Transition dredging would remove undisturbed sediments from 13.5 acres. It is possible that unknown cultural resources may be buried in these sediments. Review of the Alaska Heritage Resources System (AHRS) and shipwreck database indicate no known historic properties would be adversely affected by the preferred alternative.

No Action Alternative. Under the No Action Alternative, the USACE would not dredge the area. There would be no adverse effect to cultural resources.

4.6 Vegetation

Preferred Alternative. Dredging and disposal would be confined to areas with naturally high sediment load suspended by tidal action. Dredged material discharged in the disposal area is believed to be quickly dispersed by the same tidal action and does not make a significant impact on turbidity. Vascular plants and attached algae do not tolerate the intense tidal activity and high volume of suspended solids preventing sunlight from penetrating beyond the upper fringe of the water column. This prevents them from surviving in the areas affected by dredging and disposal. The preferred alternative would have no effect on vegetation.

No Action Alternative. Under the No Action Alternative, the USACE would not dredge the area. Marine vegetation would be unaffected, as it would continue to be unable to grow in the affected area due to high natural sediment load and tidal energy.

4.7 Marine Invertebrates

Preferred Alternative. Marine invertebrates in the Port area are discussed in section 3.7. The principal identified concern related to those invertebrates was related to their availability at the surface where they would be available as prey to birds and small fish that may feed in less turbid water at the surface. The bottom material that would be dredged consists of silty sediments that have been deposited after the previous year's dredging event. The Anchorage Harbor basin is necessarily dominated by heavy vessel traffic and other features of industrial waters, making the area of limited value as benthic habitat regardless of dredging activity.

Benthic infauna and epifauna could be entrained into a suction dredge or excavated along with bottom material in a clamshell dredge. The only relatively abundant animals living in the bottom material in the Knik Arm are polychaete worms in the shallower waters nearer to shore. There is no indication that they or any other invertebrate are present in substantial numbers in bottom material that would be dredged or in the disposal site.

Small bottom-dwelling shrimp and other small crustaceans collected in Knik Arm could be in the areas to be dredged in at least small numbers. Those bottom-dwelling invertebrates could be injured or killed by the mechanical effects of dredging or could be smothered in the disposal site.

Direct impacts to benthic habitat would be temporary due to the rapid sedimentation rate. Organisms inhabiting the project area are adapted to turbulent conditions and unpredictable accretion/scouring. Because the area to be dredged supports few living resources and has little habitat value, effects of the proposed action on marine invertebrates would be less than significant.

No Action Alternative. Under the No Action Alternative, the Alaska District would not dredge the Port of Anchorage. Benthic organisms would not be displaced or smothered by disposal. The No Action Alternative would have a beneficial impact on marine invertebrates.

4.8 Fish

Preferred Alternative. The principal concerns of dredging and disposal are temporary, and are associated with local increases of suspended sediment over the already high ambient levels near the Port and their potential effects on juvenile salmon. (USACE, 2008) Suspended solids in estuarine waters have been reported to injure juvenile salmon and could reduce their ability to sight-feed on surface and near-surface invertebrates. Individual fish could be physically impacted by entrainment into the drag arm of a suction dredge, but would likely be able to avoid injury from the bucket of a clamshell dredge.

Effects of turbidity and suspended solids on juvenile salmon are summarized in a comprehensive compilation by Bash et al. (2001). The impacts of high suspended solids concentrations on salmonids have been reported to include mortality, reduced survival, reduced growth, reduced feeding, stress, disease, avoidance, displacement, change in body color, alerted behavior, and reduced tolerance to salt water (Loyd 1987 in Bash et al. 2001). Potential severity of effects is related to: (1) duration of exposure, (2) frequency of exposure, (3) toxicity, (4) temperature, (5) life stage of fish, (6) angularity of particles, (7) size of particles, (8) type of particles, (9) severity and magnitude of pulse, (10) natural background turbidity, (11) time of occurrence, (12) other stressors and general condition of biota, and (13) availability of and access to areas with less suspended material.

Much of the research on juvenile salmonids and turbidity was done in laboratory settings. Applicability to field situations has not been thoroughly verified. Other research applies to headwaters and systems that are normally clear except for seasonal and infrequent sediment. Turbidity values reported by some research may not be a consistent and reliable tool for determining the effects of suspended solids on salmonids. Bash et al. concluded that, "salmonids encounter naturally turbid conditions in estuaries and glacial streams," but that this does not necessarily mean that salmonids in general can tolerate increases of suspended sediments over time. Relatively low levels of anthropogenic turbidity may adversely affect salmonid populations that are not naturally exposed to relatively high levels of natural turbidity (Gregory 1992 in Bash et al. 2001). Bash et al. also noted that managers are interested in learning whether there is something inherent in "natural" turbidity sources that make them somehow less harmful to fish than are anthropomorphic sources of turbidity because it is apparent that salmonids are able to cope with some level of turbidity at certain life stages. Evidence of their ability to cope is illustrated by the presence of juvenile salmonids in turbid estuaries and local streams with high natural levels of glacial silt (Gregory and Northcote 1993 in Bash et al. 2001).

Feeding efficiency of juvenile salmonids has been shown to be impaired by turbidities in excess of 70 NTU (Bisson and Bilby, 1982), well below typical and persistent levels in Knik Arm (Pentec, 2005a). Section 3.8 discussed reports that juvenile salmon and saffron cod may feed and grow in surface water microhabitats in Knik Arm where short periods (minutes) of relative quiescence in the generally turbulent water allow partial clearing.

Section 3.8 presented information indicating that dredging would have little effect on surface and near-surface invertebrates. Dredging would have equally little effect on any fish sight-feeding on those invertebrates. Collection data indicate that juvenile salmon are largely or entirely in the upper 10 feet of water in Knik Arm, so mechanical effects of dredging and turbidity produced by dredging at project depths also would be unlikely to surface, peak tidal currents might be able to lift some of the material to the surface where it could increase near-surface local turbidity for short periods. This could affect ability of juvenile fish to feed at or near the surface in small areas when dredged material was being dumped. Near-surface turbidity will be monitored during dredging for the proposed action to see whether it is affected by disposal activity. Effects on fish near-surface habitat use will be determined or dredging and disposal methodology will be modified to avoid effects if near-surface turbidity is higher.

Adult salmon in the project areas of Knik Arm could be subjected to higher suspended solids concentrations from dredging and dispersion of disposed material. Pentec (2005a) and other sources indicate that returning adults tend to run in shallow water, probably to reduce predation by beluga whales. This shallow water orientation would tend to keep them away from dredging and dredged material disposal, which would be largely in deeper water.

There is no indication that noise and turbidity, both natural and from dredging at the Port, are affecting salmon migration. Salmon regularly return to Ship Creek, which terminates adjacent to the Port, and to other area streams. This lack of apparent effect could be expected because near-shore and upper water column natural suspended material concentrations are comparable to those being dredged and at disposal sites. The apparent lack of effect at the Port is consistent with the literature, which indicates a similar lack of effect in other areas where salmon migrate near dredging and other activity.

Natural turbidity exceeds the threshold determined to be injurious to feeding efficiencies, so apparently fish using the project area are adapted to high levels of suspended sediments. Individual fish may be killed or injured by dredging operations; but fish that feed on benthic invertebrates may benefit from enhanced foraging opportunities after the dredge has passed, as injured, uncovered, or killed invertebrates could more easily be captured. Because most fish would avoid the dredging operation, are adapted to life in high suspended sediment concentrations, may benefit from benthic faunal disturbance, and physical injury would be limited to individual fish, the proposed activity would have a less than significant impact on fish.

No Action Alternative. Under the No Action Alternative, the USACE would not dredge the area. Energetic, bi-directional tidal currents would naturally suspend sediments and thoroughly mix the water column. The Anchorage Harbor would be unable to accommodate deep draft vessels and anthropogenic activity in the harbor would be impacted. Cargo could be lightered ashore, creating conditions for accidents and spills of hazardous materials. Safe operation of additional small vessels would be more difficult to enforce and unsafe conditions could be more prevalent due to the difficulty of inspecting more vessels. The No Action Alternative would have a less than significant impact on fish.

4.9 Birds

Preferred Alternative. Dredging would occur in areas that not are critical or important bird habitat and are used only sparsely by birds. The area that would be dredged is not intertidal, so the most likely birds in the project area would be gulls that are either flying or resting. Given the water depth and high suspended sediment loads, it is unlikely that ducks or geese would be found in the project area in appreciable numbers on a regular basis. Small numbers of gulls and waterfowl would be temporarily displaced by tug, barge, and ship traffic associated with dredging, but this area is not nesting habitat and there is no indication that is it especially important to any species of bird.

The proposed activity would have a less than significant impact on birds because individuals will avoid dredging operations and the areas affected by dredging are not heavily used or of particular value to avifauna.

No Action Alternative. Under the No Action Alternative, the USACE would not dredge the area. Energetic, bi-directional tidal currents would naturally suspend sediments and thoroughly mix the water column. The Anchorage Harbor would be unable to accommodate deep draft vessels and anthropogenic activity in the harbor would be impacted. A greater density of smaller, faster vessels could be used to transfer cargo ashore in the event accretion precludes deep draft vessels at low tidal stages. These small, faster vessels could be more disturbing to birds than the large, slow vessels that currently off-load at the terminal. As a result, the No Action Alternative could present less than significant impacts to birds.

4.10 Marine Mammals

Preferred Alternative.

Beluga Whale. There are no consistent observed threshold levels at which belugas, and marine mammals in general, respond to introduced sound. Beluga responses to sound stimuli are reported to be highly dependent upon their behavioral state and their motivation to remain in or leave an area. Few field studies involving industrial sounds have been conducted on beluga whales. Reactions of belugas in those studies varied. In Awbrey and Stewart (1983) (as summarized in Southall et al., 2007), recordings of noise from SEDCO 708 drilling platform (non-pulse) were projected underwater at a source level of 163 decibels (dB) root mean squared (rms). Beluga whales less than 1.5 km from the source usually reacted to onset of the noise by swimming away (relative levels (RLs) approximately 115.4 dB rms). In two instances groups of whales that were at least 3.5 km from the noise source when playback started continued to approach (RLs approximately 109.8 dB rms). One group approached to within 300 m (RLs approximately 125.8 dB rms) before all or part turned back. The other group submerged and passed within 15 meters of the projector (RL approximately 145.3 dB).

Beluga whale peak hearing sensitivity is between 10 and 100 kHz, decreasing at a rate of 11 dB per octave below 8 kHz. (Blackwell and Greene, 2002) Mean detection thresholds in the dredging bandwidth are 121 dB at 125 Hz, 118 dB at 250 Hz, 108 dB at 500 Hz, and 101 dB at 1 kHz. (Awbrey et al., 1988) Ambient broadband noise in the Anchorage Harbor is 113 dB; small craft at full speed can produce sound in the 140 dB range from 10 meters, and tug boats can produce 149 dB at 100 meters in the Port. (Blackwell and Greene, 2001)

Man-made sounds can mask whale calls or other sounds potentially relevant to whale vital functions. Masking occurs when the background noise is elevated to a level that reduces an animal's ability to detect relevant sounds. Experiments on captive belugas indicated that the critical detection ratio for noise below 1 kHz is about 16-17 dB; meaning sound pressure would have to exceed ambient noise in the reference bandwidth by the critical ratio to be detectable by beluga whales (Johnson et al., 1989). For reference, this critical ratio is about 3 dB lower than that of bottlenose dolphin, *Tursiops truncates.* Belugas have been known to increase their levels of vocalization as a function of background noise by increasing call repetition and shifting to higher frequencies (Lesage *et al.*, 1999; Scheifele *et al.*, 2005). Low tonal frequencies of construction noise and the ability of belugas to adapt vocally to increased background noise would tend to minimize masking potential interruption of behaviors such as feeding and communication.

Many marine mammals, including beluga whales, perform vital functions (e.g., feeding, resting, traveling, socializing) on a diel (i.e., 24-hour) cycle. Repeated or sustained disruption of these functions is more likely to have a demonstrable impact than a single exposure (Southall *et al.*, 2007). Conversely, it has been demonstrated that marine mammals exposed to repetitious sounds will become habituated and tolerant after initial exposure to these sounds, as demonstrated by beluga vessel tolerance (Richardson *et al.*, 1995, Blackwell and Green, 2002). Several beluga whales were observed within a few meters of the docked cargo freighter

Northern Lights during sound recording for Blackwell and Greene's Cook Inlet acoustic study; received broadband sound pressure levels were about 125 dB at 50 meters from the freighter.

Although the Port is a highly industrialized area supporting a large volume of ship traffic, belugas are present almost year round. Belugas evidently have become habituated to Port operations and annual dredging activities. Belugas are routinely sighted near dredges used each summer for maintenance at the Port. In 2016, belugas were observed on 27 separate occasions in groups of between 1 and 30 animals. No marine mammals approached within 50 meters of the dredge during operation. Belugas also demonstrate tolerance to ship traffic around the Port, as documented in numerous surveys conducted by LGL in that area.

Belugas are and will continue to be exposed to greater than background noise levels from dredging; however background sound levels in Knik Arm are already higher than most other marine and estuarine systems due to strong currents and eddies, recreational vessel traffic, and commercial shipping traffic entering and leaving the Port. During clamshell (bucket) dredging, the strongest sounds are actually produced by the tugs that dump the barges of dredged material and reposition the clam shell dredges. Hopper and pipeline dredges also produce sound levels similar to tugs and large ship traffic that routinely operate near the Port.

Hydraulic dredging produces sound characterized as continuous, at sound pressure levels and frequency contingent upon substrate consistency and power level. A study of hydraulic cutter head dredge sound generation in Stockton, California measured sound pressure produced by the 100-foot, 1,000-horsepower dredge *Veracious* at varying distances from the cutter head. The mean SPL at 50 meters was 131.2 dB, mostly below 1000 Hz, with peak frequencies between 100 and 350 Hz being most common (Reine and Dickerson, 2014). The dredging contractor at the Port of Anchorage would likely employ a somewhat larger vessel; a trailing suction hopper dredge (TSHD) of 180 feet and 2,560 horsepower was used in 2016.

The TSHD *Sand Falcon* was estimated, using logarithmic propagation modeling, to produce a peak broadband source SPL around 190 dB dredging sand in 2009. Peak received 100-meter SPL of 139 dB was at 125 Hz. Sound pressure produced by pumping only water was only slightly less intense, about 138 dB. The *Sand Falcon* is 393 feet long with nearly 5,000 horsepower total installed power. Research conducted during the expansion of the Port of Rotterdam in the Netherlands shows that TSHD produced virtually identical sound pressure levels at a slightly higher peak frequency during transit than during dredging, about 40 Hz for dredging and about 55 Hz for transiting (Heinis et al., 2016). The *Sand Falcon* was dredging sand and gravel in deep (27 meters to 45 meters) water with significantly more installed power; all factors that would contribute to greater SPL than the shallow, turbid waters and silty aggregate dredged by a less powerful dredge in Cook Inlet would produce.

Silt load, shallow water, and soft sediments can have an attenuating effect on sound propagation. Viscous absorption is a result of density differentials between the fluid and the solid particles. Suspended particles are generally denser than the fluid, so they have more inertia than an equivalent volume of fluid. This difference causes a velocity gradient when the fluid is subjected to sound energy, which results in frictional heat generation and loss of sound energy (Richards et al., 1997). Suspended sediment concentrations of 200 mg/L can attenuate as much as 3 dB in a 100-meter path (Richards and Heathershaw, 1998); sediment concentration in the Port of Anchorage is as high as 2,400 mg/L during the dredging season. Particles of 3-micron-diameter have the greatest impact on attenuation; silts like the sediments found in Cook Inlet range between 3.9 and 62.5 micron. (Liu et al., 2010)

Harbor Seal, Orca Whale, and Harbor Porpoise. Given the low density of these marine mammals in upper Cook Inlet and near the Port of Anchorage, impacts from dredging noise are unlikely. No marine mammals, aside from beluga whales, were observed by the dredging contractor during the 2016 dredging season. The infrequent occurrence decreases the likelihood of negative effects to marine mammals from underwater noise at the Port of Anchorage.

The proposed activity would have a less than significant impact on marine mammals because commercial shipping traffic in the Port of Anchorage produces sound pressure in the same bandwidth and intensity that dredging would, marine mammals in the Port have apparently become habituated to anthropogenic disturbances such as vessel traffic, the high natural sediment load increase the rate of sound attenuation in the Knik Arm, and the areas affected by dredging are not of particular importance for marine mammals in any life stage.

No Action Alternative. Under the No Action Alternative, the USACE would not dredge the area. The Anchorage Harbor would be unable to accommodate deep draft vessels and anthropogenic activity in the harbor would decline. Large vessels would be forced to pull away from the terminal at low tidal stages and small vessels may become more numerous. The increased movement of vessels caused by limited access to the dock could have a less than significant impact on marine mammals.

4.11. Essential Fish Habitat

Preferred Alternative. Reintroduction of sediments into the Knik Arm water column during dredging and disposal is not expected to adversely impact essential fish habitat (EFH). Knik Arm is a highly turbid ecosystem with high and variable suspended sediment concentrations and mobile soft-bottom sediments that are shifted consistently by extreme tidal forces. Pacific salmon and other EFH species that might be in the area have adapted to high suspended sediment levels and would likely avoid the immediate area near the discharge without suffering adverse impacts. The preferred alternative would have a less than significant impact on essential fish habitat.

No Action Alternative. Under the No Action Alternative, the USACE would not dredge the area. The Anchorage Harbor would be unable to accommodate deep draft vessels at all tidal stages, substrate would not be removed and redeposited, and suspended sediments would be reduced, producing a beneficial impact on essential fish habitat.

4.12 Threatened and Endangered Species

Preferred Alternative. In October 2008, the Cook Inlet distinct population segment (DPS) of beluga whale was listed as endangered under the Endangered Species Act (ESA) of 1973. Three years later, in April 2011, critical habitat for this DPS was designated under the ESA. The Port of Anchorage Federal dredging project and disposal area lies within the external boundary of this critical habitat, but the harbor was excluded from the designation due to its importance as a Department of Defense strategic port. The Port of Anchorage exclusion zone from Cook Inlet beluga whale critical habitat is shown in Figure 7. The proposed Federal dredging project and disposal area in relation to the Cook Inlet beluga whale critical habitat exclusion is shown in figure 10.

Coordination with the NMFS Endangered Species Act (ESA) division in conjunction with the 2008 Anchorage Harbor Dredging and Disposal Environmental Assessment concluded that:

- Sounds generated by dredging and related activities are similar in intensity to those associated with other harbor activities and most are close to ambient noise levels. To protect beluga whales, dredging activities will be suspended any time beluga whales are within 50 meters of the activity.

- Activities at and near Port of Anchorage, including dredging, do not prevent beluga whales from feeding actively near the Port. During the winter, beluga whales may feed on fish and invertebrates on and near the bottom that are not available in Knik Arm at other times. Dredging and dredged material disposal will affect a maximum of about 650 acres of Knik Arm bottom habitat that may be used by prey organisms. Alteration of habitat is unlikely to substantially affect beluga whale feeding because: (1) potential prey organisms are mobile and able to repopulate affected areas; (2) the affected area is a small part of available habitat in the Cook Inlet beluga whale winter range; and (3) because winter habitat in Cook Inlet belugas' range supported a much larger population just a few years ago.

Beluga whales are frequently observed within the Port of Anchorage and have apparently become habituated to the noise and activity associated with an industrial port facility. Beluga whales were observed in 27 discrete events during the 2016 Port of Anchorage dredging season, in groups varying between 1 and 30 animals, and never approached within 50 meters of the dredger. This indicates that the operation of the dredge does not deter beluga whales from using the area, but it does produce enough disturbance to prevent the animals from getting close enough to be physically injured by dredging or disposal. The preferred alternative would have a less than significant impact on endangered species because of the high ambient noise level present in the Anchorage Harbor, the consistency of dredging noise and commercial shipping noise, high levels of naturally suspended sediments, and capacity of beluga whales to adapt and become habituated to anthropogenic activities. The proposed action may affect, but is not likely to adversely effect, endangered species.

No Action Alternative. Under the No Action Alternative, the USACE would not dredge the area. The Anchorage Harbor would be unable to accommodate deep draft vessels at all tidal stages. The restricted access to large vessels could result in more vessel movement to avoid grounding at low tide. Tug boats are among the loudest vessels in the Port of Anchorage and their use could increase as a function of the additional maneuvering. The No Action Alternative would have a less than significant impact on endangered species.

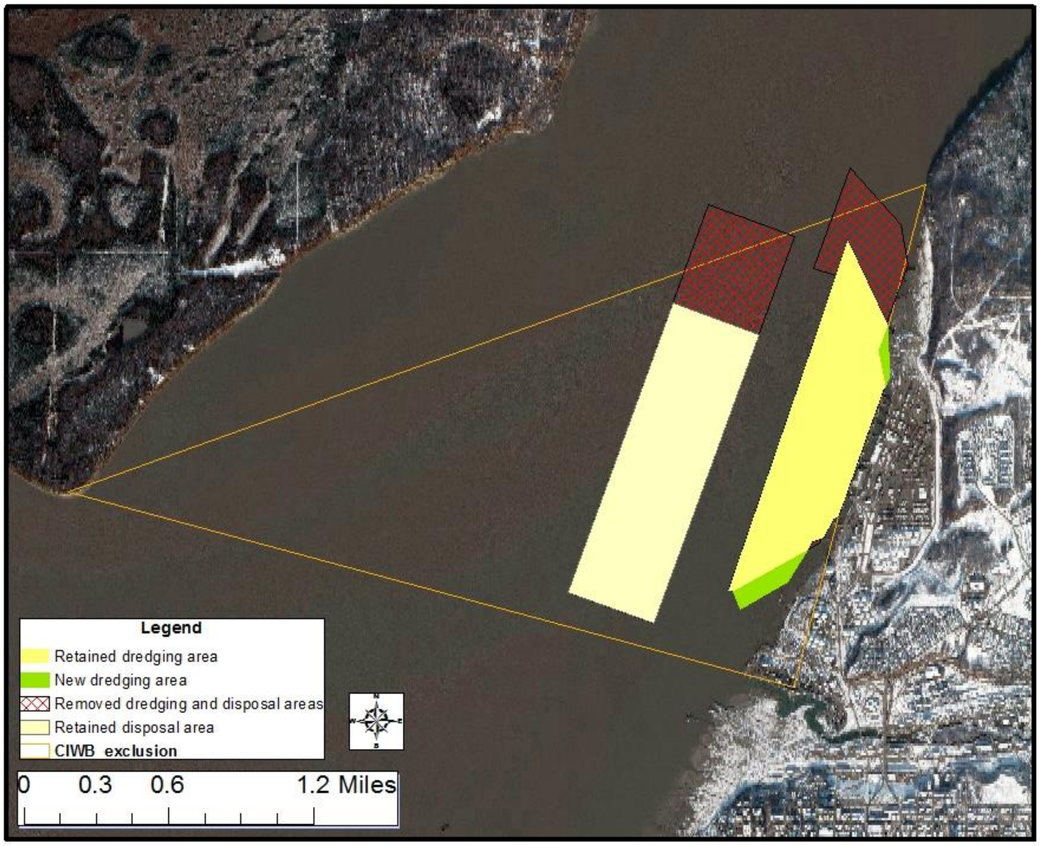

Figure 10. Depiction of the proposed dredge limits in relation to the Port of Anchorage excluded area from Cook Inlet beluga whale critical habitat

4.13 Climate Change

Preferred Alternative. The operation of dredging equipment produces greenhouse gasses through the combustion of hydrocarbon fuels. It is likely that the dredge used to remove sediments from the Federal project and dispose of material would have around 2,500 horsepower total installed power. Carbon dioxide emissions from ships are only 2 percent of the 6000 Tg of carbon emitted from fossil fuel use; whereas ships are estimated to produce 14 percent of all nitrogen and 16 percent of all sulfur emissions. (Khalil and Rasmussen 1995)

Greenhouse gas emissions from ships represent a comparatively small portion of the global sum and continuing to dredge the Port would have a less than significant impact on climate change.

No Action Alternative. Under the No Action Alternative, the USACE would not dredge the area. The Anchorage Harbor would be unable to accommodate deep draft vessels at all tidal stages, necessitating additional maneuvering of deeper draft vessels and/or lightering operations to transport cargo ashore. Additional transits and combustion of fuel required for lightering could produce a less than significant impact on climate change.

4.14 Cumulative Effects.

Preferred Alternative. USACE dredging to maintain the Port is the only major on-going dredging and disposal action in Knik Arm or anywhere in upper Cook Inlet. The only other past or reasonably foreseeable future dredging is related to the following:

(1) Construction and maintenance of Point McKenzie port facilities. This comparatively small port is in a high-energy environment that has not required substantial dredging for construction or maintenance. Point McKenzie facilities may be expanded in the future, but plans for activities that would substantially increase dredging or suspended material in Knik Arm are not advanced enough to be useful for predicting future impacts.

(2) Knik Arm Bridge. This major Knik Arm project would not be likely to require substantial dredging. It could, however, influence tidal currents and movement of bottom material. Potential for effects depend upon project design, which is still being studied. In a less turbid system, sediment loads might be increased substantially over background levels until the system reached some kind of equilibrium. In Knik Arm, where huge volumes of sediment are constantly suspended, distributed, deposited, and re-suspended, potential effects of a bridge on suspended solids appear to be less than significant. In June 2016, the Knik Arm Bridge project was shut down by the Governor of Alaska. Money appropriated for the project has been redirected, making the construction of a Knik Arm bridge extremely unlikely in the near-term.

(3) New construction or dredging near the Port. The Municipality of Anchorage intends to update the rest of the Port under its Anchorage Port Modernization Plan (APMP) in the near future, as funding permits. These modernization projects would include replacing the existing Petroleum, Oils, and Lubricants (POL) terminal with a new Petroleum and Concrete Terminal (PCT-1), replacement of Terminals 1 and 2, replacement of POL-2 with a Petroleum Terminal, and North Extension Stabilization Step 1 and 2. The planned projects would all require construction dredging and disposal, pile driving, and elevated anthropogenic activity in the harbor area. The NES Step-1 and PCT are planned for construction beginning in 2017-2018, Terminal 1 and 2 are planned for 2018-2022 construction, the Petroleum Terminal for 2019 or later, and construction of North Extension Step-2 and demolition of Terminal 3 are planned for 2020 or later.

The NES Step-1 project would result in the disposal of around 1.2 million cubic yards of fill material in the Port of Anchorage open water disposal site, pile driving during construction would contribute to marine noise levels, and anthropogenic activity would be elevated in the Port area during construction.

Construction of the PCT would involve the disposal of 68,000 cubic yards of material in the Port of Anchorage open water disposal site, pile driving during construction activities, and elevated anthropogenic activity levels during construction.

The dispersive nature of the upper Cook Inlet currents, high natural sediment load, and loud existing environment minimize the effects of dredging in the project area. The preferred alternative would have a less than significant impact on cumulative effects.

No Action Alternative. Under the No Action Alternative, the USACE would not dredge the area, resulting in a reduction of the cumulative impacts of dredging in the upper Cook Inlet.

5.0 Environmental Compliance

The Preferred Alternative was considered in relation to compliance with Federal environmental review and consultation requirements. The following paragraphs document compliance with applicable Federal statutes, Executive Orders, and policies.

BALD AND GOLDEN EAGLE PROTECTION ACT, (BGEPA) AS AMENDED

This act prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" bald eagles, including their parts, nests, or eggs. The act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." Disturbance of eagles can include any action causing interference with normal breeding, nesting, or feeding activities.

There is no indication that the project would have an impact on eagles or their habitat. The project is in compliance with the BGEPA.

CLEAN WATER ACT OF 1972, AS AMENDED

The objective of the Federal Water Pollution Control Act of 1972, as amended by the Clean Water Act (CWA) of 1977 (Public Law 92-500), is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. Specific sections of the CWA control the discharge of pollutants and wastes into aquatic and marine environments.

Dredging and disposal in waters of the United States is an activity regulated by the CWA and analysis under Section 404(b)(1) was performed in conjunction with the 2008 USACE EA evaluating the harbor expansion project. The expansion of the dredged and disposal areas was deemed to be not contrary to the public interest. Reducing the scope and areal extent of dredging in the Anchorage Harbor would also not be contrary to the public interest. The project is in compliance with the Clean Water Act.

COASTAL BARRIER RESOURCES ACT

This Act is not applicable. The study area is not in a designated Coastal Barrier Resources Act unit.

COASTAL ZONE MANAGEMENT ACT OF 1972, AS AMENDED
As of July 1, 2011, the CZMA Federal consistency provision no longer applies in Alaska. Federal agencies shall no longer provide the State of Alaska with CZMA Consistency Determinations or Negative Determinations pursuant to 16 U.S.C. 1456(c)(1) and (2), and 15 CFR part 930, subpart C. Persons or applicant agencies for Federal authorizations or funding shall no longer provide to the State of Alaska CZMA Consistency Certifications pursuant to 16 U.S.C. 1456(c)(3)(A), (B) and (d), and 15 CFR part 930, subparts D, E and F. Because the CZMA Federal consistency provisions no longer apply in Alaska, consistency determinations from Federal agencies and consistency certifications from applicants for Federal authorizations or funding that are currently pending ACMP response are no longer required to receive a response from the ACMP and may proceed in accordance with other applicable laws and procedures.

ENDANGERED SPECIES ACT OF 1973, AS AMENDED
The Cook Inlet beluga whale is present in the project area, a species listed as “endangered” under the Endangered Species Act (ESA). The proposed activity would have a less than significant impact on endangered species because commercial shipping traffic in the Port of Anchorage produces sound pressure in the same bandwidth and intensity that dredging would, beluga whales in the Port have apparently become habituated to anthropogenic disturbances such as vessel traffic, and the areas affected by dredging are not of particular significance or used for breeding or rearing. The project is in compliance with the ESA.

ESTUARY PROTECTION ACT OF 1968
Cook Inlet is a large estuary on the south-central coast of Alaska, bordered on three sides by rugged mountains, tidal flats, marshlands, and rolling lowlands. The preferred alternative would have a less than significant impact on the Cook Inlet estuary due to the natural levels of suspended sediments and ambient noise. The project is in compliance.

MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT
The National Oceanic and Atmospheric Administration, National Marine Fisheries Service works with the regional fishery management councils to identify the essential habitat for every life stage of each federally managed species using the best available scientific information. Essential fish habitat (EFH) has been described for approximately 1,000 managed species to date. The preferred alternative would have a less than significant impact on essential fish habitat due to the natural levels of suspended sediments and ambient noise. The project is in compliance with the Magnuson-Stevens Act.

MARINE PROTECTION, RESEARCH, AND SANCTUARIES ACT OF 1972, AS AMENDED
Titles I and II of the Marine Protection, Research, and Sanctuaries Act (MPRSA), also referred to as the Ocean Dumping Act, generally prohibits (1) transportation of material from the United States for the purpose of ocean dumping, (2) transportation of material from anywhere for the purpose of ocean dumping by U.S. agencies or U.S.-flagged vessels, and (3) dumping of material transported from outside the United States into the U.S. territorial sea. The Port of Anchorage dredging and disposal project lies wholly within the territorial seas of the United States, so the MPRSA does not apply to this project.

MIGRATORY BIRD TREATY ACT AND MIGRATORY BIRD CONSERVATION ACT

Under the Migratory Bird Treaty Act, project construction shall not destroy migratory birds, their active nests, their eggs, or their hatchlings. The preferred alternative would have a less than significant impact on the migratory birds because individuals would avoid dredging operations and the areas affected by dredging are not heavily used or of particular value to avifauna. The project is in compliance.

NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) OF 1969, AS AMENDED

This Act requires that environmental consequences and project alternatives be considered before a decision is made to implement a Federal project. NEPA established the requirements for preparation of an Environmental Impact Statement (EIS) for projects potentially having significant environmental impacts and an Environmental Assessment (EA) for projects with no significant environmental impacts. This EA has been prepared to address impacts and propose avoidance and minimization steps for the proposed project, as discussed in the CEQ regulations on implementing NEPA (40 CFR 1500 et seq.). This document presents sufficient information regarding the generic impacts of the proposed construction activities at the proposed project to guide future studies and is intended to satisfy all NEPA requirements.

NATIONAL HISTORIC PRESERVATION ACT OF 1966 (INTER ALIA)

The purpose of the National Historic Preservation Act (NHPA) is to preserve and protect historic and prehistoric resources that may be damaged, destroyed, or made less available by a project. Under this Act, Federal agencies are required to identify cultural or historic resources that may be affected by a project and to consult with the State Historic Preservation Officer (SHPO) and other interested parties when a Federal action may affect cultural resources.
The Area of Potential Effect (APE) has been assessed by the Alaska District archeologist. The Corps has determined that no historic properties will be adversely affected by the proposed activities and has received concurrence from the State Historic Preservation Office.

RIVER AND HARBOR APPROPRIATION ACT OF 1899

The Port of Anchorage dredging project consists of work within navigable waters of the United States, and correspondingly falls within the purview of the Rivers and Harbors Act of 1899 (RHA). The project purpose is to provide safe navigation, authorized by Section 118 of Public Law 108-447. The preferred alternative would allow for safe navigation required by legislation and accommodate the planned expansion of the Port of Anchorage as directed by Public Law 108-447. The project is in compliance. The proposed work would not obstruct navigable waters of the United States.

UNIFORM RELOCATION ASSISTANCE AND REAL PROPERTY ACQUISITION POLICIES ACT OF 1970 (PUBLIC LAW 91-646)

The Preferred Alternative does not require the procurement of private lands for public use. The provisions of this Act do not apply to the project.

WILD AND SCENIC RIVER ACT OF 1968, AS AMENDED

No rivers designated under the Act are in the project area. This Act is not applicable.

EXECUTIVE ORDER 11990, PROTECTION OF WETLANDS
The Preferred Alternative would not result in impacts to wetlands. The EA is in compliance with the goals of this Executive Order (EO).

EXECUTIVE ORDER 12898, ENVIRONMENTAL JUSTICE
EO 12898 requires agencies of the Federal Government to review the effects of their programs and actions on minorities and low-income communities. This project is not expected to have disproportionately high and adverse human health or environmental impacts on minority or low-income populations.

EXECUTIVE ORDER 13045, PROTECTION OF CHILDREN
EO 13045, requires each Federal agency to "identify and assess environmental risks and safety risks [that] may disproportionately affect children" and ensure that its "policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks." This project has no environmental or safety risks that may disproportionately affect children. The project is in compliance.

EXECUTIVE ORDER 13653, CLIMATE CHANGE CONSIDERATIONS
EO 13653 requires Federal agencies to review the effect of climate change on their programs. Coastal uplift in the Cook Inlet is predicted to range from approximately 0.7 meters to 1.1 meters by 2100. When uplift is combined with eustatic sea level rise predictions of 0.4 meters to 1.3 meters, relative sea level rise is expected to range from -0.7 meters and 1.3 meters by 2100 (Glick et al. 2010). Warming temperatures could have the effect of releasing additional sediment into the Knik Arm due to glacial retreat. Elevated sediment inputs could increase the rate of accretion in tidal flats, which would increase resilience to eustatic sea level rise but could also increase the volume of dredged material generated in the Port of Anchorage. Increased volume of material as a result of accelerated glacial retreat could occur in the presence or absence of the preferred alternative. Dredged material removed from the Port of Anchorage is redeposited in Knik Arm, resulting in no change to its capacity. Given the extent of variability in dredged quantities, an increase in sedimentation would not significantly impact the Port of Anchorage dredging project. The project is in compliance.

6.0 Public and Agency Involvement

The project may affect, but is not likely to adversely affect Cook Inlet beluga whales; an endangered species listed in the Endangered Species Act (ESA). This determination requires written concurrence from the responsible agency; the National Marine Fisheries Service (NMFS) Protected Resource Division (PRD).

Concurrence from the NMFS regarding the ESA determination was requested on 17 February 2017 via email. Informal consultation was initiated to obtain concurrence on 3 March 2017.

The project may affect, but is not likely to adversely affect waters and substrate required for federally managed fish species' spawning, breeding, feeding, or growth to maturity; known as Essential Fish Habitat (EFH). This determination received concurrence from the NMFS Habitat Division on 8 December 2016.

7.0 Preparers and Acknowledgements

Matt Ferguson, biologist, of the Alaska District, U.S. Army Corps of Engineers prepared this EA. Donna West is the project manager.

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