US Army Corps
of Engineers
-Alaska District

Final Feasibility Report

And Draft Environmental Assessment

Unalaska (Dutch Harbor) Channels

Unalaska, Alaska

February 1, 2019

Final Feasibility Report

And

Draft Environmental Assessment

Unalaska (Dutch Harbor) Channels

Unalaska, Alaska

Prepared by

U.S. Army Corps of Engineers

Alaska District

February 1, 2019

FINDING OF NO SIGNIFICANT IMPACT

Unalaska (Dutch Harbor) Channels

Unalaska, Alaska

The U.S. Army Corps of Engineers (USACE), Alaska District (POA) has conducted an environmental analysis in accordance with the National Environmental Policy Act of 1969, as amended for the Integrated Feasibility Report and Environmental Assessment (FR/EA) dated "TBD", for the Unalaska (Dutch Harbor) Channels, Unalaska, Alaska. The final recommendation is contained in the report of the Chief of Engineers, dated **DATE OF CHIEF'S REPORTDATE OF CHIEF'S REPORT**.

The FR/EA, incorporated herein by reference, evaluated a number of structural alternatives based on economic, engineering, environmental, and cultural resource factors. Based on the National Economic Development (NED) analysis, the Recommended Plan deepens the existing bar to -58 feet Mean Lower Low Water (MLLW) providing one-way access for vessels with a draft up to 44 feet with waves up to 5.6 feet over the bar with tides above 0 feet MLLW. This plan has a total construction cost with contingency of approximately $30.5 million (Fiscal Year [FY] 19 dollars). This plan maximizes total net benefits and has a Benefit-to-Cost Ratio (BCR) of 2.1.

The recommended plan is a dredged channel to a depth of -58 feet MLLW comprising of 182,000 cubic yards (cy) and covering 437,000 square feet. Maintenance dredging, to be performed at year 25, will comprise of 16,000 cy and covering 437,000 square feet. Disposal will be a site on the east side of the mouth of Iliuliuk Bay with a 110-foot depth. The channel will be 600 feet in length and 600 feet in width. The recommended plan is supported by the City of Unalaska, which is the non-Federal sponsor.

The recommended plan was developed in parallel with guidance from NMFS input on dredged material placement for the creation of fish habitat.

In addition to a "no action" plan, eight alternatives were evaluated.[1] Alternatives included dredging in 2-foot increments between -46 feet MLLW and -58 feet MLLW plus an increment at -66 feet MLLW. There were no non-structural alternatives considered that would have improved

[1] 40 CFR 1505.2(b) requires a summary of the alternatives considered.

navigational conditions at Unalaska. Alternatives and their formulation are considered in-depth in Section 5 of this integrated FR/EA.

Ongoing coordination with Federal and state resource agencies shall seek to ensure that all practical means to avoid or minimize adverse environmental effects will be incorporated into the preferred alternative/recommended plan. Best management practices (BMPs) and mitigation details will be developed during the Project Engineering and Design Phase (PED) of the proposed project.

For all alternatives, the potential effects listed in Table 1 were evaluated.

Table 1. Unalaska Resources Evaluated in the Environmental Assessment

	In-depth evaluation conducted	Brief evaluation due to minor effects	Resource unaffected by action
Aesthetics	☐	☐	☒
Air quality	☐	☒	☐
Aquatic resources/wetlands	☒	☐	☐
Invasive species	☐	☐	☒
Fish and wildlife habitat	☒	☐	☐
Threatened/Endangered species	☒	☐	☐
Historic properties	☐	☒	☐
Other cultural resources	☐	☒	☐
Floodplains	☐	☐	☒
Hazardous, toxic & radioactive waste	☒	☐	☐
Hydrology	☒	☐	☐
Land use	☐	☒	☐
Navigation	☒	☐	☐
Noise levels	☐	☒	☐
Public infrastructure	☒	☐	☐
Socio-economics	☒	☐	☐
Environmental justice	☒	☐	☐
Soils	☒	☐	☐
Tribal trust resources	☒	☐	☐
Water quality	☐	☒	☐
Climate change	☐	☒	☐

No compensatory mitigation measures have been identified at the time, for impacts associated with the implementation of the recommended plan. Unavoidable adverse impacts as a result of project implementation include temporal and spatial disruption of Unalaska's nearshore waters from turbidity, water quality, and underwater noise.

Pursuant to Section 106 of the National Historic Preservation Act of 1966, as amended, USACE determined that no historic properties would be affected by the recommended plan [36 CFR §800.4(d)(1)]. The Alaska State Historic Preservation Officer (SHPO) concurred with this assessment on March 16, 2018.

Pursuant to the Clean Water Act of 1972, as amended, the discharge of dredged or fill material associated with the recommended plan has been evaluated and found to be compliant with Section 404(b)(1) Guidelines (40 CFR 230). See Appendix F.

A water quality certification pursuant to section 401 of the Clean Water Act will be obtained from the Alaska Department of Environmental Conservation prior to construction.

Pursuant to the Marine Mammal Protection Act of 2007, as amended, USACE will apply for an Incidental Harassment Authorization (IHA) for confined underwater blasting required during the construction and implementation of its preferred alternative that would reach level B harassment values for disturbance to marine mammals.

Public review of the FR/EA was completed on **DATE Draft EA COMMENT PERIOD ENDEDDATE Draft EA COMMENT PERIOD ENDED**. All comments submitted during the public comment period were responded to in the Final FR/draft EA. A 30-day state and agency review of the Final FR/EA was completed on **DATE SAR PERIOD ENDED**. **PICK OPTION BASED ON RESULTS OF STATE AND AGENCY REVIEW**.

Technical, environmental, and economicand economic criteria used in the formulation of alternative plans were those specified in the Water Resources Council's 1983 Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies. All applicable laws, executive orders, regulations, and local government plans were considered in evaluation of alternatives.[2] Based on this report, the reviews by other Federal, state and local agencies, Tribes, input of the public, and the review by my staff, it is my determination that the recommended plan would not significantly affect the human environment; therefore, preparation of an Environmental Impact Statement is not required.[3]

______________________ ____________________________________

Date PHILLIP J. BORDERS

COL, EN

Commanding

[2] 40 CFR 1505.2(B) requires identification of relevant factors including any essential to national policy which were balanced in the agency decision.

[3] 40 CFR 1508.13 stated the FONSI shall include an EA or a summary of it and shall note any other environmental documents related to it. If an assessment is included, the FONSI need not repeat any of the discussion in the assessment but may incorporate by reference.

PERTINENT DATA

Recommended Plan	
Project Component	
Dredge Channel to -58 feet MLLW (See Figure 29)	
Dredge Volume	182,000 CY
Length of Channel	600 Feet
Width of Channel	600 Feet
Maintenance Dredging	16,000 CY @ 25 yrs

Economics (FY19 Dollars)	
Item	
Total Annual NED Cost (50 years, 2.875%)	$1,323,354
Total Annual NED Benefit (50 years, 2.875%)	$2,809,965
Net Annual NED Benefits	$1,486,611
Benefit/Cost Ratio	2.1

Description	Total	Federal	Non-Federal
Mobilization/Demobilization (deeper than -20FT MLLW and up to -50FT MLLW)	**$2,014,712**	**$1,511,034**	**$503,678**
Mobilization/Demobilization (deeper than -50FT MLLW)	**$2,014,712**	**$1,007,356**	**$1,007,356**
General Navigation Features (deeper than -20FT MLLW and up to -50FT MLLW)	**$6,004,888**	**$4,503,666**	**$1,501,222**
General Navigation Features (deeper than -50FT MLLW)	**$16,730,811**	**$8,365,406**	**$8,365,405**
LERR	**$0**	**$0**	**$0**
Aids to Navigation	**$24,910**	**$24,910**	**$0**
Local Service Facilities	**$0**	**$0**	**$0**
Preconstruction Engineering & Design	**$1,833,211**	**$1,145,757**	**$687,454**
Supervision, Inspection, & Overhead	**$1,845,616**	**$1,153,510**	**$692,106**
Project Cost Apportionment	**$30,468,860**	**$17,711,639**	**$12,757,221**
10% over time adjustment (less LERR)*		**($2,676,512)**	**$2,676,512**
Final Allocation of Costs	**$30,468,860**	**$15,035,127**	**$15,433,733**
***10% over time adjustment ($4,029,424 mob/demob + $22,711698 GNF = $26,765,123 x 10% = $2,676,512 - $0 = $2,676,512)			

EXECUTIVE SUMMARY

This General Investigations study is being conducted under authority granted by Section 204 of the Flood Control Act of 1948. The study evaluates Federal interest in and the feasibility of constructing deep draft navigation improvements, and proposes a Recommended Plan to improve access to Unalaska/Dutch Harbor.

The City of Unalaska is located in the Aleutian Islands, some 800 air miles from Anchorage. Dutch Harbor is a port facility on Amaknak Island within the city. Dutch Harbor is the only deep draft, year-round ice-free port along the 1,200-mile Aleutian Island chain. It provides vital services to vessels operating in both the North Pacific and the Bering Sea. As the operations center for the Bering Sea commercial fishing fleet, there are multiple docks around Unalaska-Dutch Harbor that provide general moorage and other services to the fishing fleet. For more than 30 years, Unalaska's economy has been based on commercial fishing, seafood processing, fleet services, and marine transportation. It has the western-most container terminal in the United States and provides ground and warehouse storage and transshipment opportunities for the thousands of vessels that fish in the region or pass through while in transit between North America and Asia.

A bar shallower than the surrounding bathymetry located at the entrance to Iliuliuk Bay currently limits access to Dutch Harbor. Based on the most recent bathymetry, the depth at the bar is -42 feet Mean Lower Low Water (MLLW) within the area that most vessels cross. This depth prevents deeper draft vessels from safely passing over the bar. Vessels often must take precautionary measures to safely cross the bar. These measures include light loading, waiting outside the bar for wave conditions to improve, waiting outside the bar for adequate tidal stages, foregoing fueling to capacity to reduce draft, lightering fuel outside the bar, and discharging ballast water to reduce draft. Additionally, vessels that can cross the bar during calm sea conditions may not be able to safely cross the bar during inclement conditions and must wait for calmer conditions. The surrounding natural depth of Iliuliuk Bay is -100 feet MLLW. The bar is the only constraint preventing access for the current and anticipated future fleet. The bar causes inefficiencies in the delivery of fuel, durable goods, and exports to/from Dutch Harbor.

This study evaluates a number of alternatives in accordance with the goals and procedures for water resource planning as contained in Engineer Regulation (ER) 1105-2-100, "Planning Guidance Notebook," and Institute for Water Resources (IWR) Report 10-R-4, "Deep Draft Navigation." ER 200-2-2, "Procedures for Implementing NEPA" directs the contents of environmental assessments and environmental impact statements. No compensatory mitigation measures have been identified for impacts associated with the implementation of the preferred alternative.

Based upon the National Economic Development (NED) analysis, the Recommended Plan is a dredged channel to a depth of -58 feet MLLW providing one-way access for vessels with a draft up to 44 feet with waves up to 5.6 feet over the bar with tides above 0 feet MLLW. The channel will be 600 feet in length and 600 feet in width. Initial dredging is estimated to consist of 182,000 cubic yards (cy) and maintenance dredging, to be performed at year 25, will comprise of 16,000 cy. Disposal will be a site on the east side of the mouth of Iliuliuk Bay with a 110 foot-depth.

A plan differing from the Recommended Plan was identified as the Tentatively Selected Plan in the Draft Interim Feasibility Report distributed for review in May 2018. The Tentatively Selected Plan was for a dredged channel to a depth of only -48 feet MLLW. This depth was based upon the current practice for vessels to light load from point of origin to maintain an under keel clearance of 4 feet while drifting over the bar while not under power. Calculations were based on calm sea conditions with no ship motion due to waves. To maintain maneuverability within a dredged channel, however, vessels must transit under power at greater speeds than under current conditions as well as transiting during wave conditions. Accordingly, the under keel clearance was revised to accommodate these future practices. The Recommended Plan dredged channel depth of -58 feet MLLW incorporates all required U.S. Army Corps of Engineers (USACE) deep draft safety guidelines as confirmed through a ship simulation study. The results of the ship simulation study were to be incorporated into the design of the Tentatively Selected Plan; however, execution of the study was delayed due to a government shutdown.

Ongoing coordination with Federal and state resource agencies shall seek to ensure that all practical means to avoid or minimize adverse environmental effects will be analyzed and incorporated into the recommended plan. Pursuant to Section 7 of the Endangered Species Act (ESA) of 1973, as amended, USACE expects to concurrently coordinate with NMFS and USFWS while its application for Incidental Harassment Authorization during the Preconstruction Engineering and Design (PED) Phase. This concurrent coordination would be for actions associated with the implementation of its preferred alternative that may incidentally harass marine mammals that are also listed species under the ESA as reviewed by NMFS' Protected Resources Division and USFWS. Pursuant to the Marine Mammal Protection Act of 2007, as amended, USACE will apply for an Incidental Harassment Authorization (IHA) during the PED Phase for confined underwater blasting required during the construction and implementation of the preferred alternative that would reach level B harassment values for disturbance to marine mammals. To date, formal mitigation measures have not been identified. As project coordination continues and further project information becomes available, mitigation commitments will be identified and implemented.

While incorporation of reasonable and prudent measures will likely be required by the coordinating environmental agencies to mitigate potential short-term environmental impacts, over the longer term, the project may reduce the requirement for fuel lightering and at-sea repair efforts resulting in a reduction for the potential for inadvertent release of petroleum, oils, and lubricants, and other locally persistent contaminants, into the local marine environment. Over the long-term, this potential reduction in the introduction of environmental contaminants could outweigh the short-term impacts of project construction.

This plan has a total first construction cost with contingency of approximately $30.5 million (Fiscal Year [FY]19 dollars). This plan maximizes total net benefits and has a Benefit-to-Cost Ratio (BCR) of 2.1. The recommended plan is supported by the City of Unalaska which is the non-Federal sponsor.

LIST OF ACRONYMS AND ABBREVIATIONS

ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
APE	Area of Potential Effect
BP	Before Present
C	Celsius
CAA	Clean Air Act
CFR	Code of Federal Regulations
COL	Colonel
USACE	U.S. Army Corps of Engineers
CWA	Clean Water Act
CY	Cubic Yards
dB	Decibel
DPS	Distinct Population Segment
EFH	Essential Fish Habitat
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ER	Engineer Regulations
ESA	Endangered Species Act
etc.	Et Cetera
F	Fahrenheit
FMP	Fishery Management Plan
FONSI	Finding of No Significant Impact
FR	Feasibility Report
FWCA	Fish and Wildlife Coordination Act
ft.	feet
GNF	General Navigation Feature
HTRW	Hazardous, Toxic, and Radioactive Wastes
IDC	Interest During Construction
kg.	Kilograms
lbs.	Pounds
LERR	Land, Easements, Rights-of-Way, Relocations
LSF	Local Service Facilities
MBTA	Migratory Bird Treaty Act
MLLW	Mean Lower Low Water
MMPA	Marine Mammal Protection Act
NAAQS	National Ambient Air Quality Standards

NED	National Economic Development
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
O&M	Operation and Maintenance
OCT	Opportunity Cost of Time
OMB	Office of Management and Budget
OMRR&R	Operation, Maintenance, Repair, Replacement, and Rehabilitation
PED	Preconstruction Engineering and Design
SHPO	State Historic Preservation Officer
TSP	Tentatively Selected Plan
U.S.	United States
USC	United States Code
USCG	United States Coast Guard
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

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1 INTRODUCTION

1.1 Project & Study Authority

This General Investigations study is being conducted under authority granted by Section 204 of the Flood Control Act of 1948 which states in part:

> "*The Secretary of the Army is hereby authorized and directed to cause preliminary examinations and surveys for flood controls and allied purposes ... to be made under the direction of the Chief of Engineers, in drainage areas of the United States and Territorial possessions, which include the following named localities: ... Harbors and Rivers in Alaska, with a view to determining the advisability of improvements in the interest of navigation, flood control, hydroelectric power, and related water uses.* "

1.2 Scope

This study evaluates Federal interest in and the feasibility of constructing deep draft navigation improvements, and proposes a Recommended Plan to improve access to Unalaska-Dutch Harbor. This study was conducted and the report prepared in accordance with the goals and procedures for water resource planning as contained in Engineer Regulation (ER) 1105-2-100, “Planning Guidance Notebook,” and Institute for Water Resources (IWR) Report 10-R-4, “Deep Draft Navigation.”

Studies of this nature consider a wide range of alternatives and the environmental consequences of those alternatives. The evaluation of potential environmental impacts of the proposed action is included in the integrated Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) A 404(b)(1) Evaluation is included in Appendix F.

1.3 Study Location\Congressional District

The City of Unalaska is located in the Aleutian Islands, some 800 air miles from Anchorage (Figure 1). Dutch Harbor is a port facility on Amaknak Island within the city (Figure 2). As of 2015, Unalaska had a population of 4,605. The Qawalangin Tribe of Unalaska, a federally recognized Tribe, is based in Unalaska. Subsistence activities are important to the Alaska Native community and many long-term non-Native residents, as well.

The non-Federal sponsor for this single purpose deep draft navigation improvements study is the City of Unalaska, Alaska.

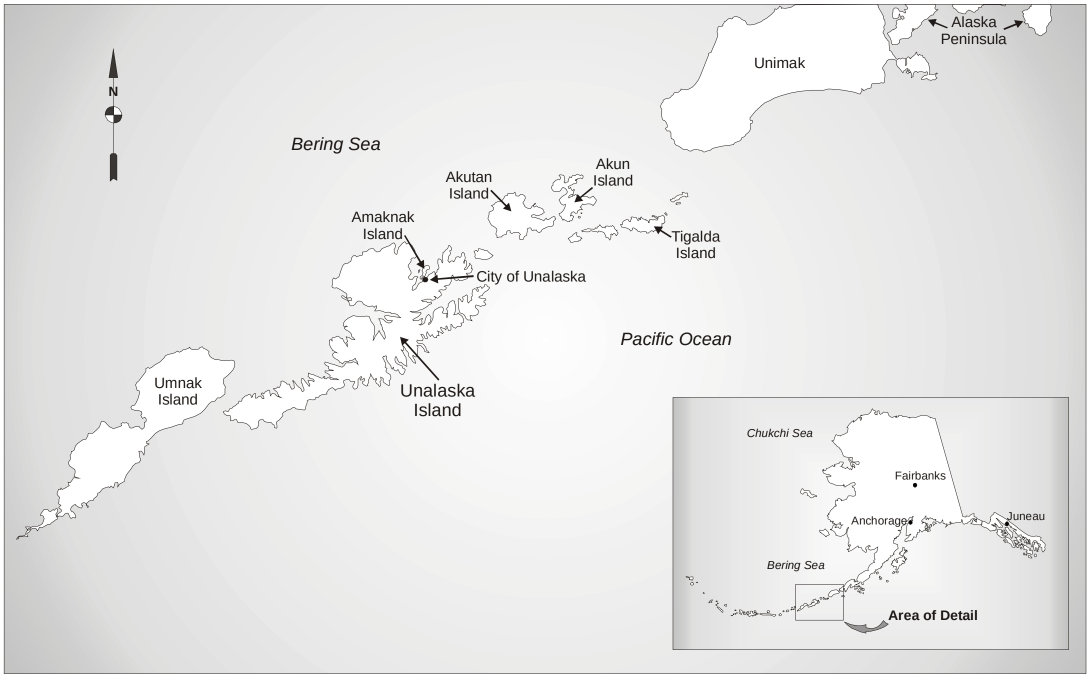

Figure 1. Vicinity Map, Unalaska, Alaska

Figure 2. Dutch Harbor

The international Port of Dutch Harbor is the only deep draft, year-round ice-free port along the 1,200-mile Aleutian Island chain. It provides vital services to vessels operating in both the North Pacific and the Bering Sea. Dutch Harbor has been the number one U.S. commercial fishing port in terms of quantity of catch every year since 1997[4] and in the top two since 1989. In terms of value, Dutch Harbor has been the number one or two U.S. port since 1989. For more than 30 years, Unalaska's economy has been based on commercial fishing, seafood processing, fleet services, and marine transportation. It has the western-most container terminal in the United States and provides ground and warehouse storage and transshipment opportunities for the thousands of vessels that fish in the region or pass through while in transit between North America and Asia.

The study area is in the Alaska Congressional District, which has the following congressional representation:

Senator Lisa Murkowski (R-AK)

Senator Dan Sullivan (R-AK)

Representative Don Young (R-AK)

1.4 Related Reports & Studies

2016 Site Inspection Report Naval Defensive Sea Area, Unalaska, Alaska (July). This report, prepared by URS Group Inc. for Naval Facilities Engineering Command (NAVFAC) Northwest, presents the results of the site inspection for munitions and explosives of concern at the Unalaska Island Naval Defensive Sea Area in Alaska.

2013 Preliminary Assessment Report for Naval Defensive Sea Area, Unalaska Island, Alaska (May). This document, prepared by NAVFAC Northwest, presents the results of a preliminary assessment conducted to evaluate the possible presence of munitions and explosives of concern in the marine environment within the Naval Defensive Sea Area at Unalaska Island resulting from training exercises and ordnance handling activities between 1940 and 1950.

2004 Navigation Improvements Integrated Interim Feasibility Report and Final Environmental Impact Statement (September). This report recommends construction of a

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[4] https://www.st.nmfs.noaa.gov/commercial-fisheries/commercial-landings/other-specialized-programs/total-commercial-fishery-landings-at-major-u-s-ports-summarized-by-year-and-ranked-by-dollar-value/index

harbor on Amaknak Island to provide moorage to 75 boats ranging from 75 to 150 feet in length. Construction of the harbor, named Carl E. Moses Harbor, was completed in 2012.

1999 Underwater Survey of Former Military Occupied Waters, Amaknak and Unalaska Islands, Alaska (November). This report was prepared by Jacobs Engineering Group, Inc. for the Alaska District, USACE. The objective of the survey was to identify abandoned submarine objects and debris protruding above the seafloor. This report describes the field work accomplished, summarizes the findings of the underwater survey, and presents recommendations for future surveys.

1998 Feasibility Study for the Expansion of the City of Unalaska Spit Dock, Concepts D, 0, 01, P, and Q, (February). This report, prepared by Peratrovich, Nottingham & Drage, Inc., and Northern Economics, discusses various concepts for expanding the Spit Dock inDutch Harbor.

1995 Proposed Small Boat Harbor, Unalaska/Dutch Harbor, Alaska (April). Prepared by Dowl Engineers, the report discusses three alternatives for small boat harbor expansion at Unalaska.

1995 Unalaska-Dutch Harbor Navigation Improvements: Supplement to the NorthernSea Route Reconnaissance Study (July). This study identified an outer bar that large container vessels must cross traveling into or out of Iliuliuk Bay and Dutch Harbor. This is the same bar that is being investigated as part of the current study. The 1995 study considered eliminating this bar and recommended proceeding to the feasibility phase. No further action was taken since there were no cost sharing agreements in place with a non-Federal sponsor for future studies and construction.

1991 Harbor Facility Demand Study: a Component of the Harbor Management Plan,(November). Prepared by ResourcEcon and Ogden Beeman & Associates, the report summarizes moorage demand at Unalaska. The report identifies shortages in moorage space for vessels less than 125 feet in length. It also identifies potential new demand for moorage by larger container vessels.

1986 Unalaska Boat Moorage Survey (December). The study determined moorage needs and categorized vessel damage at Unalaska. The study was only informational and did not result in a project at Unalaska.

2 PLANNING CRITERIA, PURPOSE & NEED FOR PROPOSED ACTION*

2.1 Problem Statement, Purpose and Need

The purpose of the project is to increase the depth at a bar located at the entrance to Iliuliuk Bay (Figure 3). The need for the project is to reduce inefficiencies in cargo transportation and provide safer options in protected waters for vessel repairs and medical evacuations than currently exist due to draft restrictions at the bar.

A bar shallower than the surrounding bathymetry located at the entrance to Iliuliuk Bay currently limits access to Dutch Harbor. Based on the most recent NOAA bathymetry, the depth at the bar where most vessels cross is -42 feet MLLW. This depth prevents deeper draft vessels from safely passing over the bar. Vessels often must take precautionary measures to safely cross the bar. These measures include light loading, waiting outside the bar for wave conditions to improve, waiting outside the bar for adequate tidal stages, foregoing fueling to capacity to reduce draft, lightering fuel outside the bar, and discharging ballast water to reduce draft. Additionally, vessels that can cross the bar during calm sea conditions may not be able to safely cross the bar during inclement conditions and must wait for calmer conditions. The surrounding natural depth of Iliuliuk Bay is -100 feet MLLW. The bar is the only constraint preventing access for the current and anticipated future fleet. The bar causes inefficiencies in the delivery of fuel, durable goods, and exports to/from Dutch Harbor. The existing entrance to Iliuliuk Bay constrains the economic development potential of Dutch Harbor during a time when the international shipping fleet is transitioning to deeper draft vessels.

The bar also prevents Dutch Harbor from effectively serving as a Potential Place of Refuge (PPOR) to many vessels transiting the Great Circle Route between the western United States and Asia. Deeper draft vessels are unable to safely cross the bar to seek refuge in Dutch Harbor, and if they have to conduct personnel evacuations, it must be done outside the bar in open waters. This presents risks to rescuers and vessel personnel.

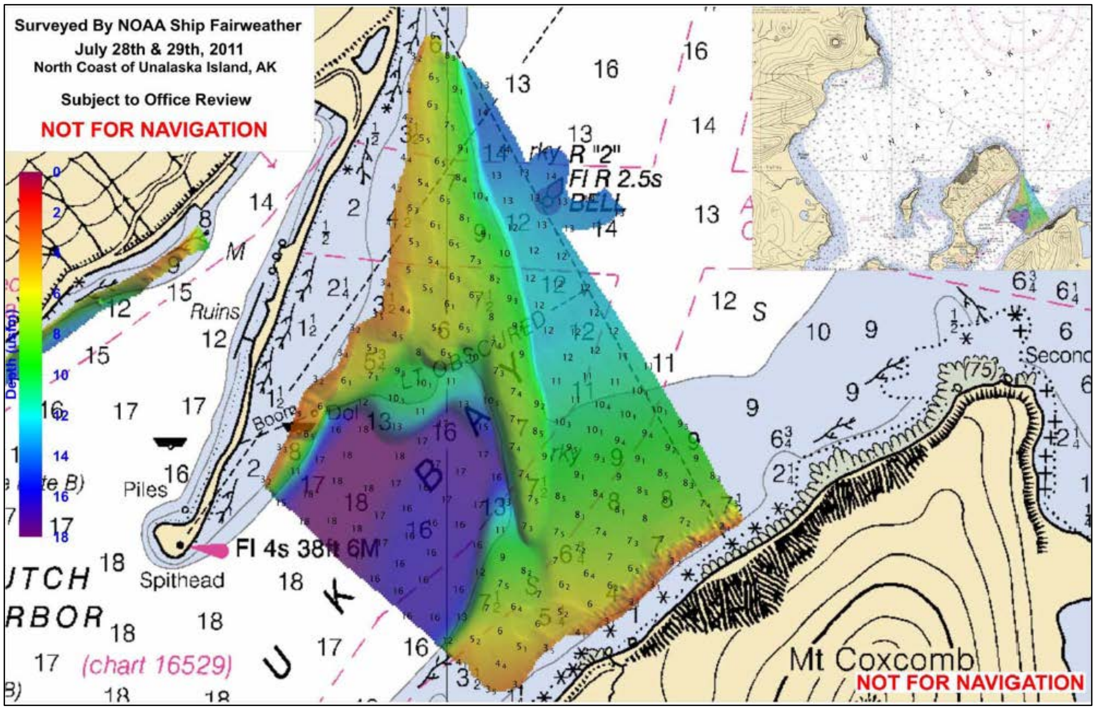

Figure 3. National Oceanic and Atmospheric Administration Bathymetry of the Shallow Bar

2.2 Problems & Opportunities

The following problem statements and opportunities were identified in the initial, and refined in the subsequent steps and iterations of the planning process:

Problem Statements

- The entrance to Iliuliuk Bay limits access to Dutch Harbor and constrains economic development and stability for the region, nation, and global seafood marketplace.
- Delivery of fuel, durable goods, and exports to and from Unalaska/Dutch Harbor can be unsafe for the current and future fleet, creating economic inefficiencies and environmental hazards to the region and nation.
- The entrance to Iliuliuk Bay hinders safe and efficient access for the existing and future fleet to services provided in Dutch Harbor as a PPOR.

Opportunities

- Lower the transportation costs of commodities
- Provide access for deeper draft vessels
- Reduce vessel delays at the bar
- Reduce the need for lightering fuel and other goods

- Lower the cost of durable goods and fuel consumed by the community
- Increase regional economic activities
- Increase regional employment opportunities
- Provide environmental habitat protection and enhancement
- Reduce navigation restrictions from storm surge

2.3 National Objectives

The Federal objective of water and land resources planning is to contribute to National Economic Development (NED) in a manner consistent with protecting the nation's environment. NED features increase the net value of goods and services provided to the economy of the nation as a whole.

2.4 Study Objectives

The following study objectives were identified in the initial, and refined in the subsequent, steps and iterations of the planning process:

- Improve access to Unalaska/ Dutch Harbor to decrease transportation inefficiencies in the region.
- Improve access to Unalaska/ Dutch Harbor to increase vessel access and safety in the region.

2.5 Study Constraints

There are no known legal constraints, but the following considerations were identified during the charette:

- Avoid impacts to Front Beach
- Avoid adverse impacts to threatened or endangered species and marine mammals
- Avoid conflicts with other port facilities
- Avoid adverse impacts to subsistence
- Minimize adverse impacts to commercial fisheries
- Avoid or minimize impacts to cultural and historical sites
- Avoid or minimize adverse impacts to marine traffic
- Minimize impacts to special aquatic sites (e.g., seagrasses)
- Ensure Dutch Harbor will remain a vital PPOR as there are no other suitable alternatives in the region.

2.6 National Evaluation Criteria

Alternative plans should be formulated to address study objectives and adhere to study constraints. Each alternative plan shall be formulated in consideration of four criteria: completeness, efficiency, effectiveness, and acceptability.

- Completeness is the extent to which alternative plans provide and account for all necessary investments or other actions to ensure the realization of the planning objectives, including actions by other Federal and non-Federal entities.
- Effectiveness is the extent to which alternative plans contribute to achieve the planning objectives.
- Efficiency is the extent to which an alternative plan is the most cost-effective means of achieving the objectives.
- Acceptability is the extent to which alternative plans are acceptable in terms of applicable laws, regulations, and public policies. Mitigation of adverse effects shall be an integral component of each alternative plan.

For the NED analysis, average annual benefits are compared to average annual costs expected to be derived from each alternative evaluated. Applying an appropriate discount rate and period of analysis makes costs and benefits comparable on the equivalent time value of money. For this analysis, all costs were calculated using FY 2019 price levels and then converted to Average Annual Equivalent (AAEQ) values using the FY 2019 Federal discount rate of 2.875 percent, assuming a 50-year period of analysis.

Each alternative has a total construction cost estimate, or project first cost, prepared by Cost Engineering utilizing MCASES. The total economic (NED) cost used in the NED analysis is the sum of project first costs, interest during construction, and operation and maintenance expenses. Further discussion of the NED analysis can be found in the Economics Appendix (Appendix D).

2.7 Study Specific Evaluation Criteria

Due to military activity during World War II, the presence of munitions and explosives of concern (MECs), including both unexploded ordnances (UXOs) and discarded military munitions (DMMs), within the project area must be considered. A study specific criteria to be considered is potential conflicts with potential MECs. An alternative that minimizes such potential conflicts would be preferred over one that does not. Marine geophysical investigations have tentatively identified a total of 38 potential MECs within potential project areas. Further investigation is necessary to determine the objects' identity, however. As elaborated within Appendix B, geotechnical field investigations proposed for the Preconstruction Engineering and Design (PED) phase would include use of a remotely operated underwater vehicle (ROV) to visually scan the confirmed dredge prism area for MEC, to include those potential MEC objects previously detected by geophysical means. If any MECs are encountered during dredging activities, it will be necessary to screen and separate them for controlled disposal in accordance with applicable regulations. The recovery, handling, and disposal of MEC will require special provisions for safety and qualified field oversight.

3 BASELINE CONDITIONS\AFFECTED ENVIRONMENT*

3.1 Physical Environment

3.1.1 Climate

Dutch Harbor is within the southwest maritime climate zone (ADCRA 2017). The area is characterized by persistently overcast skies, high winds, and frequent cyclonic storms. Climate data for Dutch Harbor from 1951 to 2005 is provided in Table 1 (Dutch Harbor, Alaska (502587), 2017). The highest recorded temperature is 81°F, and the lowest recorded temperature is -8°F, but typically temperatures range from 36°F to 46°F year round.

Table 1. Average Temperature, Precipitation, and Snowfall

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Min Temp *(°F)*	28	27	29	31	37	42	46	48	43	37	32	30	36
Max Temp *(°F)*	37	37	39	41	46	52	57	59	54	47	43	39	46
Ave Precip *(in)*	8	7	6	4	4	3	2	3	5	7	7	8	63
Ave Snowfall *(in)*	23	22	15	6	0	0	0	0	0	1	6	16	89
Ave Snow Depth *(in)*	4	5	3	1	0	0	0	0	0	0	0	3	1

Violent williwaws, sudden blasts of wind descending from a mountainous coast, are experienced with southerly gales and winds from the southeast, southwest, and northeast, which can reach hurricane velocity (Tryck Nyman Hayes, 1995). Prevailing wind direction is from the southeast. In the fall, wind direction shifts to the northwest.

3.1.2 Geology\Topography

During the late Pleistocene, glaciers covered much of Unalaska Island, excluding the Makushin

Volcano cone. The entirety of Dutch Harbor proper is inferred to have been glaciated up to 13 miles offshore based on submarine topography (Drewes et al., 1961). Submarine moraines have been mapped north of Unalaska Bay. Craggy coastlines consist of embayments and fjords and are composed of sparsely vegetated, narrow, steep boulder beaches, rock benches, and near vertical cliffs. Inferences regarding glacial and structural geology can be extended by interpretations of submarine contour maps of the surrounding areas (Drewes et al. 1961).

Based upon completed geophysical surveys, geologic reconnaissance, and established knowledge of similar geologic structures along the Alaskan coastline, the Iliuliuk bar has been determined to be a glacially-deposited recessional moraine. The moraine is submerged as a result of post-glacial period sea level rise. Recessional moraines form when the terminus of a retreating glacier remains at or near a single location for a period of time sufficient for a cross-valley accumulation to form. Post depositional consolidation of the materials comprising the Iliuliuk bar has resulted in a dense structure with dredging characteristics similar to some weaker rocks. Material within the bar is expected to consist of a consolidated, unsorted, and unstratified heterogeneous mixture of clay, silt, sand, gravel, cobbles, and boulders ranging widely in size and shape. Engineering properties of the moraine will be more thoroughly investigated during the PED phase with geotechnical borings, to correlate with the geophysical survey data and to confirm the need for blasting during dredging operations (see Appendix B).

3.1.3 Seismicity

Unalaska Island is located about midway along the Aleutian Arc, a 1,900-mile-long arcuate chain of mountain ranges extending from the Russian Kamchatka Peninsula to Cook Inlet, Alaska. The Aleutian Arc forms the northern rim of the Pacific Ocean basin, where the Pacific and North American lithospheric plates are converging at an average rate of 3.3 to 3.5 inches per year.

This on-going convergence results in southern Alaska and the Aleutian Arc being one of the most seismically active regions in the world. This region has experienced the largest magnitude earthquakes and largest measured co-seismic deformations recorded in North America.

3.1.4 Bathymetry

Seafloor topography at the site is dominated by an underwater shoal trending northwest-southeast.

Within the project area, the shoal rises to a maximum elevation of approximately -40 feet MLLW within the center of the survey area and -21 feet MLLW near the marine spit adjacent to the northwestern extent of the survey area. Maximum water depths within the survey area are approximately 102 feet on the harbor-side of the shoal within the west central portion of the survey area. Water depths on the exposed ocean-side of the survey area range from 48 feet in the southeast to 72 feet in the northeast.

Historic nautical chart records show that the bar has existed for at least 80 years. NOAA bathymetric surveys for Dutch Harbor were completed in 1934, 1991, and 2011. Depths read 7 to 8 fathoms (42 to 48 feet) along the bar in a chart dating from 1937 from a NOAA survey performed in 1934 (Figure 5). This is the earliest survey with enough detail to show the bar. Immediately adjacent to the bar, depths read 11 fathoms and greater (66 feet). This is consistent with the dimensions of the bar today (Figure 4). The most recent bathymetric survey was performed by eTrac Inc. in 2017 (Figure 4).

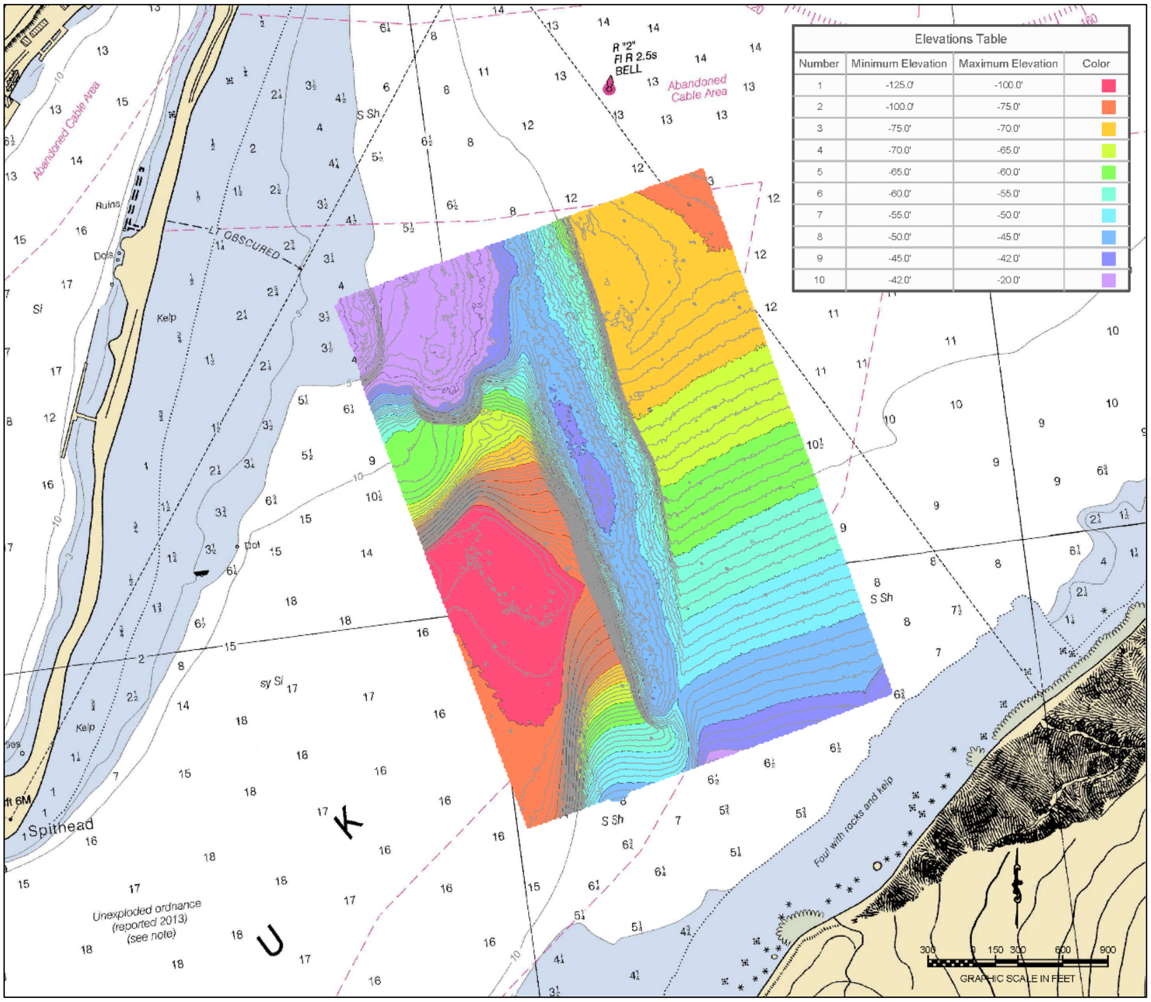

Figure 4. Dutch Harbor Marine Geophysical Bathymetric Survey (Survey, 2017)

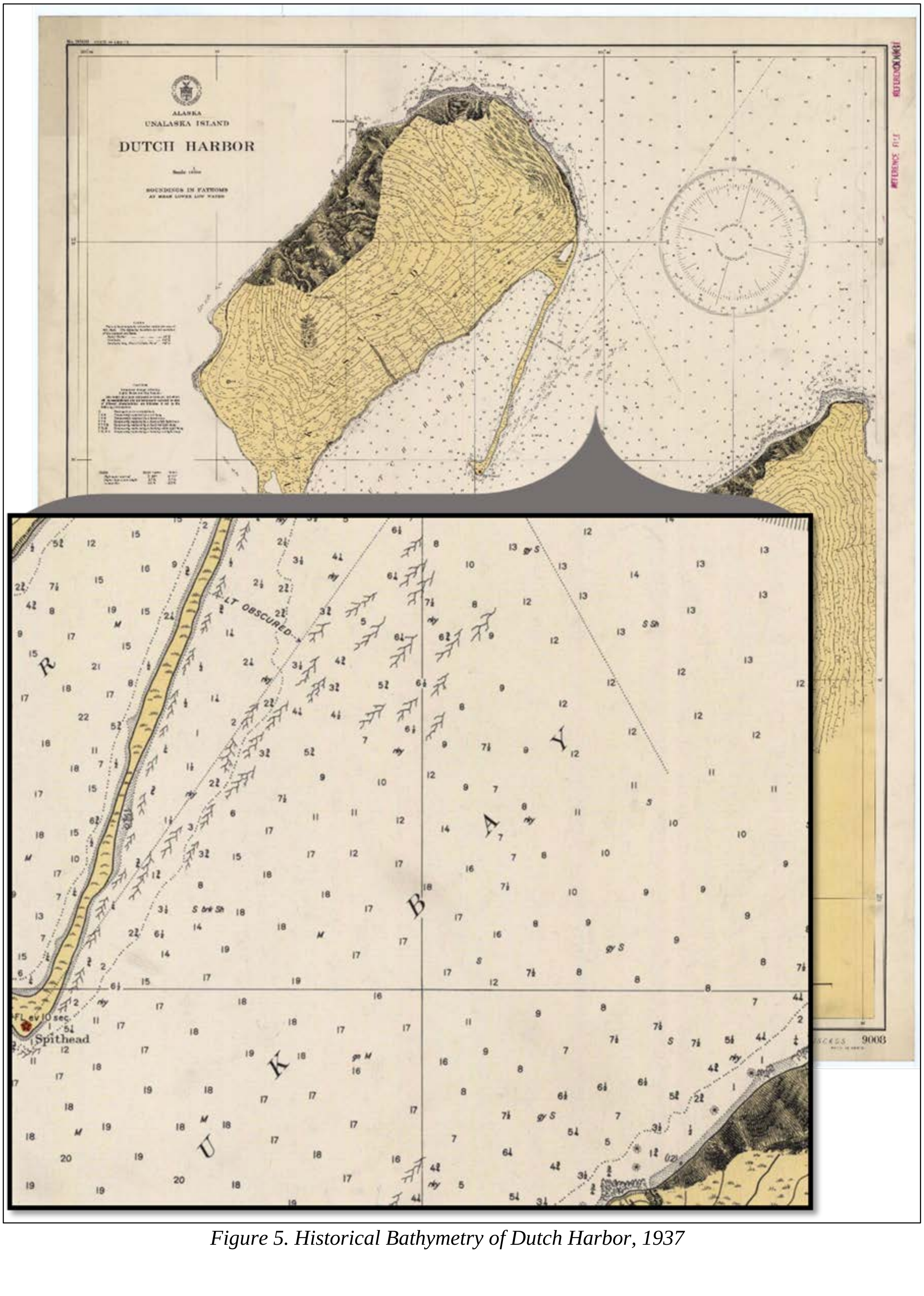

Figure 5. Historical Bathymetry of Dutch Harbor, 1937

3.1.5 Ice Conditions

Unalaska Bay is not impacted by sea ice from the Bering Sea icepack, but some local icing conditions along the shoreline can occur during extreme cold temperatures where fresh water enters Unalaska Bay at the creek mouths. Some ice has been reported in the Iliuliuk Harbor area from local minor freshwater sources, but it is relatively short lived. Strong low-pressure systems associated with storms in winter generally bring warmer temperatures that prevent the formation of significant quantities of ice.

3.1.6 Sediments

Sediment conditions were sampled visually with the use of a submersible camera attached to a trawl net during fish sampling tows. Figure 6 shows the locations of the trawl tract on the bar as well as the five potential disposal areas where bottom video was gathered.

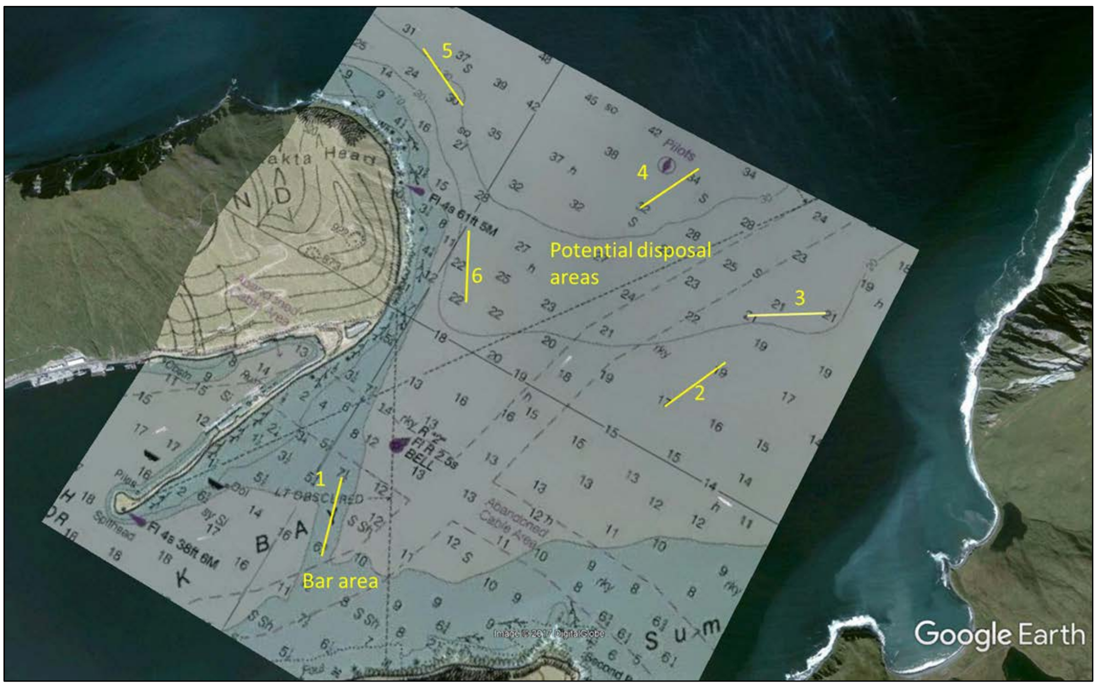

Figure 6. Potential Dredged Material Placement Areas

Bar Area

Due to the highly compacted nature of the bar, sediment samples were not collected. The geology of the bar is described in section 3.1.2. A photograph of the bottom obtained from trawl video is included as Figure 7 to show the composition of the substrate. This photo was obtained with a camera mounted in a bottom trawl used for fish sampling. The substrate appears to be highly consolidated with minimal shell litter and possibly some sand available as fines. On the eastern side of the bar, outside of the dredge prism, the substrate transitions to sand waves.

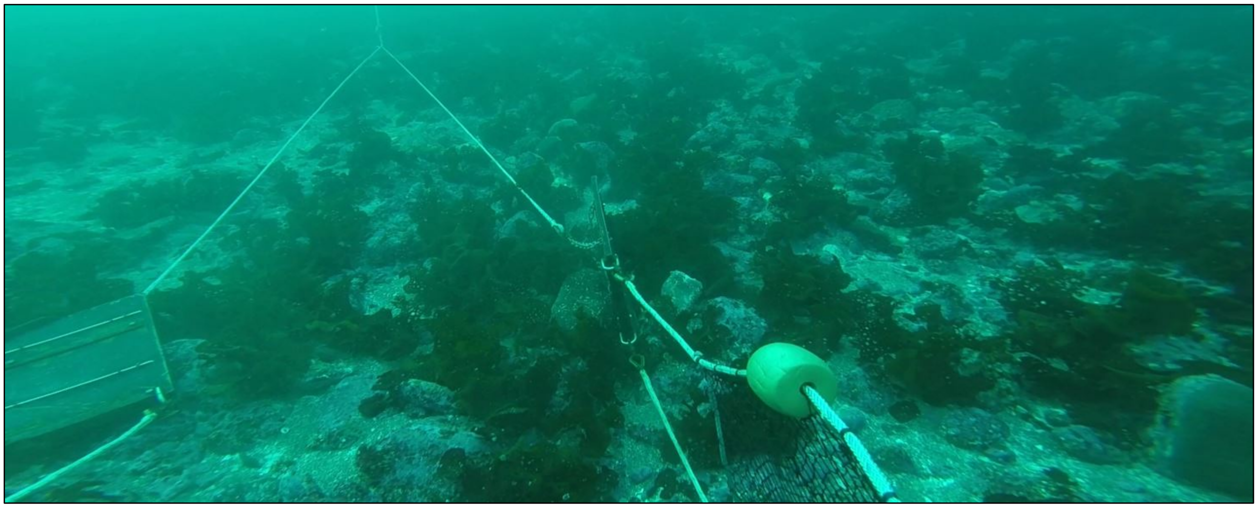

Figure 7. Bottom Composition on Bar where Dredging would occur

Dredging Disposal Sites

Bottom video was gathered at the disposal sites and annotated photographs are included in Figures 8 through 10. Site 4 was located in approximately 200 feet of water, and despite excellent visibility, it was not possible to determine the sediment composition. It appeared to be either sand or fine sediment, and either of these substrates is consistent with the habitat needs of the sea pens (*Halipteris willemoesi*) observed growing throughout the trawl tract. Sea pens are a colonial coral and look like a white feather that can grow up to 5 feet tall. No suitable photographs were obtained of the sediment in disposal alternative site 4.

Figure 8 shows a coarse sandy bottom with small sand waves and shell litter in the troughs characteristic of the bottom in the area of potential disposal site 2 (shown in Figure 6). This photo was taken from video taken at the center of the potential disposal site in March 2018. This site is in approximately 110 feet of water. The green color of the water is due to the spring phytoplankton bloom.

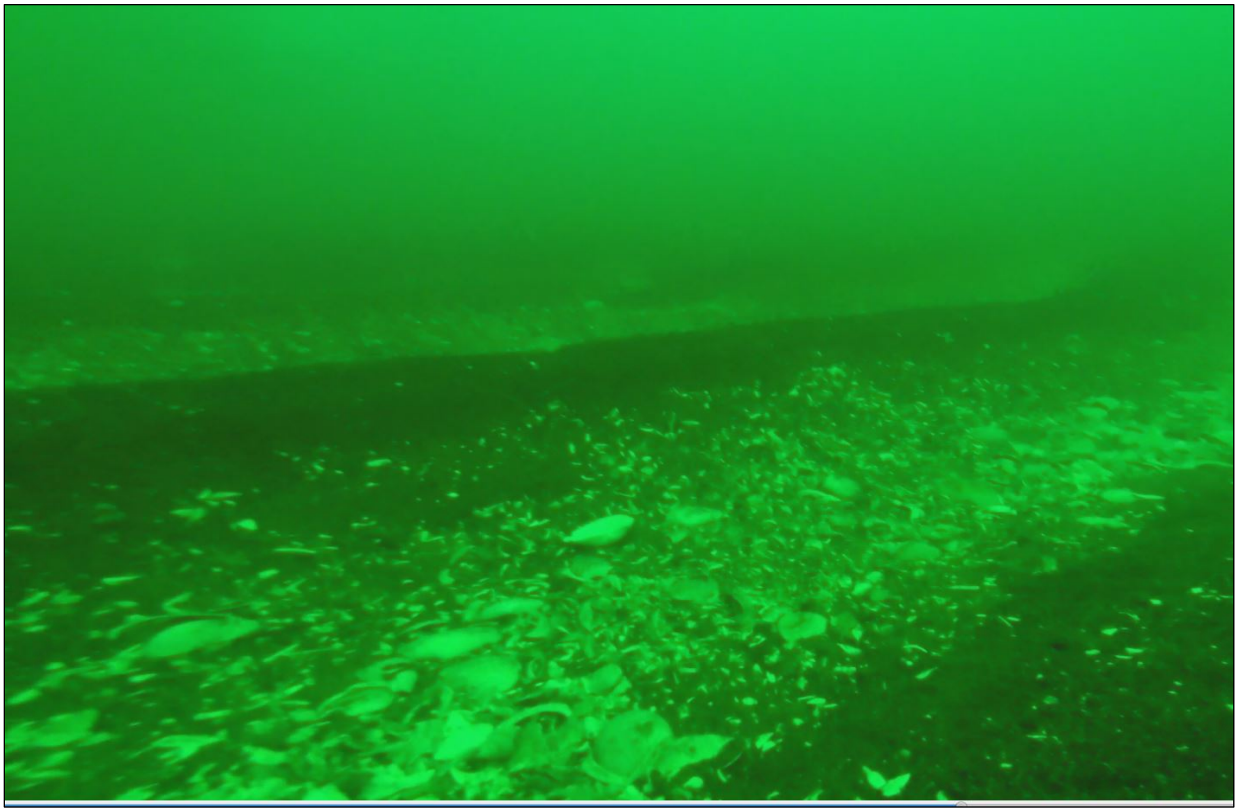

Figure 8. Proposed Disposal Site

As shown in Figure 9, coarse gravel and shell litter with some fines dominate the entire tract at site 5. This site is approximately 180 feet deep.

Figure 9. Sediment Composition at Site 5

Potential disposal site number 6 (Figure 10) is composed of fine gravel/coarse sand with some fines evidenced by the plume as the trawl net comes to a stop. This site is in 130 feet of water.

Figure 10. Potential Disposal Site 6

Sediment movement around the bar can be assessed by analyzing the 1934, 1991, 2011, and 2017 bathymetric surveys. Comparing the profiles indicate that there has been little to no movement of material at the bar. During storm events there appears to be active sediment transport by littoral drift from beaches in Summer Bay. The degree to which this contributes to sand deposits on the outside of the bar at the project site is unknown (Figure 11). The disposal area shown is the proposed disposal area for this project (sample area 2 from Figure 6). The bottom in the proposed disposal area consists of coarse sand with shell litter.

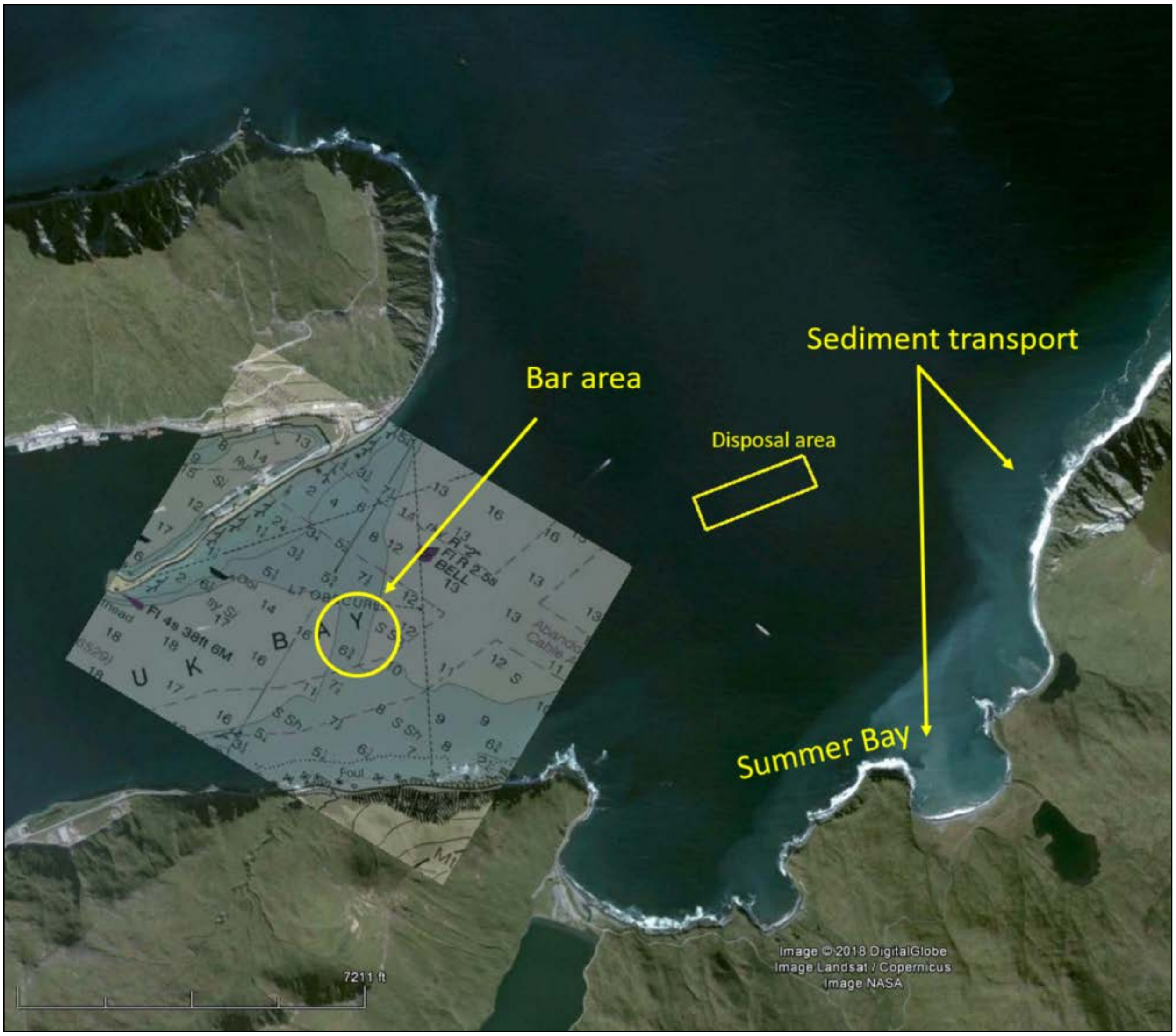

Figure 11. Bar Area and Evidence of Littoral Drift of Sediment from Summer Bay

3.1.7 Water Quality

According to the Alaska Department of Environmental Conservation's (ADEC) interactive water quality mapping tool, accessed January 2018, water quality in the vicinity of Iliuliuk Bay meets ADEC water quality standards and is not impaired. While Unalaska/Amaknak Island's tides are not as pronounced as other areas of Alaska, rigorous mixing of the surface waters occurs as a result of an energetic wind driven wave climate.

3.1.8 Tides\Currents\Surface Water

Iliuliuk Bay is in an area of mixed semi-diurnal tides, with two unequal high tides and two unequal low tides each lunar day. Tidal parameters at Iliuliuk Bay are closest to those determined by NOAA for Station 9462620 – Unalaska (53º52.8'N, 166º32.2'W). The tidal parameters in Table 2 were determined by NOAA using data from the period May 7, 1955, to present (NOAA, 2017).

Table 2. Tidal Parameters – Unalaska

	Elevation (feet MLLW)	Elevation (meters MLLW)
Highest Observed Water Level (01/27/1960)	6.70	2.04
Mean Higher High Water (MHHW)	3.60	1.10
Mean High Water (MHW)	3.31	1.01
Mean Sea Level (MSL)	2.08	0.63
Mean Low Water (MLW)	0.93	0.28
Mean Lower Low Water (MLLW)	0.00	0.00
Lowest Observed Water Level (12/13/2008)	-2.78	-0.85

A maximum flood current velocity of 1.6 knots and a maximum ebb current velocity of 2.0 knots are predicted in the NOAA Tides & Currents program for Priest Rock, approximately 7 nautical miles from the project site. The flood and ebb currents closer to the project site at Ulakta Head are reported as weak and variable.

3.1.9 Air Quality

Limited industrial development, low population density, and strong meteorological influences combine to maintain good to excellent air quality throughout the entire Aleutian Island chain and surrounding regions. No Clean Air Act non-attainment areas exist in the region. Point sources of air pollution in the vicinity of Unalaska do not significantly degrade air quality in the general area. Air quality in Unalaska is generally considered good. Air pollution sources in the vicinity include: land-based and floating seafood processing plants, moored fishing vessels, aircraft, automobiles, fuel transfer activities, and the City of Unalaska. Activities that generate air emissions include: incinerating solid wastes; vessel, motor vehicle, and aircraft exhaust; motor vehicle traffic in dusty or unpaved areas; fuel evaporation; and electrical power generating equipment and facilities. Air quality generally improves with distance from sources of pollution.

3.1.10 Noise

Terrestrial noise in Dutch Harbor is composed of a mixture of natural and anthropogenic sources. Natural sources are primarily wind, waves, surf crashing on the beaches and bird sounds. Depending on the weather conditions, Dutch Harbor can be very loud or very quiet. Anthropogenic noise is primarily due to vessel traffic, road traffic, air traffic, vessel loading, and vessel maintenance and repairs, both dockside and at a local salvage yard and floating dry dock. Construction noise can be a major source of anthropogenic noise, but is inconsistent and seasonal. Dutch Harbor is an industrial area and vessel activity takes place at all hours of the day year round, though the activity levels change throughout the year depending on fishing seasons.

Underwater noise is also caused by natural and anthropogenic sources. Common natural sources include waves, crashing surf, rain, and marine mammals. Anthropogenic sources include vessel engines, pumps, generators, propeller cavitation, and marine construction. Underwater noise from vessels is nearly continuous inside Dutch Harbor, while the traffic in the bar area rises and falls depending on the season. Marine construction, namely vibratory pile driving, has been very active in 2016 and 2017 due to several new construction projects or upgrades.

3.2 Biological Resources

3.2.1 Threatened & Endangered Species

Birds

<u>*Short-tailed Albatross*</u>

The short-tailed albatross (*Phoebastria albatrus*) is found in the offshore marine waters around islands in the eastern Aleutians (Piatt et al., 2006). The short-tailed albatross is listed by the USFWS as an endangered species. Critical habitat has not been designated, nor has a habitat conservation plan been developed for the short-tailed albatross. An active recovery plan was developed in 2008, and though it was scheduled for updating by the USFWS in 2013, it was deferred for higher-priority projects. Once a common Pacific Ocean seabird with at least 11 colonies of several million birds in the western subtropical Pacific Ocean south of Japan, it was believed extinct in the mid-1930s due to feather harvesting. In 1951, approximately 50 recently matured birds that apparently survived at sea returned to a former breeding colony on an uninhabited volcanic island in the eastern Pacific (administered by Japan), and the first eggs were laid there in 1954. In 1979, nesting birds were found on a second small Pacific island (also administered by Japan). The world population decreased from as many as 10 million short-tailed albatross around 1900 to about 50 birds in the 1950s, and with protection has subsequently increased to more than 1,200 today, with about 600 of breeding age (they live between 40 and 60 years and do not breed until older than 10 years). Radio-tracking studies reveal that short-tailed albatross now forage across the northern temperate and subarctic Pacific Ocean, between Japan and the west coast of the continental United States, with much activity concentrated along the Aleutian Island chain and in the Bering Sea.

Short-tailed albatross are surface feeders and when at sea feed primarily on small fish, squid, and zooplankton.

The main continuing threats to short-tailed albatross are long-line fishing (birds are accidentally hooked) and the vulnerability of the two remaining small nesting islands (the main natal colony is on a small volcanically active island and the smaller colony is a disputed territory, preventing any research or conservation efforts). Additional potential threats to conservation and recovery include small population size, oil spills and other contaminants, accidental consumption of plastic particles, entanglement in derelict fishing gear, and collisions with aircraft at Midway Atoll (USFWS, 2000). In its final rule, the USFWS identified activities not anticipated to result in take of short-tailed albatross, including fishing activities other than long-line fishing, lawfully conducted vessel operations (transport, tankering, barging), and harbor activities and improvements. Older short-tailed albatross are present in Alaska primarily during summer and fall along the shelf break from the Alaska Peninsula to the Gulf of Alaska, although 1 and 2-year-old juveniles may be present at other times of year. The nearest reported sighting of short-tailed albatross in the North Pacific Pelagic Seabird Database (U.S. Geological Survey [USGS], 2005) is approximately 30 miles (48 kilometers) from Dutch Harbor (1 bird of unknown age).

Steller's eider

Steller's eiders commonly occur in Dutch Harbor during winter (November–March) and are consistently observed in the nearshore zone near the proposed dredging area on the bar in Iliuliuk Bay (USACE, unpublished data 2000-2003, 2006, 2007, and 2010). The Alaska breeding population of Steller's eider was federally listed as threatened on June 11, 1997. The breeding range of Steller's eiders is in northern Russia and northern and western Alaska, but they have nearly disappeared from most nesting areas in Alaska. The current population of Steller's eiders is estimated as 220,000 birds, most of which nest in Russia. The population is believed to have fallen 50 percent over the last 30 years. In most years, most of the world population of Steller's eiders molt along the northern coast of the Alaska Peninsula, from Nunivak Island to Cold Bay, Nelson Lagoon, and near the Seal Islands. At least 150,000 Steller's eiders winter in Alaska in shallow nearshore waters from the eastern Aleutian Islands to Lower Cook Inlet.

Wintering Steller's eiders feed by diving and dabbling for mollusks and crustaceans in shallow nearshore marine waters. Principal foods in marine areas include bivalves, gastropods, crustaceans, and polychaete worms (Petersen, 1980; Metzner, 1993).

The causes of population decline of the Steller's eider are unknown. Marine contaminants and changes in the Bering Sea ecosystem are considered potential contributors to the population decline of Steller's eiders. The primary threats to this population are the substantial decrease in the species' nesting range in Alaska and the reduction in the number of Steller's eiders nesting in Alaska, which result in increased vulnerability of the remaining breeding population to extirpation. Continuing threats include lead poisoning and predation on breeding grounds. Hunting, nesting habitat loss, and oil spills are additional potential threats.

On February 2, 2001, the USFWS designated critical habitat for the Alaska-breeding population of the Steller's eider, comprising breeding habitat on the Yukon–Kuskokwim Delta and four units in the marine waters of Southwest Alaska; the Kuskokwim Shoals in northern Kuskokwim Bay; and the Seal Islands, Nelson Lagoon, and Izembek Lagoon on the north side of the Alaska Peninsula. These areas total approximately 2,830 square miles (7,333 square km) and include 852 miles (1,363 km) of shoreline, though the closest of these designated critical habitat areas is approximately 170 miles away from the proposed dredging site. There is no critical habitat designated in Unalaska Bay or Iliuliuk Bay.

Waterfowl and marine mammal surveys were conducted by USACE biologists during the winters of 2000-2001, 2001-2002, 2002-2003, and 2005-2006. Areas with high eider densities are shown in yellow in Figure 12. During the multi-year survey period, a total of 3,656 Steller's eiders were observed during 61 individual survey periods in the highlighted area near the Dutch Harbor spit. The maximum number observed during any of these surveys in this area was 542 Steller's eiders. The mean number of Steller's eiders per survey in this area was 60, and there was an average of 54 Steller's eiders per kilometer of coastline in this sector. Additional surveys in 2011-2012 and 2016 have revealed similar patterns. The proposed dredging project does not overlap areas used by Steller's eiders.

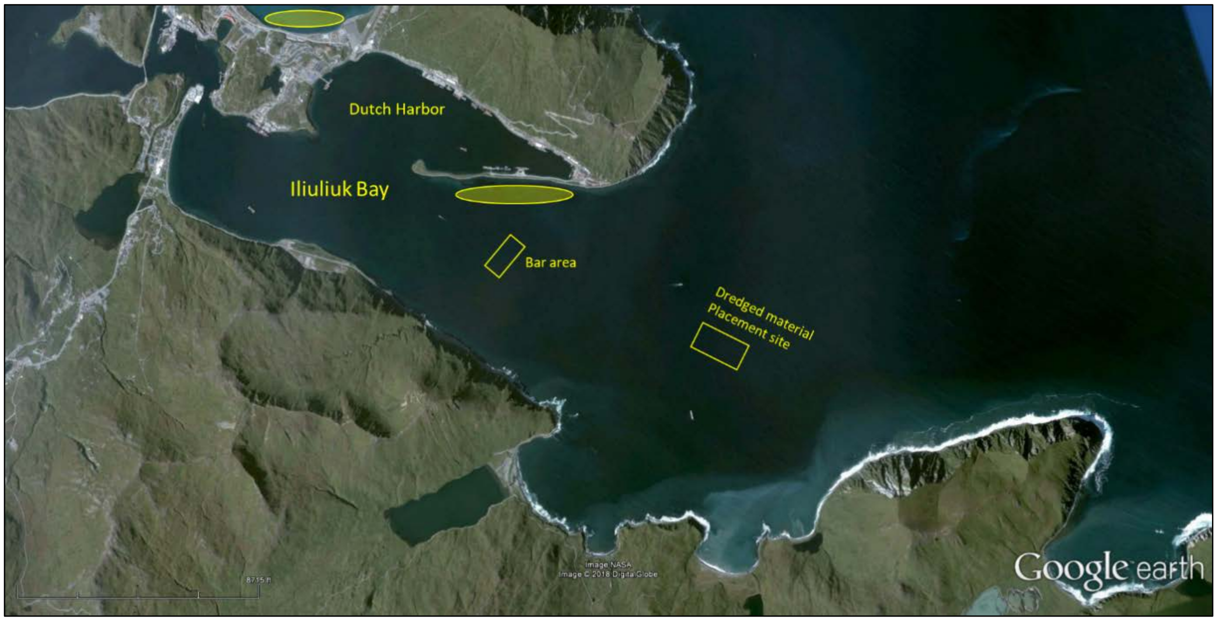

Figure 12. Areas Consistently used by Large Numbers of Steller's Eiders

Marine Mammals

2018 Marine Mammal Surveys

In 2018, an intensive survey effort was undertaken to acquire data on marine mammals in the project area with an aim towards informing an Incidental Harassment Authorization (IHA) application process. While resource agencies conduct their own population surveys, they tend to cover large areas to get a snapshot at a particular time of the year on a recurring basis. For the proposed dredging project, it is important to understand species abundance and distribution in a very specific area during the entire potential construction window. In this way, potential take numbers could be obtained that would inform the IHA application process as well as the related Biological Assessment.

The survey area of interest was defined by likely zone where effects would occur based on presumed confined underwater blasting charges. The potential effect zones for Dutch Harbor were based on coordination with NMFS completed for another proposed confined underwater blasting project in Valdez, Alaska in 2016. Though the Unalaska project would have more extensive blasting in terms of number of shots and the overall extent of the area to be blasted, the maximum charge size would be limited by USACE safety guidelines. Accordingly, the potential effect zone per shot would be similar to the calculations for the Valdez project. To be conservative in our surveys for Unalaska, an additional kilometer of survey area was added for the observations.

Based on details of how different groups of marine mammals hear and their auditory thresholds, the potential effect radii can vary greatly. For instance, data from the Valdez project indicated that a single 220-lb. confined underwater charge would effect a sea lion out to approximately 270 meters, but the same charge would effect a harbor seal out to about 3,800 meters and a humpback whale out to nearly 6,800 meters. For the 2018 field survey in Dutch Harbor, we counted all marine mammals in an 8,000 meter zone centered on the dredging site in order to be conservative. As the confined underwater blasting details are developed during the PED phase of this project, the requested number of marine mammal "takes" will be calculated.

The survey zones for the 2018 effort are shown in Figure 13. The green, yellow, and orange zones were surveyed during the 2018 surveys and the red zone was extensively surveyed as part of local construction monitoring program 2017. Distances from the dredge site in 2 kilometer increments are also shown. The non-highlighted portions of the radii would not be affected due to shielding from land masses and were not surveyed. Marine mammal surveys were conducted four days per month between April and October 2018 with two biologists for approximately 12 hours per day as weather and visibility allowed. Biologists used a combination of 10x42 binoculars and 20-60x spotting scopes at elevations between sea level and some elevated vantage points at approximately 800 feet above sea level.

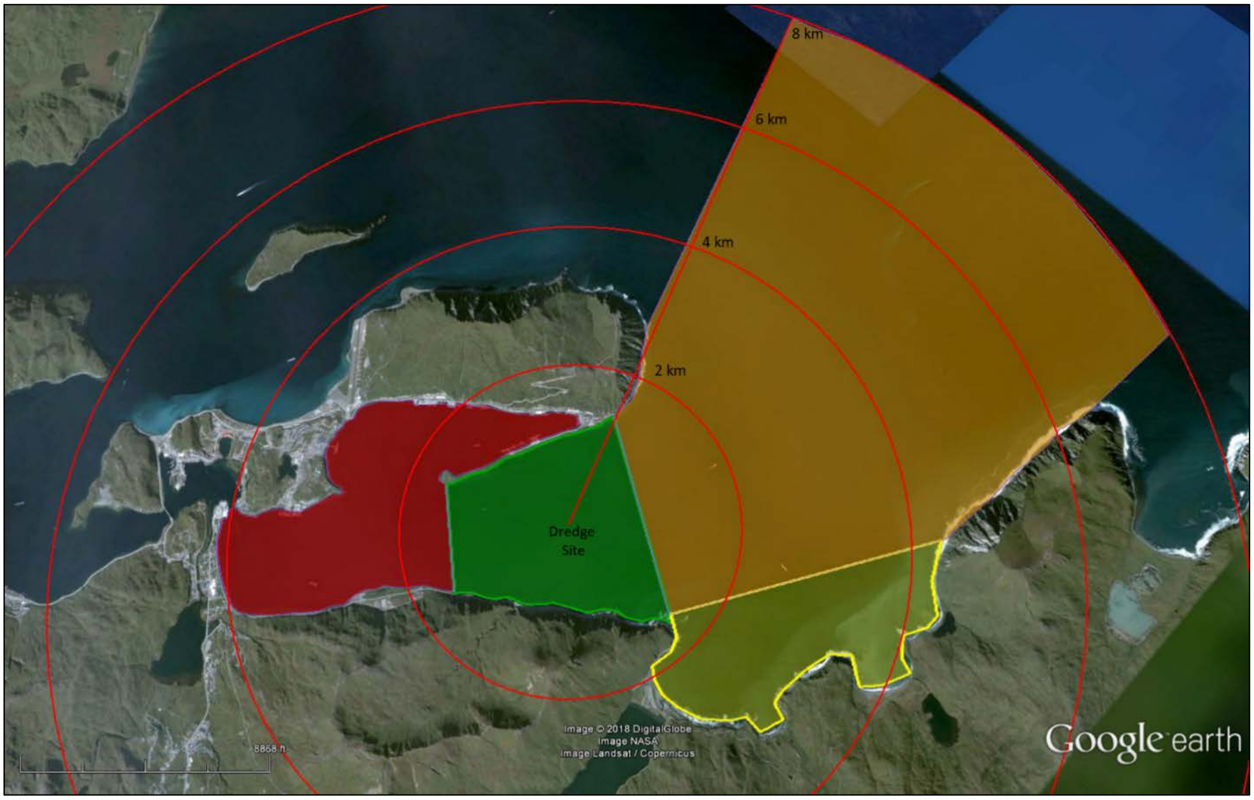

Figure 13. Marine Mammal Survey Zones

Steller Sea Lion

Steller sea lions (*Eumetopias jubatus*) occur in two Distinct Population Segments (DPSs) in Alaska. An eastern U.S. DPS, including animals east of Cape Suckling, Alaska (144°W), was listed as threatened under the ESA until recently being de-listed, and a western U.S. DPS listed as endangered, including sea lions at and west of Cape Suckling (including Unalaska Island and the associated project area) (62 CFR 30772, June 5, 1997, and 78 CFR 66140, November 4, 2013). The centers of abundance and distribution are in the Gulf of Alaska and Aleutian Islands. Members of this species are not known to migrate, but individuals disperse widely outside the breeding season (late May to early July). At sea, Steller sea lions commonly occur near the 656-foot (200-meter) depth contour, but have been seen from near shore to well beyond the continental shelf (Kajimura and Loughlin, 1988). Steller sea lions are opportunistic predators, feeding primarily on a wide variety of fishes and cephalopods, including walleye pollock (*Theragra chalcogramma*), Atka mackerel (*Pleurogrammus monopterygius*), Pacific herring (*Clupea pallasi*), capelin (*Mallotus villosus*), Pacific sand lance (*Ammodytes hexapterus*), Pacific cod (*Gadus macrocephalus*), and salmon (*Oncorhynchus* spp.) (Pitcher, 1981; Merrick et al., 1997). On rare occasions, Steller sea lions prey on seals, and possibly sea otter pups.

About three-fourths of all Steller sea lions haul out on and pup in U.S. territory (Marine Mammal Commission, 2000). Pups are born from late May through early July, with peak birthing during the second or third week of June. Females stay with their pups for about 9 days before initiating routine foraging trips to sea. Females mate 11 to 14 days after giving birth with implantation occurring 3 to 4 months later in late September or early October. Weaning is not narrowly defined as it is for most other pinniped species, but probably takes place gradually during winter and spring prior to the breeding season.

Critical Habitat

Sea lion rookeries in Alaska are in the Pribilof Islands, on Amak Island north of the Alaska Peninsula, throughout the Aleutian Islands and western Gulf of Alaska to Prince William Sound, and on several islands in southeastern Alaska. Haulouts and rookery sites are numerous throughout the breeding range, and those located in the region of the project area are shown on Figure 14 and in Table 3. As shown on Figure 14, a 20-nautical mile zone is drawn around the project site for simplicity, but could also be drawn around the major haulouts or rookeries since the 20-nautical mile zones around both rookeries and major haulouts are designated as critical habitat.

The project area occurs within critical habitat for two major haulouts; NOAA Fisheries defines Steller sea lion critical habitat by a 20-nautical mile (nm) radius (straight line distance) encircling a major haul-out or rookery. Two major haul-outs (Old Man Rocks, Unalaska/Cape Sedanka) are between approximately 15 nm (straight line distance) from the project area. The closest rookery is Akutan/Cape Morgan, which is approximately 19 nm from the project area using straight line distance over the mountains. Another major rookery is located approximately 19 nm from the project location (straight line distance over mountains) at Akutan/Lava Reef. The number of adult Steller sea lions recently observed using these sites is presented in Table 3.

In addition to major haulouts and rookeries, three special foraging areas in Alaska have also been designated critical habitat for Steller sea lions, including the Bogoslof area on the Bering Sea shelf, the Seguam Pass area in the central Aleutian Islands, and the Shelikof Strait area near Kodiak Island (50 CFR 226.202). There are no special foraging areas within the project area.

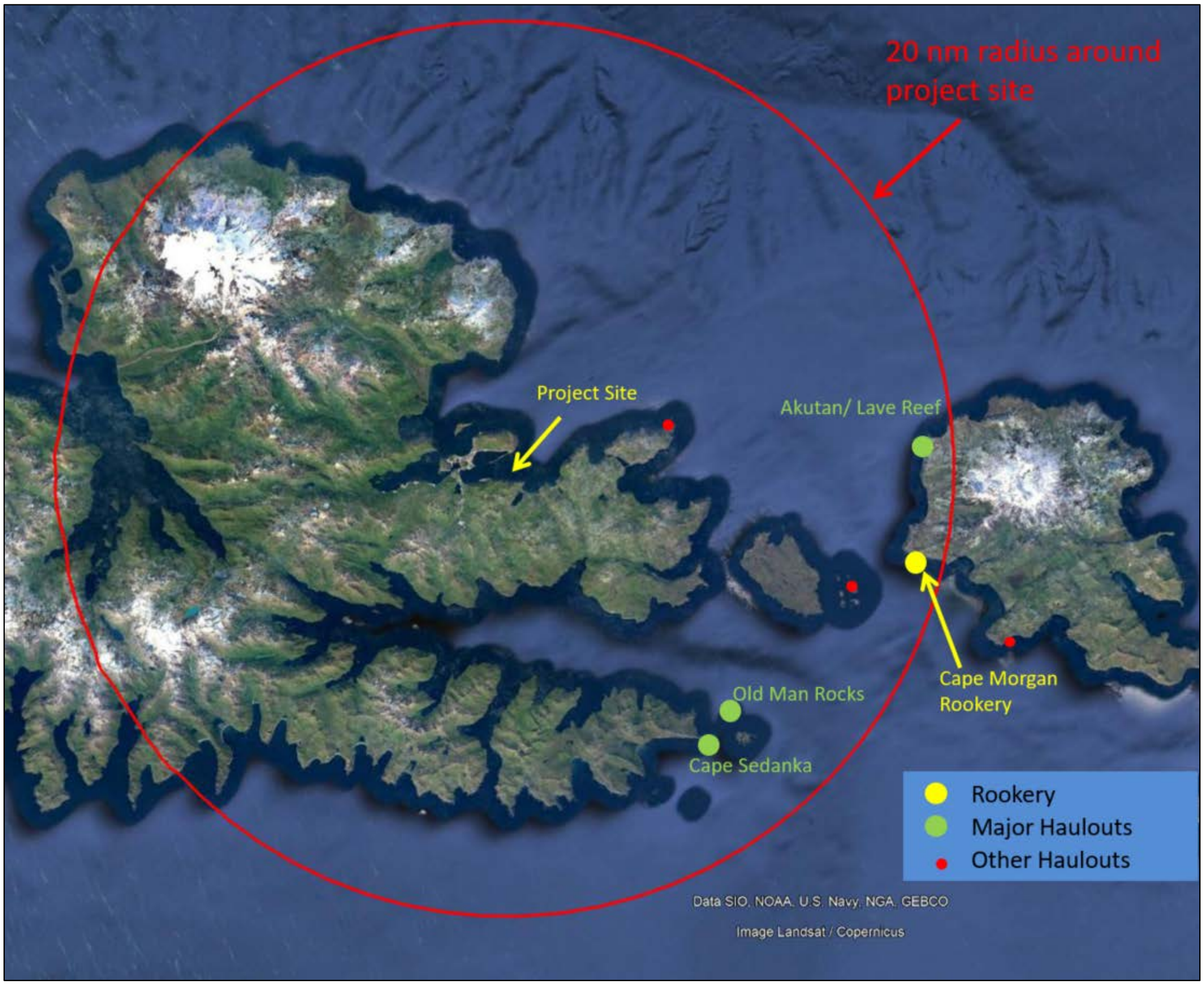

Figure 14. Steller Sea Lion Rookeries, Major Haulouts, and other Haulouts

Table 3. 2014 Summer Aea Lion Count

Site Name	Adults and Juveniles	Rookery
Akutan/Cape Morgan	1129	yes
Akutan/Reef-Lava (2015)	182	no
Old Man Rocks	15	no
Unalaska/Cape Sedanka	0	no

Source: NMML Steller Sea Lion Count Database (Adults) 2016.

Sea lion abundance in the western DPS began increasing after 2000 (Fritz et al. 2008), with the most recent size estimate for pups and non-pups placed at 79,300 animals for 2008-2012 (Fritz et al., 2016). This included an estimated 52,200 animals in western and central Alaska and 27,100 animals in Russia. However, numbers of both pups and non-pups continue to decline in some areas of the range, including the western and central Aleutians (west of Samalga Pass) and parts of Russia (Fritz et al., 2016). Factors contributing to the decline of the stock include incidental take in fisheries, illegal and legal shooting, predation or certain diseases, climate change, and contaminants.

Steller sea lions were common during periodic USACE winter surveys in Dutch Harbor between 2000 and 2016, but they were not abundant near the proposed dredging project area. Single animals were observed on occasion outside the Dutch Harbor spit. In past years during winter surveys (2000-2006), there were two areas where large aggregations (50-60) of sea lions were common (USACE, unpublished data). These areas are shown on Figure 15.

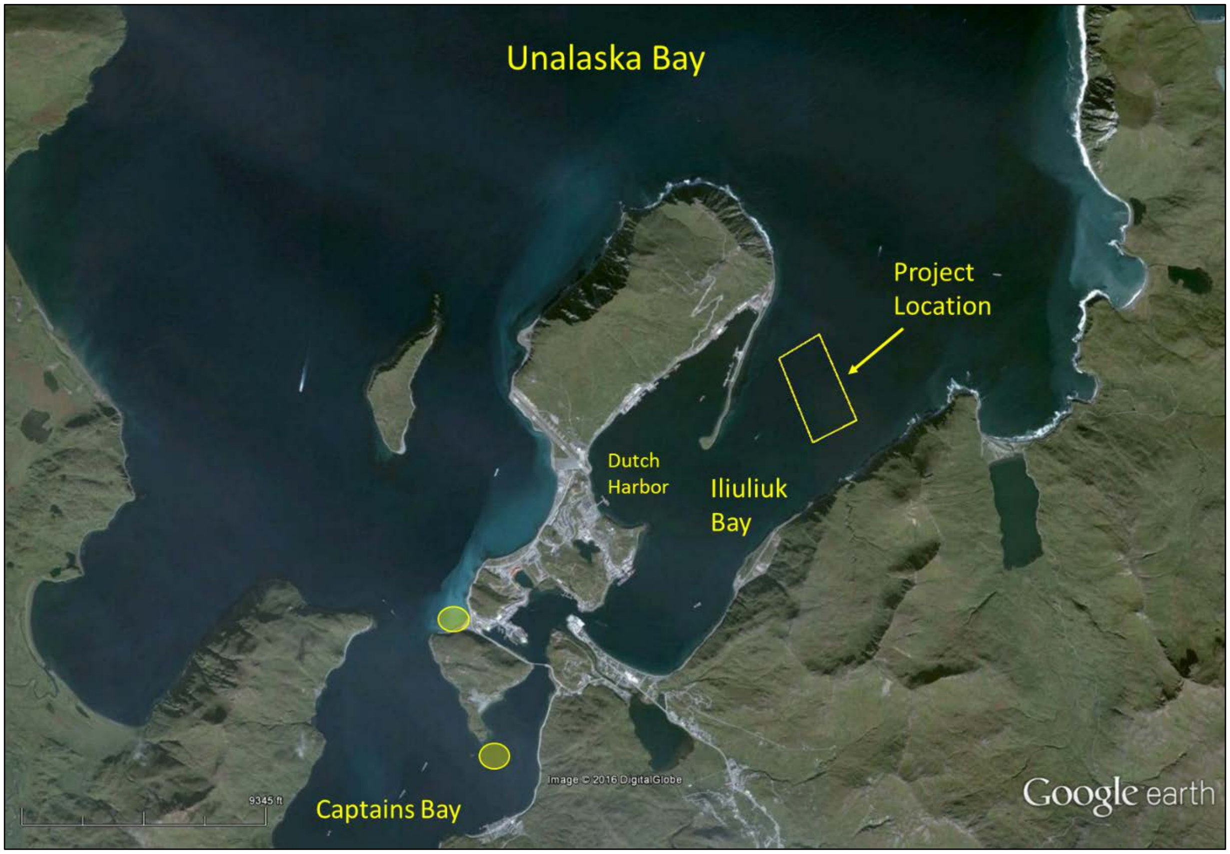

Figure 15. Common Steller Sea Lion Aggregation Areas During Winters from 2000-2006

Data from field surveys in 2018 as well as marine mammal monitoring data from a Dutch Harbor construction project in 2017 are summarized in Table 4. The maximum numbers of Steller sea lions observed per month at any single observation period in each of the zones shown in Figure 13. "NS" indicates the zone was not surveyed in a particular month.

Table 4. 2018 Survey Steller Sea Lion Numbers.

	Orange Zone	**Yellow Zone**	**Green Zone**	**Red Zone**
April	4	0	0	NS
May	7	0	1	NS
June	0	1	1	3
July	0	5	32	4
August	4	0	3	9
September	0	1	0	23
October	0	0	7	11

The data presented in Table 4 show low numbers during most months in all zones, with the greatest abundance in the red zone. The higher numbers in the red zone could be due to Steller sea lions that sometime congregate around commercial fishing vessels. The 32 observed at one time in July in the green zone occurred in a few groups of 10-12 individuals.

Northern Sea Otter

The Southwest Alaska DPS of northern sea otter (*Enhydra lutris kenyoni*) includes animals found off the Alaska Peninsula and Bristol Bay coasts and on the Aleutian, Barren, Kodiak, and Pribilof Islands. Although other sea otter stocks in Alaska are considered stable, the Southwest Alaska DPS has declined dramatically over the past 10 to 20 years (Doroff et al., 2003), causing the USFWS to list the population as threatened under the ESA on August 9, 2005 (70 CFR 46366). Critical habitat was designated for the species by the USFWS throughout its range in 2009 (Federal Register, 2009).

Sea otters occur in nearshore coastal waters, generally less than 40 meters (128 feet) in depth and 1 to 2 kilometers (0.6 to 1.2 miles) from shore since they need frequent access to subtidal and intertidal zones for feeding (Green and Brueggeman, 1991). Sea otters eat primarily benthic invertebrates, including mainly sea urchins, crabs, octopus, mussels, and some bottom fishes in rocky substrates and clams in soft substrates. They require cover and shelter from marine predators, especially killer whales. Sea otters also seek shelter in bays, inlets, or lees during high winds (Kenyon, 1969).

Sea otters in Alaska are not migratory and do not normally disperse over long distances. Distribution is nearly continuous from Attu Island in the western Aleutians to the Alaska Peninsula. In the Aleutian Islands, breeding males remain for all or part of the year within the bounds of their breeding territory, which constitutes a length of coastline anywhere from 100 meters (328 feet) to approximately 1 kilometer (0.6 mile). Sexually mature females have home ranges of approximately 8 to 16 kilometers (5-10 miles), which may include one or more male territories. Male sea otters that do not hold territories may move greater distances between resting and foraging areas than territorial males (Lensink, 1962; Kenyon, 1969; Riedman and Estes, 1990; Tinker and Estes, 1996).

Pupping appears to occur at all times of the year. Most areas that have been studied show evidence of one or more seasonal peaks in pupping (Rotterman and Simon-Jackson, 1988). Sea otters can have delayed implantation of the blastocyst (developing embryo) (Sinha et al., 1966). The average time between copulation and birth is 6 to 7 months. Female sea otters typically will not mate while accompanied by a pup (Lensink, 1962; Kenyon, 1969; Schneider, 1978; Garshelis et al., 1984). The interval between pups is typically 1 year. It is not known if pupping occurs in or near the project area in Dutch Harbor; however, pups have rarely been observed during any of the USACE winter waterfowl and marine mammal surveys or on numerous summer field trips in Dutch Harbor (non-surveys).

Critical Habitat

Critical habitat for northern sea otters is defined as all contiguous waters from the mean high tide line to the 20-meter (65.6-foot) depth contour as well as waters within 100 meters (328 feet) of the mean high tide line that occur adjacent to the island. Since the proposed project area is located in approximately 42 feet of water, it fits the definition of critical habitat. Excluded as critical habitat are the physical structures that create a harbor or marina, such as piers, docks, jetties, and breakwaters; however, the waters contained within harbors or marinas are not excluded from the critical habitat designation (Federal Register, 2009). The primary habitat features required for sea otter conservation include shallow, rocky areas (less than 2 meters deep [6.4 feet]) for foraging, nearshore waters within 100 meters (328 feet) of the mean tide line, and kelp forests (less than 20 meters deep [64 feet]) for protection from marine predators, and prey resources within these areas.

Approximately 8,700 sea otters inhabit the Aleutian Islands (Doroff *et al*., 2003). The estimated population size for the Southwest Alaska DPS is slightly higher than previous estimates, primarily due to a higher population estimate for the Kodiak archipelago in 2004. However, the overall sea otter population in Southwest Alaska has declined by more than 50 percent since the mid-1980s. Thus, the overall population trend for the Southwest Alaska DPS is believed to be declining (Allen and Angliss, 2010). Although killer whale predation has been hypothesized to be responsible for the sea otter decline in the Aleutian Islands, the cause(s) of the decline throughout Southwest Alaska are not definitively known (Federal Register, 2005).

Common sea otter locations are shown in Figure 16. Sea otters are commonly observed year round outside the Dutch Harbor spit where large kelp beds are present. It is typical to see approximately 3 to 12 otters present in these areas. Sea otters were common during USACE winter surveys in Dutch Harbor where they occurred only in low numbers in a small number of survey sectors. During all the winter surveys between 2000 and 2012, most sea otter observations were in Iliuliuk Harbor and Dutch Harbor. Otters were only occasionally observed in Captains Bay and were rare south of the airport.

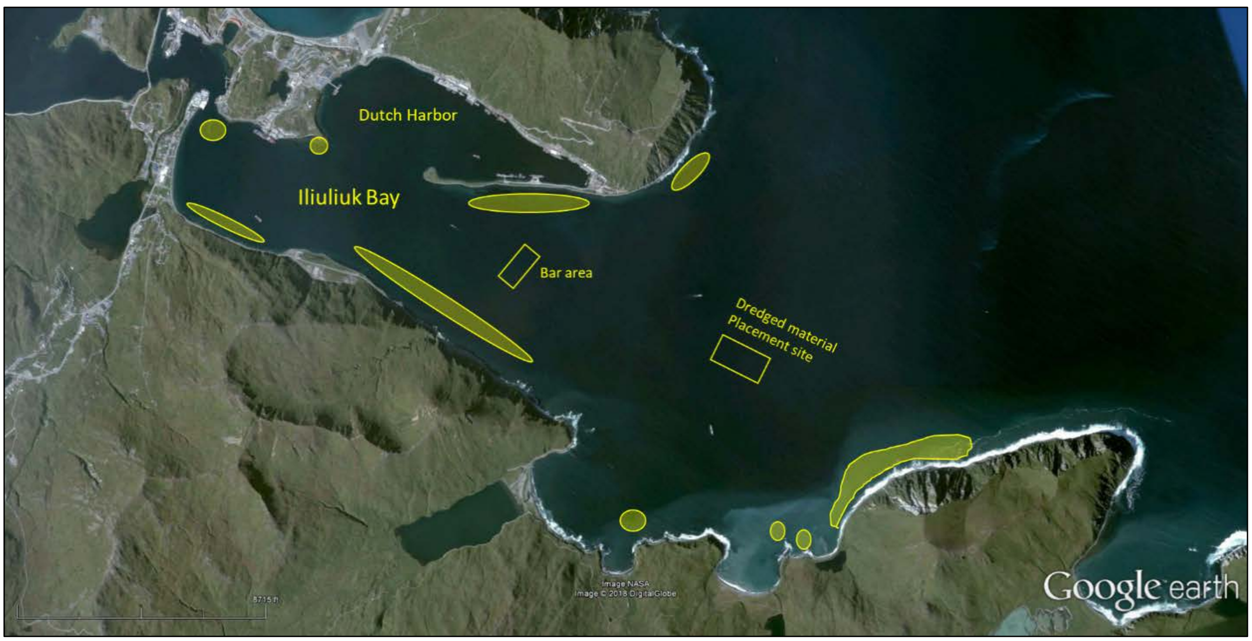

Figure 16. Common Sea Otter locations in Dutch Harbor

Data from field surveys in 2018 as well as marine mammal monitoring data from a Dutch Harbor construction project in 2017 are summarized in Table 5.

The maximum numbers of sea otters observed per month at any single observation period in each of the zones shown in Figure 13. “NS” indicates the zone was not surveyed in a particular month. In the case of sea otters, the 2017 monitoring protocol for the construction project inside the spit did not require sea otter observations. Based on observer notes, a maximum of 25 otters in each month for this zone would be conservative.

Table 5. 2018 Survey Sea Otter Numbers.

	Orange Zone	**Yellow Zone**	**Green Zone**	**Red Zone**
April	19	7	19	NS
May	1	158	32	NS
June	10	158	20	NS
July	22	166	92	NS
August	2	90	47	NS
September	0	3	100	NS
October	0	44	29	NS

The data presented in Table 5 show highly variable numbers during most months in all zones, with the greatest abundance in the yellow zone in May through June. Almost all of the otters in the yellow zone occurred near shore at the outer edge of the zone near the 4 kilometer distance from the dredge site (i.e. the blast area).

Humpback Whale

We used information available in the most recent stock assessment (Allen and Angliss 2015), the most recent status review (Bettridge *et al.* 2015), the most recent global review (Fleming and Jackson 2011), and NMFS species information (NMFS 2016, NMML 2016g5) to summarize the status of the species, as follows.

Status

The humpback whale (*Megaptera novaeangliae*) was listed as endangered under the Endangered Species Conservation Act (ESCA) on December 2, 1970 (35 FR 18319). Congress replaced the ESCA with the ESA in 1973, and humpback whales continued to be listed as endangered. NMFS recently conducted a global status review of humpback whales (Bettridge *et al.* 2015). After analysis and extensive public review, NMFS published a final rule on September 8, 2016, (81 FR 62260), recognizing 14 humpback whale DPSs, designating four of these as endangered and one as threatened, with the remaining nine not warranting ESA listing status. Wade *et al.* (2016) provides information on the basis for DPS designation and the status of each DPS in the North Pacific.

Based on an analysis of migration between winter mating/calving areas and summer feeding areas using photo-identification, Wade *et al.* (2016) concluded that whales feeding in Alaskan waters belong primarily to the Hawaii DPS (recovered), with small numbers of Western North Pacific DPS (endangered) and Mexico DPS (threatened) individuals. In the summer feeding areas (Aleutian Islands, Bering, Chukchi, and Beaufort Seas) that overlap with Iliuliuk Bay entrance to Dutch Harbor, Hawaii DPS individuals are estimated to comprise 86.5 percent of the humpback whales present, Mexico DPS individuals 11.3 percent, and Western North Pacific DPS individuals 4.4 percent (Table 6). Critical habitat has not been designated for the western North Pacific or Mexico DPSs of humpback whales. Table 6 shows the probability of encountering humpback whales from each DPS in the north Pacific Ocean (shown in columns) in the various feeding areas (shown in rows).

Table 6. Probability of Encountering Humpback Whales from each DPS in the North Pacific Ocean

Summer Feeding Areas	North Pacific Distinct Population Segments in Alaska		
	Western North Pacific DPS (endangered)	**Hawaii DPS (not listed)**	**Mexico DPS (threatened)**
Kamchatka	100%	0%	0%
Aleutian Islands, Bering, Chukchi, Beaufort	4.4%	86.5%	11.3%
Gulf of Alaska	0.5%	89.0%	10.5%
Southeast Alaska / Northern BC	0%	93.9%	6.1%

NOTE: For the ESA-listed DPSs, these percentages reflect the upper limit of the 95% confidence interval of the probability of occurrence in order to give the benefit of the doubt to the species and to reduce the chance of underestimating potential takes.

Souce: Adapted from Wade et al. (2016).

Description and Range

Humpbacks are classified in the cetacean suborder Mysticeti, whales characterized by having baleen plates for filtering food from water, rather than teeth like the toothed whales (Odontoceti). The humpback whale is one of the larger baleen whales, weighing from 25 to 40 tons (50,000-80,000 pounds; 22,000-36,000 kg) and up to 60 feet (18 meters) long, with females larger than males. Newborns are about 15 feet (4.5 meters) long and weigh about 1 ton (2,000 pounds; 900 kg). The species is well known for long pectoral fins, which can be up to 15 feet (4.6 meters) long. The body coloration is primarily dark grey, but individuals have a variable amount of white on their pectoral fins and belly. This variation is so distinctive that tail fluke pigmentation patterns are used to identify individual whales, analogous to human fingerprints.

Humpbacks filter feed on tiny crustaceans (mostly krill), plankton, and small fish; they can consume up to 3,000 pounds (1,360 kg) of food per day. Several hunting methods involve using air bubbles to herd, corral, or disorient fish.

Humpback whales reach sexual maturity at 4 to 7 years, and their lifespan is probably around 50 years or more. The gestation period of humpback whales is 11 months, and calves are nursed for 12 months. The average calving interval is 2 to 3 years. Birthing occurs in low latitudes during winter months; feeding occurs primarily at high latitudes during summer months.

Abundance

The worldwide population of all humpback whales is estimated to be approximately 75,000 individuals. The abundances of the western North Pacific, Hawaii, and Mexico DPSs are estimated to be 1,000, 12,000, and 6,000 - 7,000, respectively. The abundance estimate for humpback whales in the Bering Sea/Aleutian Islands area is estimated to be between 1,650 and 3,570 animals, which includes whales from the Hawaii DPS (86.5 percent), Mexico DPS (11.3 percent), and western North Pacific DPS (4.4 percent) (Wade *et al.* 2016).

Population trends are not available for all humpback whale stocks or populations due to insufficient data, but populations appear to be growing in most areas. The growth rate for the western North Pacific DPS is estimated to be 6.9 percent, though humpback whales of this population remain rare in some parts of their former range. The growth rate of the Hawaii DPS is between 5.5 and 6.0 percent. The current growth rate of the Mexico DPS is unknown, although the population increased slightly between the 1990s and 2000s (Wade *et al.* 2016).

Distribution

Humpback whales are widely distributed in the Atlantic, Indian, Pacific, and Southern Oceans. Nearly all populations undertake seasonal migrations from their tropical calving and breeding grounds in winter to their high-latitude feeding grounds in summer. Humpbacks may be seen at any time of year in Alaska, but most animals winter in temperate or tropical waters near Mexico, Hawaii, and in the western Pacific near Japan. In the spring, the animals migrate back to Alaska where food is abundant. They tend to concentrate in several areas, including Southeast Alaska, Prince William Sound, Kodiak, the Barren Islands at the mouth of Cook Inlet, and along the Aleutian Islands. The Chukchi Sea is the northernmost area for humpbacks during their summer feeding, although, in 2007, humpbacks were seen in the Beaufort Sea east of Barrow, which would suggest a northward expansion of their feeding grounds (Zimmerman and Karpovich 2008).

Results of satellite tracking indicate that humpbacks frequently congregate in shallow, highly productive coastal areas of the North Pacific Ocean and Bering Sea. The waters surrounding the eastern Aleutian Islands are dominated by strong tidal currents, water-column mixing, and unique bathymetry. These factors are thought to concentrate the small fish and zooplankton that compose the typical humpback diet in Alaska, creating a reliable and abundant food source for whales (Kennedy *et al.* 2014). Kennedy *et al.* (2014) tagged humpback whales in Unalaska Bay during August and September. Further, Unalaska Island is situated between Unimak and Umnak Passes, which are known to be important humpback whale migration routes and feeding areas (Kennedy *et al.* 2014). USACE biologists have worked on the water in the project area and know that humpback whales are often present near the project area during summer and show up in the larger area of Unalaska Bay beginning in April and are present well into October most years.

Data from field surveys in 2018 as well as marine mammal monitoring data from a Dutch Harbor construction project in 2017 are summarized in Table 7. The maximum numbers of humpback whales observed per month at any single observation period in each of the zones shown in Figure 13. “NS” indicates the zone was not surveyed in a particular month.

Table 7. 2018 Survey Humpback Whale Lion Numbers

	Orange Zone	**Yellow Zone**	**Green Zone**	**Red Zone**
April	1	0	0	NS
May	2	0	0	NS
June	10	0	0	1
July	13	0	0	0
August	40	0	0	4
September	47	0	0	2
October	7	0	0	1

The data presented in Table 7 show low numbers in all zones except the orange zone, with the greatest abundance in the orange zone in August and September. Most of the whales in the orange zone ranged from the 2 kilometer distance from the dredge site to 8 kilometers away. Many more humpback whales were beyond the 8 kilometer zone or elsewhere in Unalaska Bay beyond the survey area. Since humpback whales are sometimes seen inside Dutch Harbor (red zone) then they certainly pass through the green zone. However, these whales were not observed in the green zone during our surveys.

Hearing Ability and Vocalizations

Because of the lack of captive subjects and logistical challenges of bringing experimental subjects into the laboratory, no direct measurements of mysticete hearing are available. Consequently, hearing in mysticetes is estimated based on other means such as vocalizations (Wartzok and Ketten, 1999), anatomy (Houser *et al.* 2001; Ketten 1997), behavioral responses to sound (Edds-Walton 1997), and nominal natural background noise conditions in their likely frequency ranges of hearing (Clark and Ellison 2004). The combined information from these and other sources strongly suggests that mysticetes are likely most sensitive to sound from perhaps tens of hertz to 10 kHz. However, evidence suggests that humpbacks can hear sounds as low as 7 Hz (Southall *et al.* (2007), up to 24 kHz, and possibly as high as 30 kHz (Au *et al.* 2006; Ketten 1997).

Humpback whales produce a variety of vocalizations ranging from 0.02 to 10 kHz (Richardson *et al.* 1995, Au 2000, Frazer and Mercado III 2000, Erbe 2002, Au *et al.* 2006, Vu *et al.* 2012). NMFS categorizes humpback whales in the low-frequency cetacean functional hearing group. As a group, it is estimated that low-frequency cetaceans can hear frequencies between 0.007 and 25 kHz (NMFS 2016).

Critical Habitat

Critical habitat has not been designated for the humpback whale.

3.2.2 Marine Species and Habitat

Birds

Sea Birds

The closest colony nesting areas for sea birds to the project area have been reported at Eider Point and Hog Island. The colony at Eider Point consists of 30 breeding red-faced cormorants (*Phalacrocorax urile*). The Hog Island colony has a presence (i.e. unconfirmed breeding) of 54 horned puffins (*Fratercula corniculata*), and 142 pigeon guillemots (*Cepphus columba*), as well as 200 breeding glaucous-winged gulls (*Larus glaucesens*). Small colonies are also near the east and west sides of the southern portion of Amaknak Island, and around the islands at the southern end of Captains Bay. The colonies nearest the project site are shown on Figure 17.

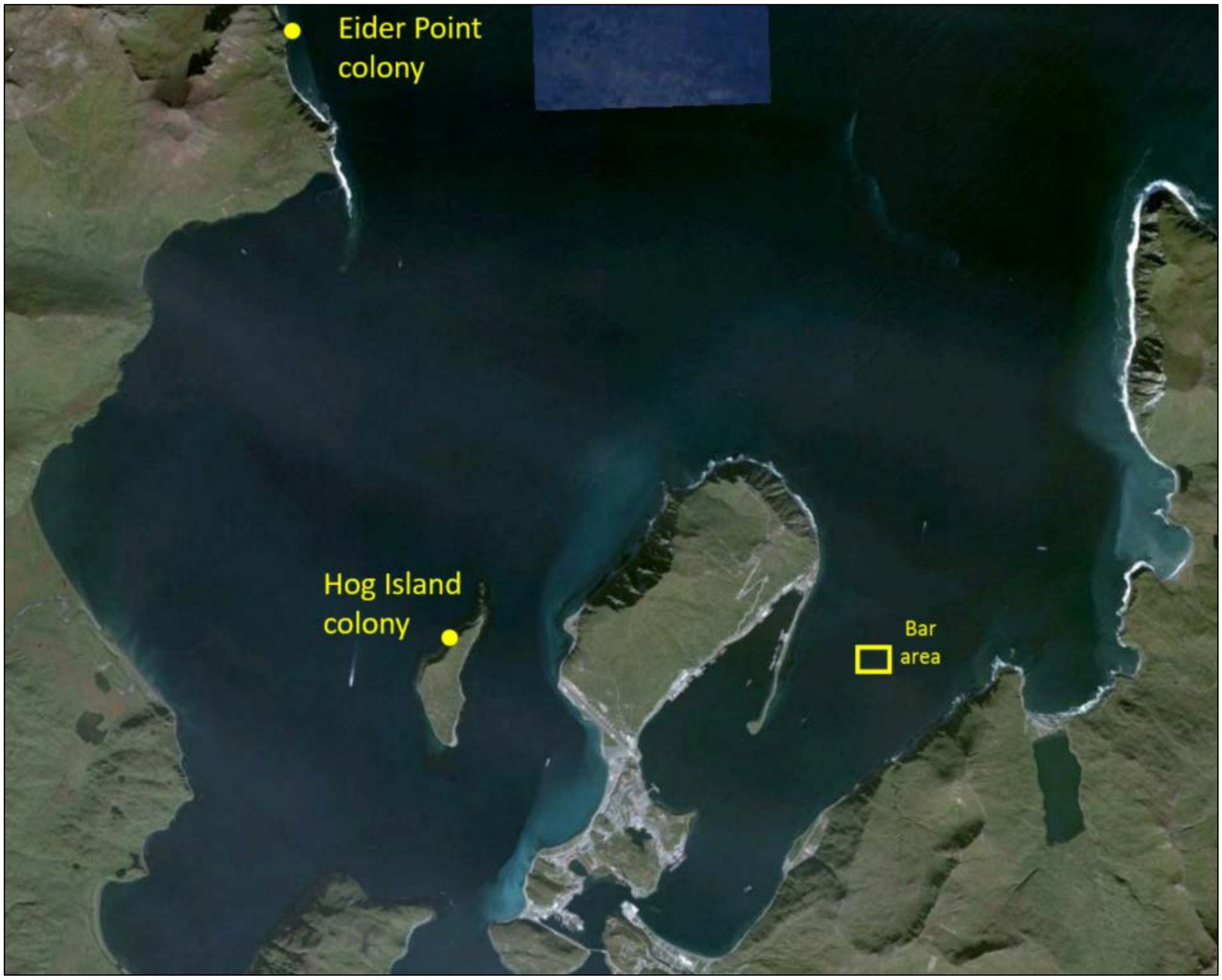

Figure 17. Seabird Colonies in the Vicinity of the Project Site.

In addition to the birds at the colonies, other seabirds use the water in Unalaska Bay and Iliuliuk Bay year round to a varying extent. The most common species include pelagic cormorant (*Phalacrocorax pelagicus*), common murre (*Uria aalge*), thick-billed murre (*Uria lomvia*), marbled murrelet (*Brachyramphus marmoratus*), black-legged kittiwake (*Rissa tridactyla*), Northern fulmar (*Fulmarus glacialis*), black oystercatcher (*Haematopus bachmani*) and a variety of gulls (*Larus spp*.). Ancient murrelet (*Synthliboramphus antiquus*) are uncommon, while short-tailed shearwater (*Puffinus tenuirostris*) are only present in the summer months.

<u>*Waterfowl*</u>

Waterfowl are diverse and abundant in Iliuliuk Bay from fall through spring. In summer, the situation is quite different, with only a few harlequin ducks (*Histrionicus histrionicus*) present in marine waters. Most waterfowl begin arriving in Iliuliuk Bay in early fall and stay through early spring, with peak abundance for most species in February. Species are noted in Table 8. All notes on species are based on in-house USACE biological survey data that supported other USACE projects in Dutch Harbor/Unalaska conducted since January 2000. Additional species have been observed inconsistently or in small numbers.

Table 8. Notes on Waterfowl in Iliuliuk Bay

Species	Scientific Name	Notes
Steller's eider	Polysticta stelleri	ESA listed as *threatened*. Common in shallow nearshore waters on the outside of the Dutch Harbor spit from November through March.
King eider	Somateria spectabilis	Uncommon, often show up in small numbers (6-8 birds) in late February and March. Mostly females and sub-adult males. Found in shallow nearshore waters on the outside of the Dutch Harbor spit.
Common eider	Somateria mollissima	Not observed in winter in Dutch Harbor. Common in small numbers nearshore in Iliuliuk Bay in April and early May.
Harlequin	Histrionicus histrionicus	Abundant in all habitat types and wave exposure zones in Iliuliuk Bay from late summer until late spring.
Black scoter	Mellanita nigra	Common and abundant nearshore in Iliuliuk Bay from fall through early spring.
White-winged scoter	Mellanita fusca	Same as the black scoter, though usually found a little farther offshore than black scoters.
Greater scaup	Aythya marila	Common in the nearshore waters, especially near the head of Iliuliuk Bay and offshore of the spit near the seafood outfall terminus.
Long-tailed duck	Clangula hyemalis	Common in nearshore marine waters on the outside of the Dutch Harbor spit, often in proximity to seafood waste discharge.
Red-breasted merganser	Mergus serrator	Commonly observed in small numbers in shallow waters of Iliuliuk Bay where they sight-feed for fish.
Common goldeneye	Bucephala clangula	Common in low numbers in Iliuliuk Bay.
Bufflehead	Bucephala albeola	Common in low numbers in Iliuliuk Bay.

Emperor goose	Chen canagica	Common along the outer shore of the Dutch Harbor spit (on land and in nearshore waters).
Common loon	Gavia immer	Occasionally observed in Iliuluk Bay in small numbers, often solitary or in small groups.
Pacific loon	Gavia pacifica	Occasionally observed in Iliuluk Bay in small numbers, often in small groups.
Yellow-billed loon	Gavia adamsii	Uncommon and typically only observed in small numbers.

3.2.3 Submerged Aquatic Vegetation

Approximately 25 percent of the bar within the dredging prism area is covered with sieve kelp (*Agarum clathratum*). Canopy kelps such as dragon kelp (*Eularia fistulosa*) and bull kelp (*Nerocystis luetkeanus*) are found closer to shore and are not found in the dredging prism. There is no submerged aquatic vegetation at the proposed dredged material placement site or at any of the alternative dredged material placement sites.

3.2.4 Marine Fish

Seasonal marine fish and invertebrate surveys were conducted in Iliuliuk Bay in 2017 during February, May, August, and October. These surveys focused on bottom fish and invertebrates at locations on or near the bar area as well as five potential dredged material disposal sites. Two beach seine locations were sited at Front Beach (Figure 2). These collections were conducted so that a seasonal “baseline” condition could be defined. The methods and results of these surveys are described in Appendix C, *Marine Biota in Iliuliuk Bay, Project Report, February 5, 2018*.

Fish were sampled with trawl and pot gear as described in the report noted above. A total of 740 fish representing at least 31 species were captured with a mean catch per unit effort (CPUE) of 10.3 (n = 72 sets). Three species – rock sole, pink salmon, and English sole – accounted for 70 percent of the total fish catch. Catch varied by gear type, with overall fish abundance and richness of both bottom trawl and beach seine exceeding that of crab pots. Mean fish CPUE of seine sets greatly exceeded that of both trawl and pot sets. Trawl catch was dominated by rock sole. Indeed, rock sole was the most abundant and the most frequently captured species in trawls, but it should be noted that 82 percent of trawl-caught rock sole were captured in one trawl during fall. Pot and seine catch were dominated by yellow Irish lord and pink salmon. Fish catch also varied by season. Mean CPUE and species richness were lowest in winter and highest in fall and summer, respectively. In winter, yellow Irish lord dominated the catch. In spring, yellow Irish lord remained the most frequently occurring species, but young-of-the-year (YOY) pink salmon were the most abundant. In both summer and fall, rock sole had the highest mean CPUE and frequency of occurrence (FO). Fish catch differed between offshore and nearshore areas and among offshore areas. Only four species – rock sole, sturgeon poacher, Pacific cod, and Pacific halibut – were captured in both offshore and nearshore areas. Among offshore areas, the two deepest areas were markedly depauperate, with a combined mean CPUE of 0.5 fish and a total of two species. In contrast, the four shallower offshore areas had a combined mean CPUE of 6.5 and a total of 20 species. Finally, the single nearshore area had a mean CPUE of 104.8 and 17 species. Juveniles and YOY were the most abundant life stages, accounting for more than 87 percent of the total fish catch. Most species (88%) were also represented in part by juvenile or younger individuals; only four species – yellow Irish lord, crescent gunnel, red Irish lord, and yellowfin sole – were captured exclusively as adults.

The marine fish survey was focused on sampling bottom fish and invertebrates since most of the potential project impacts are located on the bottom for dredging and disposal. The survey did not sample fish in the water column (e.g. salmon and herring), though these would likely be the most impacted by blasting since they have swim bladders. While salmon may be found in Iliuliuk Bay year round, they are most abundant in summer as many return to natal streams (such as Iliuliuk Creek) to spawn. Pacific herring (*Clupea pallasii*) are most likely to be found in Iliuliuk Bay in the summer months and can be from either the Bering Sea stock or the Gulf of Alaska stock. Herring are known for forming large schools and are often spotted from the air during forage fish surveys since their dense aggregations often contrast with the water color.

3.2.5 Marine Invertebrates & Associated Habitat

Seasonal marine fish and invertebrate surveys were conducted in Iliuliuk Bay in 2017 during February, May, August, and October. These surveys focused on bottom fish and invertebrates at locations on or near the bar area as well as five potential dredged material disposal sites. Two beach seine sites were also sampled since an early concern raised for this project was potential impacts to Front Beach from dredging due to an altered wave environment. The methods and results of these surveys are described in Appendix C, Marine Biota in Iliuliuk Bay, Project Report, February 5, 2018.

A total of 1,636 invertebrates representing at least 65 species were captured with a mean CPUE of 22.7 (n = 72 sets). Five species – puppet margarites (*Margarites pupillus),* northern lacuna (*Lacuna vincta),* green urchin (*Strongylocentrotus droebachiensis),* Oregon hairy triton (*Fusitriton oregonensis),* and wrinkled dove snail (*Amphissa Columbiana)* – accounted for 68.5 percent of the total invertebrate catch. Catch differed among gear types, with most invertebrate species (65 percent) captured exclusively by bottom trawl. As a result, total invertebrate catch, mean CPUE, and species richness of trawls greatly exceeded that of both crab pots and beach seines. The most common species in trawl, pot, and seine sets were green urchin, Oregon hairy triton, and Dungeness crab (*Cancer magister).* Sea pens (*Halipteris willemoesi*), a colonial coral that looks like a white feather that can grow up to 5 feet tall were observed growing throughout the deepest dredged material placement site alternative (site 4 in approximately 200 feet of water).

Invertebrate catch also differed between offshore and nearshore areas and among offshore areas. A total of 62 invertebrate species were captured in offshore areas, compared with 4 in the near shore. Among offshore areas, the shallowest area (the bar area that would be dredged) had the most diverse invertebrate assemblage. The bar area had a mean CPUE of 57.3 invertebrates compared with a combined, mean CPUE of 10.8 in the deeper offshore areas. The bar area also had 33 species, 55 percent of which were captured in no other area. Although invertebrate CPUE and richness were highest in this area, it should be noted that the area's CPUE was not consistently high; more than 83 percent of the total catch in area 6 was captured in the summer trawl.

3.2.6 Marine Mammals

Information on marine mammals in the Dutch Harbor area is primarily based on Corps biologists' extensive experience in the area for approximately the past two decades for various other projects as well as extensive surveys in 2018. While other resource agencies conduct marine mammal surveys on a regional scale, Corp biologists have gathered more focused data with more intense effort in recent years. The site-specific information provided in this section and the Threatened and Endangered Species section (3.2.1) is a combination of general observations since 2000 and more focused survey efforts between March and October 2018.

Harbor seals, northern sea otters, Steller sea lions, killer whales, and harbor porpoises inhabit Unalaska Bay year round, though killer whales and harbor porpoises occur infrequently and in small numbers. Humpback whales are present in Unalaska Bay from early spring through fall. Northern fur seals and Pacific white-sided dolphins occur seasonally and in small numbers. Fur seals are occasionally observed in Unalaska Bay during migration to the Pribilof Islands during the spring and fall.

Harbor seals (*Phoca vitulina*) are distributed throughout Unalaska Bay and are usually solitary except when hauled out. These seals will occasionally haul out at three different locations in Iliuliuk Bay and routinely forage at the kelp beds along the spit (Figure 18). They can be found anywhere along the shoreline, but are more commonly seen near kelp beds. The three haulouts inside Iliuliuk Bay are small and can support from 1 to 10 seals and are only usable during calm conditions. The haulout near Ulakta Head is larger and can support approximately 40 seals, but is also only usable at lower tide levels in calm seas.

Harbor seals, like all marine mammals, are protected under the Marine Mammal Protection Act, but are not listed under the Endangered Species Act.

Figure 18. Typical Locations of Harbor Seals

Table 9 presents survey results from the 2018 field surveys. Table 9 shows the maximum numbers of harbor seals observed per month at any single observation period in each of the zones shown in Figure 13. “NS” indicates the zone was not surveyed in a particular month. As shown in Table 9, the greatest abundance is in the orange zone in July through September. Most of the seals observed in the orange zone were hauled out on some large flat rocks that were usable during clam sea conditions at lower tide levels.

Table 9. Maximum Number of Harbor Seals per Month

	Orange Zone	**Yellow Zone**	**Green Zone**	**Red Zone**
April	9	2	8	NS
May	2	2	6	NS
June	0	0	4	3
July	43	1	0	4
August	42	1	0	9
September	53	1	15	23
October	0	5	13	11

Killer whales (*Orcinus orca*) and harbor porpoises (*Phocoena phocoena*) are occasionally found in Iliuliuk Bay and Unalaska Bay, though typically in low numbers and for short periods of time. For example, marine mammal observers for the construction activity at the Unalaska Marine Center collectively spent over 3,000 hours between June 2017 and February 2018 observing the entirety of Dutch Harbor and the portion of Iliuliuk Bay from the spit south to Front Beach and did not observe a killer whale or harbor porpoise. However, USACE biologists encountered a pod of approximately eight harbor porpoises in August 2017 near a potential offshore disposal site just outside Iliuliuk Bay.

Several other species of whales including finback (*Balaenoptera physalus*), blue (*Balaenoptera musculus*), sperm (*Physeter macrocephalus*), and northern right whales (*Eubalaena glacialis*) are more likely to be found farther offshore in the Bering Sea or Gulf of Alaska. A single minke whale (*Balaenoptera acutorostrata*), was observed during the 2018 surveys in Unalaska Bay.

Northern sea otters, Steller sea lions, and humpback whales are discussed in the Threatened and Endangered Species Section 3.2.1.

3.2.7 Special Aquatic Sites

Special aquatic sites are geographic areas, large or small, possessing special ecological characteristics of productivity, habitat, wildlife protection, or other important and easily disrupted ecological values. Special aquatic sites include wetlands, sanctuaries and refuges, mud flats, vegetated shallows, coral reefs, and riffle and pool complexes. These sites are generally recognized as significantly influencing or positively contributing to the overall environmental health of the entire ecosystem and receive special attention under Section 404(b)(1) guidelines.

The project area, including the bar area for dredging and the disposal area, is surrounded by the lands that are part of the Alaska Maritime National Wildlife Refuge. However, neither the bar that would be dredged nor the disposal area is part of the refuge. Additionally, the dredge area and disposal area do not possess characteristics that would make them a special aquatic site.

3.2.8 Essential Fish Habitat

The marine waters of Iliuliuk Bay are designated Essential Fish Habitat (EFH) under the Gulf of Alaska Groundfish, Bering Sea Aleutian Islands Groundfish, Salmon Fisheries in the Exclusive Economic Zone, and Scallop Fishery Management Plans. Specifically, EFH is defined by the Magnuson-Stevens Fishery Conservation and Management Act as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. Federal agencies are required to consult with National Marine Fisheries Service (NMFS) on all actions, authorized, funded, or undertaken by the agency that may adversely affect EFH.

According to NMFS' interactive mapping tool, accessed January 2018, the waters of Iliuliuk Bay provide EFH for a variety of species and their respective life history stages: weathervane scallop, squid, arrowtooth flounder, rock sole, flathead sole, sculpin, Pacific cod, skate, walleye pollock, chum salmon, pink salmon, coho salmon, sockeye salmon, and chinook salmon. NFMS' interactive mapping tool did not identify any Habitat Areas of Particular Concern (HAPC) in the waters of Iliuliuk Bay or the greater Unalaska Bay. HAPCs are considered high priority areas for conservation, management, or research because they are rare, sensitive, stressed by development, or important to ecosystem function. An HAPC designation of a specific habitat helps to prioritize and focus conservation efforts.

Weathervane Scallop (Patinopecten caurinus)

Weathervane scallops are a filter feeder species found from intertidal waters to depths of 300m in beds of mud, clay, sand, and gravel. Eggs are released into the water column to drift freely with currents until hatching. The larvae drift until achieving metamorphosis at the juvenile stage to settle at the ocean's bottom. Weathervane scallops are the only commercially exploited scallop stock within the Fisheries Management Plan (FMP) and exist in range from California to Pribilof Islands, Alaska.

Squid

Squids of the Bering Sea and Aleutian Islands occur only at salinities of 30 ppt. or greater. Eggs range from the enveloped gelatinous matrix attached to hard surfaces of inshore species to offshore species extruding drifting masses. Larval stages are miniature versions of adults. Diet includes small forage species, crustaceans, cephalopods, and zooplankton. Juveniles are largely epipelagic while adults are mesopelagically distributed. Squid species include the armhook squid (*Berryteuthis magister*), boreal clubhook squid (*Onychoteuthis borealjaponicus),* robust clubhook squid (*Moroteuthis robusta*), and the eastern Pacific bobtail squid (*Rossia pacifica*).

The armhook squid is widely distributed throughout the Bering Sea in depths of 30 to 1,500 m. Eggs are laid on the bottom of the upper slope (200-800 m), but the Alaskan spawning timing is not known. The boreal clubhook squid is an epipelagic species located throughout the Aleutian Islands found throughout all depths over shelf waters, while the robust clubhook squid is found on the bottom of the slopes and rare on the shelf. The eastern Pacific bobtail squid is a small demersal species in the Bering Sea at about 20 to 300 m in depth. It is observed in abundance on the shelf through bottom trawl surveys.

Arrowtooth Flounder (*Atheresthes stomas*)

Arrowtooth flounder are a benthic species found on the continental shelf and upper slope of the Bering Sea. Adult Arrowtooth flounder occupy separate winter and summer distribution through seasonal migrations moving to the middle and outer shelf with the arrival of warmer weather. Juveniles remain in shallow waters separate from adults until maturity. Arrowtooth flounder are a large predator fish, feeding on forage fish, but mainly Walleye pollock.

Rock Sole (Lepidopsetta bilineata)

Rock sole occupy relatively shallow water throughout their range. Rock sole are common throughout the Aleutian Islands region in depths from 100 to 300 meters and occasionally are found at 500 meters. In the eastern Bering Sea they occur from shallow waters to depths of 200 to 300 meters.

Rock sole spawn in deeper water during winter and spring throughout their range. The yellowish- orange eggs of rock sole are demersal and adhesive. The larvae are planktonic. Young rock sole assume their bottom-dwelling existence at about 20mm and occur in shallow water in some localities. Little is known about where rock sole spend their first year of life on the seafloor, but by age 1 they are found with the adults.

Flathead Sole (Hippoglossoides elassodon)

Flathead soles range from California across the Pacific Rim including the continental shelf of the Bering Sea. The adults are benthic and prefer soft and muddy bottoms to about 1,100 meters deep. Flathead sole are more common at depths from about 100 meters to 850 meters.

Adults use separate winter spawning and summertime feeding habitats. Winter habitat is near the shelf margins and the adults migrate to the mid and outer continental shelf in April or May each year for feeding. Spawning starts as early as January, primarily in deeper waters near the margins of the shelf. Eggs hatch in 9 to 20 days depending on temperature. The eggs and larvae are planktonic. Size at metamorphosis and the age at 50 percent maturity are unknown. Bays and estuaries with non-rocky shelf composition are important for juvenile flat head sole in Oregon, and we assume that habitat requirements would be similar in the Bering Sea.

Sculpin

Sculpins are a large family of bottomfish inhabiting a wide range of habitats from tide pools to water 1,000 meters deep. Most sculpins spawn in the winter. All species lay eggs, but in some genera, fertilization is internal. Eggs are generally laid among rocks and are guarded by the males. The larval stage is found across broad areas of the shelf and slope. Smaller sculpins generally eat small invertebrates, but larger species eat small fish and crustaceans.

Skate

At least nine species of skates of the genus *Raja* and *Bathyvaja* are found in Aleutian Island waters. Most inhabit water along the continental shelf deeper than 50 meters. The adults of some species are primarily predators eating mostly fishes, cephalopods, and large crustaceans while adults of other species consume mostly smaller benthic crustaceans. Juvenile *Bathyvaja* skates eat mostly marine worms and amphipods.

Pacific Cod (Gadus macrocephalus)

Pacific cod inhabit coastal Pacific Ocean waters from California to southern Japan.

They are mostly benthic at depths ranging from about 15 to 550 meters. Adult cod migrate to relatively deep water to spawn during the winter spawning season, but spawning is probably correlated with temperature rather than depth. Cod eggs are demersal and hatch in about 12 to 28 days depending on the water temperature. Small cod mainly feed on copepods while the large adults are mainly piscivorous. The adults do not feed during spawning. Juvenile cod less than one year old mostly occupy coastal habitats and move to deeper water as they grow.

Walleye Pollock (*Gadus chalcogrammus*)

Adult walleye Pollock are migratory and spend the winter months in deeper water off the continental shelf. They spend the spring and summer months in inshore waters from 90 to 140 meters deep. They mostly feed only during summer and do not feed at all during the spawning season. The diet consists of euphausiids and small fishes including juvenile Pollock.

Adult Pollock occur both on the outer and mid-continental shelf and are usually not associated with coastal waters. Walleye Pollock in the Bering Sea spawn in dense schools near the surface mostly in March and mostly over water from about 90 to 200 meters deep. Spawning in the Bering Sea occurs at temperatures from 1° to 3° C. Development of the eggs is temperature dependent; in colder water, eggs take longer to hatch. The eggs and early larval stages are planktonic and found within the upper 30 meters of water, but older juvenile Pollock are found throughout the water column. Juvenile Pollock spend their days in deeper water, but feed near the surface at night. Juvenile Pollock distribute spatially according to the strength of their year class. Strong year classes are found from the outer to inner continental shelf, while weak year classes are found only on the outer shelf.

Chum Salmon (Oncorhynchus keta)

Chum salmon are the most abundant of the Pacific salmon species and can be identified through large developed teeth during spawning. Chum salmon are anadromous and spawn their eggs in varying depths of freshwater streambeds consisting of coarse gravel in the early summer. Larvae remain in the freshwater stream until progressing into estuarine and coastal marine zones as juveniles. Juveniles migrate further into deeper marine waters for growth through active feeding. Adult chum salmon ranging from 2 to 7 years of age return to freshwater streams in their final stage in order to spawn. Both the adult carcasses and eggs/larvae of the chum salmon are important nutrient inputs with the local trophic system.

Pink Salmon (Oncorhynchus gorbuscha)

Pink salmon are the smallest of the Pacific salmon, operate on a fixed 2-year life span, and can be identified through their pronounced dorsal hump during spawning. The anadromous pink salmon spawn at depths of 30 to 100 cm. Their eggs are hatched in freshwater streams of gravel in the summer where the juveniles remain until progressing into estuarine and marine environments. Juveniles then exist in the coastal waters before moving further offshore into oceanic marine waters during their immature and adult period of life for rapid growth. Schools of juvenile pink salmon follow shorelines in shallow waters. After 2 years, the pink salmon return to their native freshwater streams without further feeding in order to spawn. Both the adult carcasses and eggs/larvae of the pink salmon are important nutrient inputs with the local trophic system.

Coho Salmon (Oncorhynchus kisutch)

Coho salmon are widely distributed throughout the Pacific Ocean and identified with their hooked snout or kype while spawning. The anadromous Coho salmon spawns in freshwater streams, rivers, or lakes. These juveniles remain in freshwater for 1 to 5 years before moving into estuarine conditions and then onto marine waters as juveniles. Territorial behavior such as individual feeding territories can be presented in flowing water, but not as prevalent within a lake system. Juveniles remain in coastal waters up to 4 months before migrating and dispersing offshore. Immature salmon remain at sea for approximately 14 months feeding before returning to spawn. Both the adult carcasses and eggs/larvae of the Coho salmon are important nutrient inputs with the local trophic system.

Sockeye S**almon (*Oncorhynchus nerka*)**

Sockeye salmon have a large variability in their life stage in comparison to the other Pacific salmon species. Sockeye salmon are anadromous and spawn in the late summer or fall in freshwater streams or lakes where the larvae remain. Spawning depth does not appear to be as large of concern for sockeye and can occur at almost 30 m, but largely in gravel by the coast. Juveniles remain in freshwater longer than other *Oncorhynchus* species before moving into estuarine coastal waters and can use nursery lakes to further their growth. Immature sockeye salmon in marine waters stick largely to the coast in schools and can take anywhere from 1 to 4 years to mature to adults. After their final feedings, adult sockeye salmon return to freshwater streams or lakes to spawn. Both the adult carcasses and eggs/larvae of the pink salmon are important nutrient inputs with the local trophic system.

Chinook Salmon (Oncorhynchus tshawytscha)

Chinook salmon are the least abundant Pacific salmon but the largest in size. The anadromous chinook salmon spawn in freshwater in a variety of habitats from a few centimeters to several meters deep. Additionally, due to the size of Chinook salmon, they are able to spawn in faster water velocities than other salmonids. Juveniles remain in freshwater for varied amounts of time from days to years before moving into estuarine conditions. Adult chinook salmon remain feeding at sea for 1 to 6 years before returning to spawn in temperatures ranging from 1 to 15° C and remain lower in the water column compared to other salmon around 30 to 70m in depth. Both the adult carcasses and eggs/larvae of the Chinook salmon are important nutrient inputs with the local trophic system.

Table 10 presents life history stage information for EFH species through the Bering Sea and Aleutian Islands Ground Fish (BSAI) Fishery Management Plan (FMP) identified for potential impacts in the project footprint. Table 11 presents life history stage information for EFH species through the Salmon Fisheries in the EEZ Off Alaska Fishery Management Plan (FMP) identified for potential impacts in the project footprint.

Table 10. Life History Stage Information for EFH identified through BSAI for Potential Impacts

Species	Eggs	Larvae	Early Juveniles	Late Juveniles	Adults
Weathervane scallop	X	X	X	1	1
Squid	X	X	X	1	1
Arrowtooth flounder	X	1	1	1	1
Rock sole	X	1	1	1	1
Flathead sole	1	1	1	1	1
Sculpin	X	X	1	1	1
Pacific cod	X	1	1	1	1
Skate	X	0	1	1	1
Walleye Pollock	1	1	1	1	1

X - No EFH description determined. Insufficient information is available.
0 - Not applicable.
1 - EFH applicable for life stage.

Table 11. Life History Stage Information for EFH Species through the Salmon Fisheries in the EEZ Off Alaska FMP Identified for Potential Impacts

Species	Eggs	Freshwater Larvae & Juveniles	Marine Juveniles	Marine Immature & Maturing Adults	Freshwater Adults
Chum salmon	1	1	1	1	1
Pink salmon	1	1	1	1	1
Coho salmon	1	1	1	1	1
Sockeye salmon	1	1	1	1	1
Chinook salmon	1	1	1	1	1

3.3 Socio-Economic Conditions

3.3.1 Population & Demographics

An estimated 4,437 residents lived in Unalaska in 2016. This represents a population increase of 1.3 percent since 2010 and an increase of 3.5 percent since 2000. It should also be noted that Unalaska has many transient workers who are not counted by the U.S. Census. During the peak processing season (January – March) the number of transient workers increases the community population to nearly 10,000 people.[5] Table 12 provides population data for the United States, Alaska, and Unalaska over the last 20 years for which data is available.

[5] *Unalaska Comprehensive Plan 2020*, City of Unalaska Planning Department, February 2011.

Table 12. The City of Unalaska Geographical Area – Total Population Data

Area	% Change '00-'16	2016	2010	2000
United States	14.8%	323,127,513	308,745,105	281,421,906
Alaska	18.3%	741,894	710,231	626,932
Unalaska	3.5%	4,437	4,376	4,283

Source: 2000 Census, 2010 Census, 2016 Population Estimate; Census Bureau

The residents of Unalaska are racially and ethnically diverse. Based on 2015 census estimates, 48.3 percent of residents are Asian, 11.4 percent are Hispanic or Latino, and 5.8 percent are Alaska Native or American Indian. In the state of Alaska, 19.3 percent of the population is American Indian or Alaska Native, while Asian/Pacific Islanders or other races amounted to 9.5 percent. Table 13 displays racial demographics for the Nation, State, and Unalaska.

Table 13. Population by Race

	Unalaska	Alaska	United States
Total	4,619	733,375	316,515,021
White alone	37.2%	73.4%	76.9%
Black or African American alone	5.9%	5.2%	13.3%
American Indian and Alaska Native alone	5.8%	19.3%	1.3%
Asian alone	48.3%	7.7%	5.7%
Native Hawaiian and Other Pacific Islander alone	2.9%	1.7%	0.2%
Two or more races	6.3%	8.4%	2.6%
Hispanic or Latino	11.4%	6.5%	17.8%
White alone, not Hispanic or Latino	28.7%	62.4%	61.3%

Source: 2011-2015 American Community Survey 5-Year Estimates, Census Bureau

3.3.2 Employment & Income

In 2015, approximately 83 percent of the Unalaska population was 16 years old and older. Of that population, 85.7 percent was in the labor force. Per the Census Bureau's *2011-2015 American Community Survey 5-Year Estimates*, the unemployment rate for the city was 1.7 percent, significantly lower than both the State of Alaska at 8.2 percent, and the United States at 8.3 percent. Table 14 lists occupational data for the study area.

Table 14. Civilian Labor Force by Occupation

	Unalaska	**Alaska**	**United States**
Civilian employed population 16 years and over	3,211	351,108	145,747,779
OCCUPATION			
Management, business, science, and arts occupations	466 / 14.5%	127,175 / 36.2%	53,433,469 / 36.6%
Service occupations	285 / 8.8%	61,419 / 17.4%	26,446,906 / 18.1%
Sales and office occupations	547 / 17.0%	79,623 / 22.7%	35,098,693 / 24.0%
Natural resources, construction, and maintenance occupations	434 / 13.5%	43,943 / 12.5%	13,038,579 / 8.9%
Production, transportation, and material moving occupations	1,479 / 46.1%	38,948 / 11.0%	17,730,132 / 12.1%

Source: 2011-2015 American Community Survey 5-Year Estimates, Census Bureau

In 2015, the median household income in Unalaska was $90,500, significantly higher than the State of Alaska median income of $72,515, and the national median income of $53,889. The mean household income was $102,716. Table 15 shows the number of households in Unalaska, Alaska, and the United States and the percentage of each by their respective incomes.

Table 15. Family Income

	Unalaska	Alaska	United States
Total Households	874	250,969	116,926,305
Less than $10,000	2.1%	3.8%	7.2%
$10,000 to $14,999	2.6%	3.4%	5.3%
$15,000 to $24,999	2.6%	7.4%	10.6%
$25,000 to $34,999	5.7%	7.2%	10.1%
$35,000 to $49,999	10.1%	11.7%	13.4%
$50,000 to $74,999	13.5%	18.3%	17.8%
$75,000 to $99,999	21.4%	14.9%	12.1%
$100,000 to $149,999	20.4%	18.9%	13.1%
$150,000 to $199,999	13.0%	8.3%	5.1%
$200,000 or more	8.6%	6.1%	5.3%

Source: 2011-2015 American Community Survey 5-Year Estimates, Census Bureau

3.3.3 Existing Infrastructure & Facilities

As the operations center for the Bering Sea commercial fishing fleet, there are multiple docks around Unalaska-Dutch Harbor that provide general moorage and other services to the fishing fleet. However, there only are three major terminals serving deep draft ships: Unalaska Marine Center, the American President's Line (APL) Dock, and Delta Western Fuels (Figures 19-21). Those are the focus of this economic analysis since only those docks handle vessels large enough to benefit from a deeper bar crossing.

Figure 19. Deep Draft Docks in Unalaska-Dutch Harbor

Figure 20. APL Dock Looking South

The APL dock faces southeast on Iliuliuk Bay and provides containerized cargo and fueling services to line haul vessels en route from the U. S. West Coast to Asia. The facility is owned and operated by APL, Ltd. The dock has one 40-ton, Post-Panamax-capable container crane. The dock's open storage area has capacity for approximately 1,000 containers stacked four high, with up to 420 outlets for refrigerated cargo. One 8-inch fuel-oil pipeline extends from the dock to storage tanks for onload/offload. It has one, 1,050-foot berth that is currently 45 feet deep. Per the Alaska Marine Pilots, the largest vessel allowed at that dock is 965 feet long and with a 44 foot draft. There are currently no plans to expand or deepen the dock.

Figure 21. Unalaska Marine Center (UMC) and USCG Dock

The Unalaska Marine Center (UMC) and the USCG Dock consists of approximately 2,051 linear feet of dock face. The UMC offers cargo, passenger, and other port services. The marine terminal is owned by the City of Unalaska. Matson Lines operates both a 30-ton and a 40-ton crane and rail system for containerized cargo servicing their fleet of container ships on a Tacoma-Kodiak-Anchorage rotation. Maersk Services also has an agreement to use the dock and presently serves line haul ships from the west coast to Asia, as well as feeder ships and barges operated by others, but providing service to Maersk. A second berth at UMC is used for loading and unloading fish and petroleum products transferred to and from nearby storage tanks. North Pacific Fuel operates fueling facilities, including their 6-inch fuel-oil pipeline, which extends from the dock to the storage tanks. The open storage area at the UMC has a capacity of 1,500 containers, including 467 positions for refrigerated cargo. Depths at MLLW alongside the berthing area vary from 32 feet to 45 feet. According to the Alaska Marine Pilots, the largest vessel allowed at the UMC is 1000 feet long and 39 feet deep.

The city have capital improvement plans to both lengthen and dredge the docks at the UMC. The proposed lengthening project would replace sections of dock between the UMC and the USCG station (where the passenger ship is docked in Figure 11). They will also extend the rails used by the container cranes to cover this area. This will provide an additional 220 feet to the 1000-foot capacity used by the pilots. Based on the city's FY2017-FY2021 Capital and Major Maintenance

Plan (CMMP), engineering and design began in 2014 and was completed in FY2017. Construction was budgeted for completion in FY2018. As of October 2018, construction was still ongoing. Completion is scheduled for spring 2019.

Their proposed dredging project will create a constant 45 feet MLLW depth across the entire dock. According to the city, “The existing sheet pile is driven to approximately 58 feet and dredging to 45 feet will not undermine the existing sheet pile. This project is primarily to accommodate large class vessels. Many of the vessels currently calling the Port must adjust ballast to cross the entrance channel and dock inside Dutch Harbor,” (City of Unalaska FY17-21 CMMP, Approved March 16, 2016). Based on the City’s CMMP, funds have already been spent for preliminary designs of the work. By comparison, the dredging costs are approximately 5 percent of the costs of the completed dock expansion project. This dredging project is contingent on USACE completing a dredging project at the bar. Otherwise, dredging the dock is unnecessary, since vessels will still be limited by draft by the bar.

The Delta Western Fuel dock is the final deep draft dock that is used in this analysis. It is on the southerly shore of Dutch Harbor and provides shipment and receipt of petroleum products from larger vessels as well as fueling services for smaller vessels. It is currently owned and operated by Delta Western, Inc. One 12-inch, three 8-inch, and three 6-inch pipelines extend from the dock to 14 steel storage tanks at the rear of their facility. Those tanks have a capacity of 187,650 barrels (10,331,000 gallons). The dock also has another 8-inch fuel oil delivery line for fueling vessels. Depths at the dock range from 12 feet to 50 feet MLLW. According to the Alaska Marine Pilots, the largest ship allowed at the Delta Western dock is 600 feet long and 30 feet deep. There are currently no plans to expand or deepen the dock.

Table 16 displays the current dimensions of the relevant docks. There are currently only two locations in Dutch Harbor where vessels are constrained by draft: the bar and the dock. The rest of Dutch Harbor is naturally at depths of 75-100 feet MLLW. It is important to note that all three docks would benefit from a deeper bar. All three docks would be able to utilize their full depth, where it cannot with a combination of the 42-foot bar and prevailing conditions.

Table 16 Deep Draft Dock Summary

Dock Name	Length (ft)	Depth (ft)	Notes	Benefits from Deeper Bar (Y/N)
APL	1,050	45	No expansion planned	Y
UMC	2,000	40	3,000 long after expansion in 2019 To be deepened to 45 ft if bar dredged	Y
Delta Western	600	30	No expansion planned	Y

3.4 Subsistence Activities

Subsistence practices over the last 10,000 years in the Unalaska-Dutch Harbor area have been reconstructed through archaeological data, ethnographic information, and traditional ecological knowledge. Unangan subsistence was directed almost entirely to the sea as a direct or indirect provider of resources for food and raw material (Veltre 2003: 10). Veltre (2003:9-10) provides a breakdown of several major types of historical resource categories: marine mammals, fish, birds and eggs, marine invertebrates, plants, and other resources.

Unalaska is the population and economic center for the Aleutian Islands area, which is the largest fishing port in the U.S. in terms of volume of seafood caught and second largest in monetary value (ADF&G 2011). Resources in Unalaska are used in recreation and subsistence and are sources of food for al1 members of the community of Unalaska. Activities include recreational sport fishing and subsistence fishing and other activities regulated by the Alaska Department of Fish and Game including, recreational wildlife viewing, bicycling, hiking, boating, and fishing.

3.4.1 Sea Mammals

Traditional Unangan subsistence practices include the harvesting of harbor seals (*Phoca vitulina)*, Steller sea lions (*Eumetopias jubatus)*, northern fur seals (*Callorhinus ursinus*), harbor porpoises (*Phocoena phocoena),* and occasionally walrus (*Odobenus rosmarus divergens)* (USACE 2004). Today, walrus are not known to occur within the general area, but are hunted elsewhere by Unangan people. A ban on firearm discharge within in the City of Unalaska ended hunting of seal in the harbor. Marine mammals provide meat and oil for food, materials for tools, clothing, lamp fuel, and gun oil. Steller sea lions are hunted in the outer areas of Unalaska Bay.

Northern Fur seals are also harvested in late autumn on their migration south (USACE 2004). Sea otters (*Enhydra lutris kenyoni*) are also harvested in portions of Unalaska bay.

3.4.2 Fish and Invertebrates

Pacific halibut (*Hippoglossus stenolepis)* and salmon (*Oncorhynchus)* are the main fish resource obtained by subsistence fishers in Unalaska (Veltre 2003: 13). Halibut are obtained in deeper waters offshore in the outer areas on Unalaska Bay, requiring travel by boat. All five species of Pacific salmon are present, including pink (*Oncorhynchus gorbuscha*), chum (*Oncorhynchus keta)*, sockeye (*Oncorhynchus nerka)*, king (*Oncorhynchus tshawytscha)*, and silver (*Oncorhynchus kisutch)*. A 2001 survey by the State of Alaska Division of Subsistence indicated that 4 percent of all salmon harvested for home use were removed from commercial catches, 62 percent were harvested with non-commercial nets, and 34 percent were taken with rod and reel (ADF&G 2001). The majority of the subsistence-harvested sockeye are taken from Reese Bay, approximately 5 miles west of Unalaska near Cape Wislow (USACE 2004:142; ADF&G 2012:151). The 2012 reported number of salmon harvested in Reese Bay was estimated at 4,347 fish (ADF&G 2012:151). Silver salmon harvested focuses on the Nateekin River and Broad Bay on the west side of Unalaska Bay (USACE 2004:142). Pink salmon are harvested in Nateekin Bay with smaller runs in Broad Bay, Captains Bay, and Summer Bay (USACE 2004:142). Finally, chum salmon are harvested in Iliuliuk River (USACE 2004: 142). King salmon occur in deeper waters throughout the channels (USACE 2004:40). Fishing also occurs with rod and reel, and net for personal use across the bay. Silver and sockeye are the most heavily targeted salmon for sport fishing and personal use in the Unalaska area. The total estimated subsistence harvest of salmon in the Unalaska area for 2014 was 4,339 salmon (ADF&G 2017).

Invertebrates commonly collected include crab (*Paralihodes camtschatica*, *Chionoecetes bairdi*, and *Cancer magister*), shrimp (*Pandalus borealis)*, clams (*Siliqua patula* and *Saxidomus gigantean)*, mussels (*Mytilus* spp.), sea urchins (*Strongylocentrotus* spp.), and chitons (e.g., *Cryptochiton stelleri*). Clams, mussels, sea urchins, and chitons are hand picked off rocks and collected off the beach or intertidal zones. Crab and shrimp are harvested in Iliuliuk Bay using crab pots and nets near shore.

3.4.3 Birds

Seasonally available ducks (e.g., *Histrionicus histrionicus)* and geese (*Chen canagica* and *Branta canadensis)* are hunted by some residents with firearms outside the city limits. Traditionally, cormorants (*Phalacrocorax* spp.*)*, puffins (*Fratercula* spp.), murrelets (*Brachyramphus* sp.), and other birds were hunted using special bird spears, bolas, nets, snares, and by other means (Veltre 2003:10).

3.4.4 Plants

A variety of berries, including blueberries (*Vaccinium* spp.), mossberries (*Empetrum nigrum*), salmonberries (*Rubus chamaemorus*), and strawberries (*Fragaria* sp.), can be found on Unalaska Island. The majority of berry picking is concentrated around Captains Bay, Summer Bay, Nateekin Bay, and Broad Bay (USACE 2004:143). Kelp is also collected from intertidal zones.

A 1994 baseline harvest profile by the Alaska Department of Fish and Game (ADF&G) lists non-salmon fishes as the largest amount of subsistence resource harvest (Table 17). Veltre (2003) estimates that 30 percent of Unalaska subsistence harvest is marine mammals, 30 percent fish, 20 percent birds and eggs, 15 percent marine invertebrates, and 5 percent plants. In 2008, a survey conducted by the ADF&G found that a total of 26 Steller sea lions and zero harbor seals were harvested that year (ADF&G 2008).

Table 17. Pounds of Subsistence Take by Resource

Resource	Pounds Harvested
Non-Salmon Fish	147,684 lbs.
Salmon	98,198 lbs.
Plants and Berries	21,304 lbs.
Marine Invertebrates	520,138 lbs.
Marine Mammals	17,536 lbs.
Large Land Mammals	7,412 lbs.

Source: ADF&G 1994 representative study

3.5 Cultural Resources

Cultural resources include prehistoric and historic sites, structures, districts, artifacts, or any other physical evidence of human activity considered important to a culture, subculture, or community for scientific, traditional, religious, or any other reason.

Cultural resources are limited, nonrenewable resources whose potential for scientific research or value as a traditional resource may be easily diminished by actions impacting their integrity. Numerous laws and regulations require that possible effects on cultural resources be considered during the planning and execution of Federal undertakings. These laws and regulations stipulate a process of compliance, define the responsibilities of the Federal agency proposing the action, and prescribe the relationship among other involved agencies (e.g., State Historic Preservation Officer [SHPO]). In addition to NEPA, the primary laws that pertain to the treatment of cultural resources during environmental analysis are the National Historic Preservation Act (NHPA) (especially Sections 106 and 110), the Archaeological Resources Protection Act, the Antiquities Act of 1906, the American Indian Religious Freedom Act, and the Native American Graves Protection and Repatriation Act.

3.5.1 Area of Potential Effect

The Area of Potential Effect (APE) is a NHPA specific term. The APE includes any areas that will be used for the purposes of the project. This generally includes construction site, access routes, staging areas, worker camp locations, monitoring wells, etc. The APE is defined in the regulations (36 CFR §800.16(d)) as the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The APE is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking.

The APE for this action includes those areas that could potentially be disturbed by the proposed navigation improvements.

3.5.2 Historic Context

The eastern Aleutian Islands have been continuously occupied by Unangan people since at least 9,000 BP. The earliest known Unangan sites are found on Hog Island in Unalaska Bay, just west of Amaknak Island (Davis et al. 2016; Davis and Knecht 2010). Unalaska Island has over 150 known precontact village sites; there are multiple sites within Unalaska Bay (Corbett and Yarborough 2016).

The earliest documented Russian contact with Unangan of the Aleutian Islands occurred in 1741; the Russians first arrived on Unalaska Island in 1759. In response to unprovoked atrocities committed by Russians at multiple locations on Unimak Island and the Alaska Peninsula between 1761 and 1762, the Unangan of the eastern Aleutians made war upon the intruders; the Russian response was incredibly destructive. Over the next few decades, large numbers of Unangan and Unangas people were forcibly relocated to Kodiak Island, the Pribilof Islands, and elsewhere (Black 2004). Lantis (1970) calculated that at least 80 percent of the Unangan population was lost in the first two generations of Russian contact.

In 1768, Mikhail Levashov, commanding the *Sv. Pavel*, overwintered in what is now called Captains Bay near the current City of Unalaska. By the 1780s, the Kiselev Brothers Company had established headquarters at Unalaska village (also known as Iliuliuk); the Shelikhov-Golikov Company soon followed. In 1797, the “Unalaska District,” headquartered at Unalaska, was created for Grigorii Shelikhov’s new United American Company (Black 2004). The first Russian Orthodox chapel at Unalaska was constructed in 1808. The Church of the Holy Ascension was built to replace it in 1825; in 1858, the church was rebuilt. In 1896, it was replaced with a larger cathedral; the Church of the Holy Ascension stands today as a National Historic Landmark (Turner 2008). Shortly after the United States purchased Alaska from Russia in 1867, Unalaska was considered to be the commercial and religious center of the eastern Aleutians; it was the largest village at the time. Both the Alaska Commercial Company and Western Fur and Trading Company were quartered there (Turner 2008).

U.S. Military History

In 1902, an executive order set aside 23 acres on Amaknak Island for use as a U.S. Navy coaling station; however, the Navy did not use the land until they installed a radio station there in 1911. Due in part to the international Washington Naval Treaty of 1922 in which the United States agreed not to fortify the Aleutian Islands, military construction was not seriously considered until 1938. A Navy aerology station was established on Amaknak Island in July 1939. Construction on both naval and army installations began at Dutch Harbor in July 1940. By early 1941, a naval medical detachment and a Marine Defense Force were barracked on Amaknak Island, while the U.S. Coast Guard maintained a station at Unalaska (Faulkner et al. 1987).

In the early 1940s, the United States War Department had hired architect Albert Kahn to design military bases throughout Alaska. Kahn’s original plans for Dutch Harbor specified bombproof, reinforced concrete structures; however, due to scarcity of local supplies, most of the military structures were instead framed with lumber shipped up from the Pacific Northwest. In addition to supply shortages, there was also a shortage in skilled laborers. From 1940 to 1942, construction of both naval and army facilities on Amaknak Island was contracted to the Siems-Drake-Puget Sound Company. However, many laborers saw Dutch Harbor as an undesirable location and quit soon after arrival.

The naval air station was commissioned on September 1, 1941; the army base, Fort Mears, was commissioned 9 days later. The naval air station was originally designed for Consolidated PBY Catalinas and other seaplanes; it was not until May 1942 that a short runway for fighter aircraft was approved for construction at the base of Mt. Ballyhoo (Faulkner et al. 1987). On June 3, 1942, 11 bombers and 6 fighter planes from the Japanese aircraft carrier *Ryujo* flew over Amaknak Island, dropping 14 bombs on Fort Mears, destroying 5 buildings. On June 4, 17 bombers and 9 fighter planes again dropped bombs on the island, striking gun emplacements, fuel tanks, and the S. S. *Northwestern,* which was beached near the Dutch Harbor dock.

After the attack on Dutch Harbor, the ramp-up of military presence increased. The Mt. Ballyhoo Army Garrison, which later became Fort Schwatka, was constructed on Ulakta Head in 1942. Due to the lack of space available for expansion on Amaknak Island, the Army turned Fort Mears over to the Navy on August 11, 1942, in return for the construction of new facilities for the Army in Pyramid Valley and elsewhere nearby by Navy Seabees (Faulkner et al. 1987). On January 1, 1943, the Dutch Harbor Naval Operating Base was commissioned, adding to the naval air station the newly-constructed air operations building, antisubmarine net and boom depot, submarine base, and ship repair facility (Thompson 1984). In August 1944, Fort Mears was placed on housekeeping status. The naval submarine facility was decommissioned in 1945, and the Dutch Harbor Naval Operating Base was decommissioned in 1947. The remaining structures and lands associated with Fort Mears were sold in 1952 (Faulkner et al. 1987).

3.6 Existing Navigation Conditions

Under current conditions, the shallow depth of -42 feet MLLW at the bar causes restrictions to vessels approaching and departing Dutch Harbor. The surrounding natural depth of Iliuliuk Bay is -100 feet MLLW. The bar is the only constraint preventing access for the current and anticipated future fleet. Vessel traffic is restricted to one large ship movement at a time in the port, in any direction. This typically applies to container vessels and medium- to large-sized tanker vessels. Essentially, large vessels move around the port in a series, one after another, never simultaneously. All vessel traffic into and out of Dutch Harbor is managed by the Alaska Marine Pilots Association. They typically embark/debark vessels approximately 2 nautical miles outside the bar. Figure 22 shows the tracks of seven light loaded ships for the year of 2016 as they called on Dutch Harbor. The tracks are taken from Automatic Identification System Analysis Portal (AISAP), which uses automatic identification system (AIS) data to display ship tracks queued over an area of interest for a given amount of time. The width between the two outer bound ship tracks over the bar is approximately 1,200 feet.

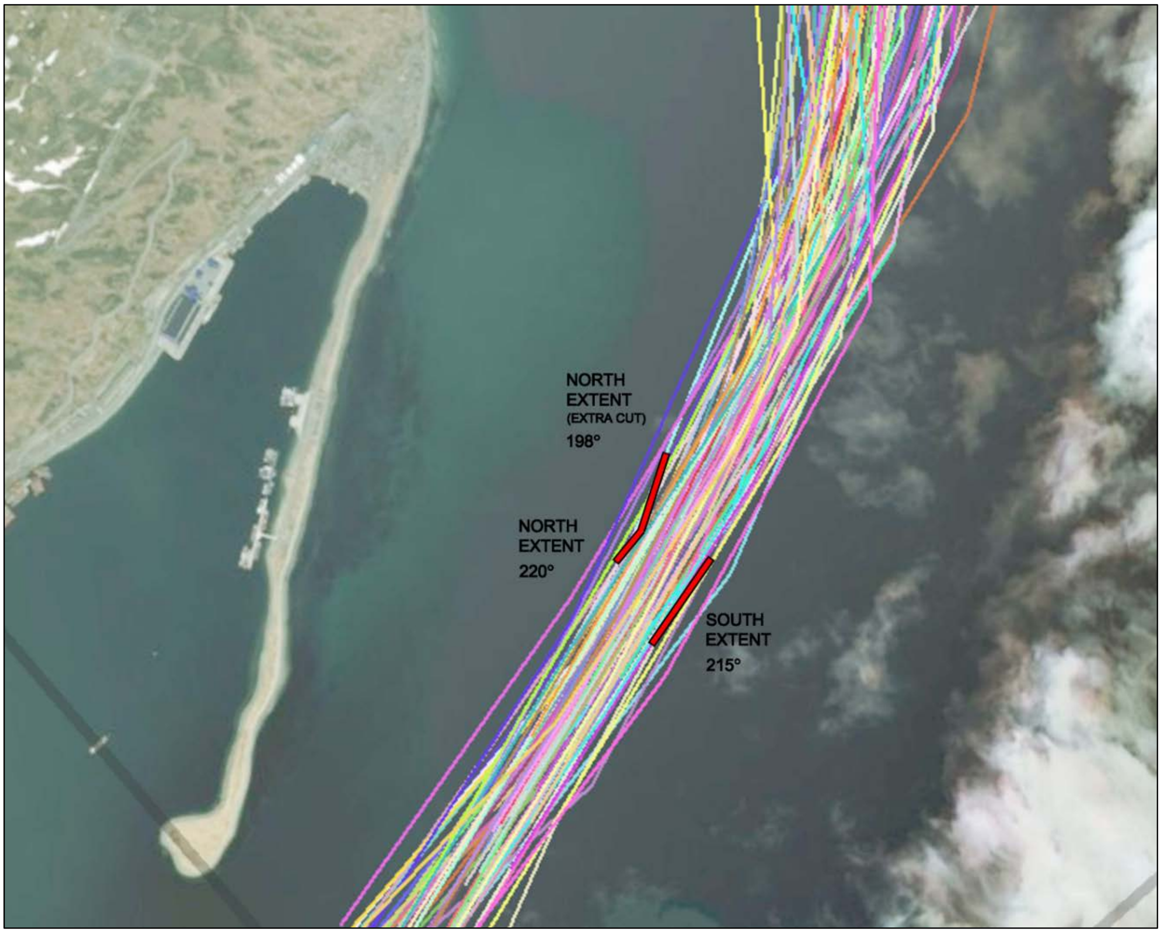

Figure 22. Ship Tracks for Lightly Loaded Vessels

It is difficult to quantify what percent of time the Dutch Harbor is accessible to vessels with drafts up to 38 feet. Deep draft vessels employ various tactics to maximize their chances of being able to cross the bar without delay, such as timing their arrival at Dutch Harbor to coincide with high tide. Vessels with a draft at or exceeding 38 feet are likely to experience delays due to the stage of the tide. Further constraints include weather, such as times of high wind or heavy seas. A vessel's maneuvering capabilities within the system come into play as well. During times of high wind and/or seas, vessels may be required to wait either at dock, a mooring buoy, or sheltered anchorage location. Vessels that are unable to enter Dutch Harbor must circle offshore.

Vessels often must take precautionary measures to safely cross the bar. These measures include light loading, waiting outside the bar for wave conditions to improve, foregoing fueling to capacity to reduce draft, lightering fuel outside the bar, and discharging ballast water to reduce draft. These all result in transportation cost inefficiencies and reduce the competitiveness of Dutch Harbor in the global marketplace as they increasingly cannot meet the needs of the increasingly deeper draft international shipping fleet.

Numerous sites within Dutch Harbor have been designated as PPORs by the Alaska Department of Environmental Conservation. PPORs are pre-identified sites to aid decision-makers in responding to vessels in distress. The U.S. Coast Guard has jurisdiction over approving temporary mooring or anchoring locations for leaking or damaged vessels[6].

The bar limits Dutch Harbor's ability to serve as a PPOR due to the draft limitations it imposes upon vessels. Vessels transiting the nearby Great Circle Route between North America and Asia (Figure 23) are sometimes unable to seek refuge, repair, and evacuations that they would otherwise seek in Dutch Harbor. However, such instances are poorly documented. For vessels unable to safely cross the bar, risky evacuations of personnel requiring medical attention occur at open sea. Likewise, maintenance and emergency repairs for such ships occur at unimproved open sea locations, posing an increased safety and environmental risk to the region.

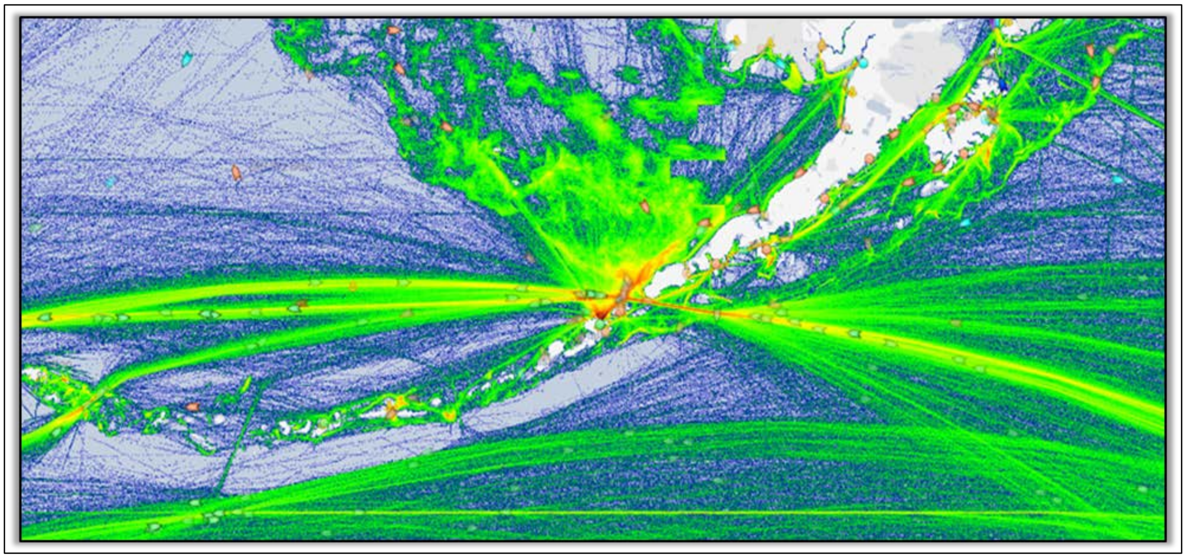

Figure 23. Vessel Traffic Transiting the Great Circle Route and in the Bering Sea 2016
Source: marinetraffic.com, accessed 1/17/2017

Marine geophysical data has identified the shoal as a submarine glacial moraine, which likely consists of an unsorted and unstratified accumulation of materials such as clay, silt, sand, gravel, cobbles, and boulders, having been transported, deposited, and consolidated by glacial ice.

Being the operations center for the Bering Sea commercial fishing fleet, there are multiple docks at Dutch Harbor that provide general moorage and other services to the fishing fleet. However,

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[6] http://dec.alaska.gov/spar/PPR/ppor/home.htm

there only are three major terminals serving deep draft ships (Figure 19). These deep draft docks are the focus of the analysis since only these docks handle vessels large enough to benefit from a deeper bar crossing.

3.7 Munitions and Explosives of Concern (MEC)

Due to military activity during World War II, the presence of MECs, including both unexploded ordnances (UXOs) and discarded military munitions (DMMs), within the project area must be determined. Geophysical techniques were utilized to conduct a survey for MECs and other marine debris that could complicate dredging efforts. A total of six seafloor surface objects with ferrous returns noted as potential MECs were detected within the potential dredging area at seafloor depths less than -58 feet MLLW, the maximum depth of expected deepening identified at the beginning of the study effort (Figure 24). An additional buried object with a ferrous return shallower than -58 feet MLLW was also detected. Additionally, there are nine locations within the potential dredging area that had strong gradiometer returns, indicating ferrous content, which could not be linked to surface or subsurface objects detected by the other geophysical survey tools.

Use of a remotely operated underwater vehicle (ROV) to visually observe and further characterize identified seafloor targets of concern will be required during PED to further reduce this uncertainty.

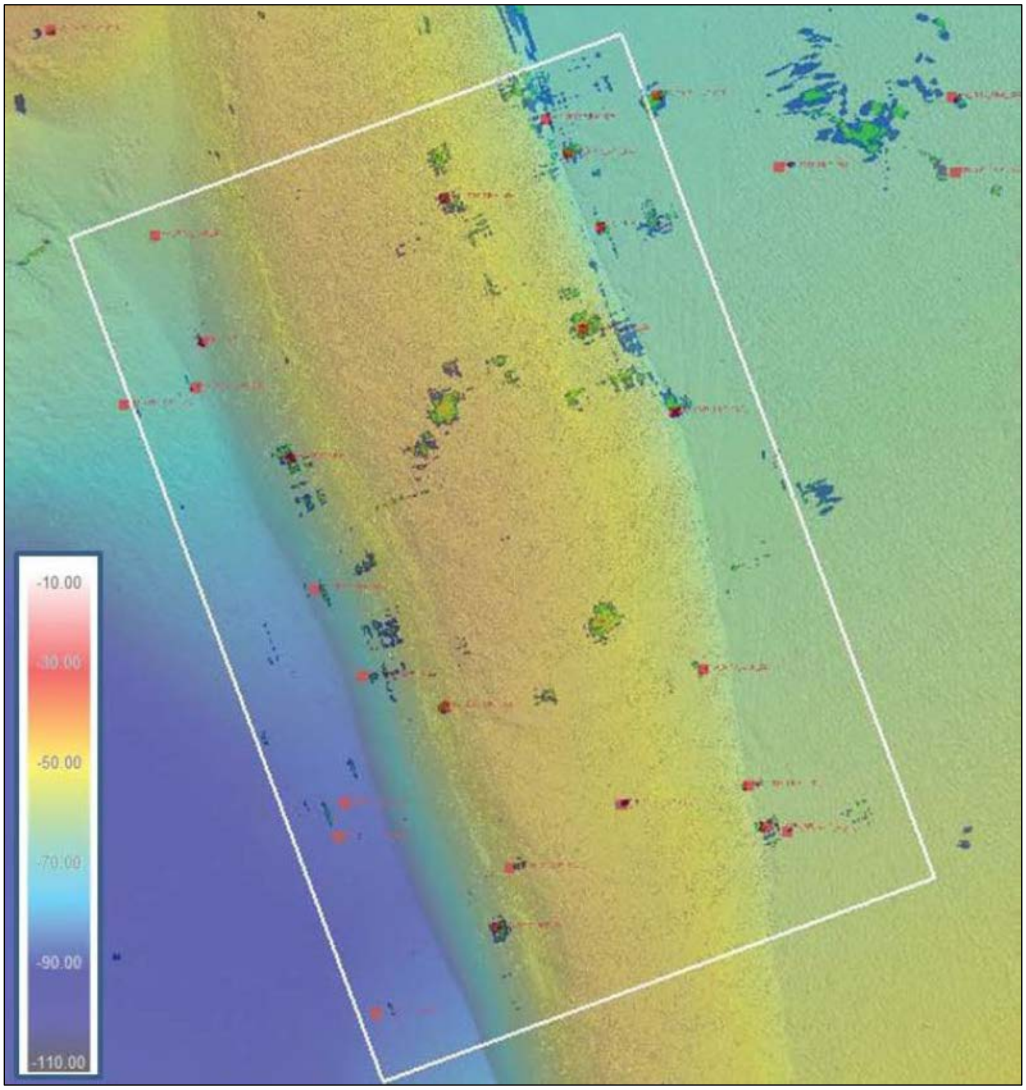


Figure 24. Geophysical Survey Data.

Note: Surface objects with ferrous returns are indicated in red. Six of these occur within the potential area of deepening.

4 FUTURE WITHOUT PROJECT CONDITIONS

4.1 Physical Environment

Sea level rise estimates using guidance from *Incorporating Sea Level Change in Civil Works Programs* (EC 1100-2-8162) and NOAA historic rates predict a low end estimate of a drop by 0.93 feet due to isostatic rebound being greater than sea level rise, intermediate estimate of a drop of 0.46 feet, and a high end estimate of a rise of 1.03 feet between 2020 and 2070. Though there is a great deal of uncertainty in this estimate, there is a potential impact on the proposed project or the ability of Dutch Harbor to serve as a maritime hub over the next 50 years. The situation of sea level decrease would be problematic since it would decrease the water level over the bar and pose a larger navigation hazard with increased economic impacts on shipping. The bar would need to be dredged an additional foot to mitigate the effects of this worst case scenario. A sea level increase would reduce the impact of the bar in a future without project scenario by providing more water depth. Beyond potential sea level changes, there are no foreseeable changes in the physical environment in Dutch Harbor. The bar is a stable area that is unlikely to change in terms of substrate or depth. The preferred disposal area is also likely to remain in its current condition. At this time, no additional depth of the channel is being considered due to sea level rise.

There are no anticipated changes expected to the climate, geology/topography, seismicity, bathymetry, ice conditions or tides and currents in the project area.

4.2 Economic Conditions

The Port of Dutch Harbor is the operations center for the commercial fishing fleet in the Bering Sea and is also a major transshipment point for the Western Aleutian Island chain. Most economic activity there can be attributed to some aspect of the fishing industry.

4.2.1 Port Commerce Forecasts

Without and With Project Conditions

The commodity forecasts for Dutch Harbor are assumed to be the same for future without and with project conditions as navigation improvements are not anticipated to attract new commerce; rather, improvements will provide for commerce to be moved through the port more efficiently. The methodology used to develop the trade forecasts for current harbor facilities is documented in the report sections that follow.

Current and Future Commodities

To develop the long-term commerce forecast, commodities currently moving through Dutch Harbor were separated into two groups: 1) bulk commodities and 2) containerized cargo. Over 90 percent of bulk movements at the port are petroleum products, so the Department of Energy’s Annual Energy Outlook 2017 was used to develop a forecast for this commodity. For containerized cargo, all levels were held constant over the period of analysis. Containerized cargo is primarily fish exports and manufactured imports. Because the fish catch around Dutch Harbor drives those commodity levels, this forecast will depend on that annual catch. This annual catch is limited by law; therefore, the anticipated levels of containerized commodities are not anticipated to grow. The law that affects the catch levels is driven by research and study of the fishery. These regulations are not anticipated to change in the future. Also, due to Unalaska Island’s isolated geography, hinterland impacts are not anticipated to drive changes in the economy or throughput of the harbor. The Figure 25 shows the last 3 years of historical volumes and forecasted volumes of bulk and containerized cargo over the study period.

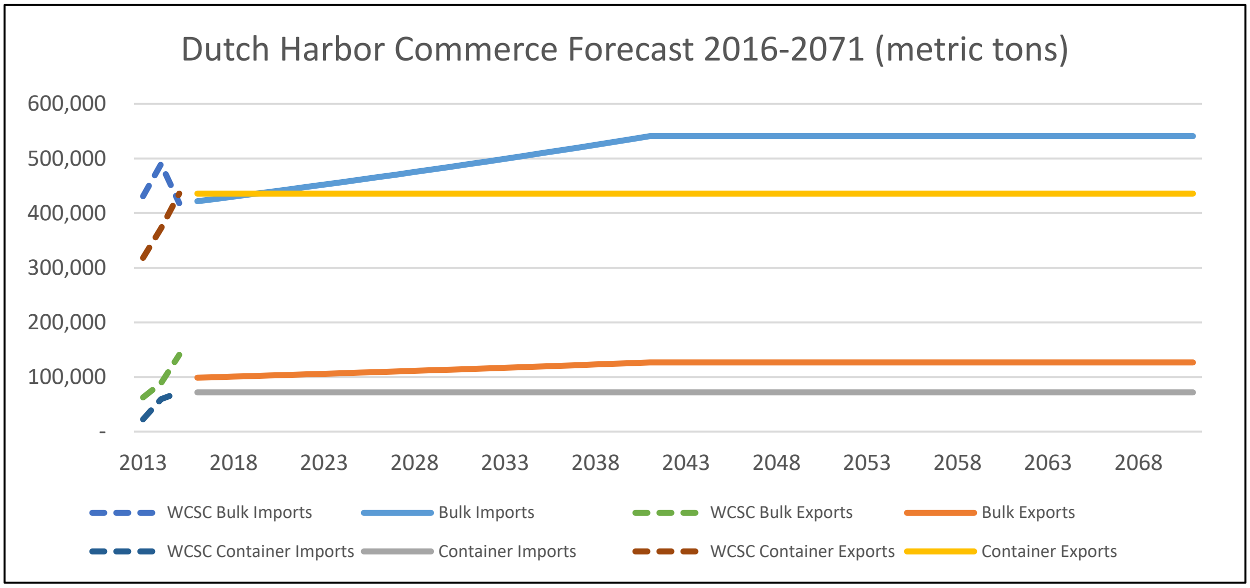


Figure 25. Historical Commerce and Forecasted Commerce Levels (Metric Tons)

4.2.2 Vessel Fleet and Operations

The existing fleet for the analysis was developed by evaluating a combination of empirical data for a 5-year period (2010-2015). Vessel movement data were collected from the Waterborne Commerce Statistics Center for 2010-2015 for the port. The City of Unalaska also provided pilots' records for 2013-2016, and Automated Identification System (AIS) vessel movement data were collected from IHS's Maritime database, SeaWeb, for 2015.

Based on the data collected, only four types of vessels carried the primary bulk and containerized commodities: liquid barges, refrigerated cargo ships, bulk carriers, and container ships. Since the purpose of this study is to evaluate the effects of a deepened channel, only those types of vessels that would benefit from a deepened channel were included in the base fleet. If we were modeling to reduce overall harbor congestion, more types of vessels would have been included. A deeper channel allows containers and bulkers to gain efficiencies with their larger vessels. This would replace calls from smaller ships and barges. The refrigerated cargo fleet is currently not deep enough to benefit, so were not included.

The compilation of data, combined with the above methodology, allowed the benefiting fleet to be reduced to five vessel types. Those five vessel types were then broken down into eight vessel classes, based on their size (length or beam) or capacity (DWT). The Table 18 displays the total number of vessel calls (not transits) in 2015 by vessel class that were developed for the base fleet.

Table 18. Calls by Vessel Class to Dutch Harbor in 2015

Vessel Class	LOA(ft)	Beam(ft)	DWT	Draft(ft)	Number of Calls
Barge	329	78	15,853	24.3	40
Chemical/Products Tanker					
MR2 Class Tanker	591-601	105.6	47,975-51,527	41.9-43.5	3
Products Tanker					
MR2 Class Tanker	590-596	105.6	45,761-48,700	39.8-41.4	4
Panamax Class Tanker	750	105.8	74,996	46.5	3
Crude Oil Tanker					
Aframax	820	143.7	114,749	49.0	2
Container Ship					
Regional Feeder	575-720	78.0-95.0	20,668-25,651	33.9-35.8	55
Feedermax	617-729	93.5-99.7	27,130-39,266	34.4-39.4	18
Panamax	856-965	105.8	50,201-68,411	41.3-44.7	9
Baby Post Panamax	852-906	122.4-131.2	58,197-66,696	41.0-45.9	33
Post-Panamax	909	131.9	67,987	46.0	7
Total					**174**

There were 149 unique vessels that called on the port from 2010 to 2015. Their design drafts ranged from 12.0 to 58.8 feet. Of that 149, 56 had greater design drafts than the current allowable depth of 38 feet at the bar (42 feet minus 4 feet under keel clearance), or 38 percent of the traffic.

The next step was to anticipate how the base fleet of benefiting vessels will change over the period of analysis. The fleets of bulk and container ships that call on Unalaska-Dutch Harbor are unique to the industries that drive trade movements there. A handful of bulk and container companies provide shipping services to the port for very specific purposes. An example of this is Maersk's Transpacific Alaska service that runs from northern Asia to Unalaska-Dutch Harbor and back. It is the only service in their portfolio that is dedicated solely to the Alaska import and export markets and connects Alaska to the seafood markets of Hakata, Japan and Dalian, China. This allows critical movement of manufactured imports and seafood exports to arrive and depart regularly. However, when Maersk joined Mediterranean Shipping Company (MSC) to form the 2M ALLIANCE, a 10-year vessel sharing agreement, their Alaska service was not included and kept as its own separate business unit. The specialization of fleets and the regularity of their services, like Maersk's, suggests a rather self-contained market for shipping to and from the port that would not be largely influenced by trends in fleets around the world. Another example of this is Matson Shipping's fleet of small Regional Feeder container ships. This company deals exclusively in weekly domestic shipments to the Alaskan mainland and continental U.S. This critical lifeline to the remote Aleutian Islands communities contains a fleet that is limited to one class of vessel and is on a set rotation. So, even though world fleets of tankers and container ships are shifting to larger size vessels, the fleet calling on Dutch Harbor will likely remain the same.

All vessel traffic into and out of the port is managed by the Alaska Marine Pilots Association. They typically embark/debark vessels approximately 2 nautical miles outside the bar. Due to the current shallow depth at the bar, traffic is restricted to one large ship movement at a time in the port, in any direction. This typically applies to container vessels and medium- to large-sized tanker vessels. Discussions with the Alaska Marine Pilots indicated that a project deepening the bar would not change their traffic management practices. Essentially, large vessels move around the port in a series, one after another, never simultaneously.

It is difficult to quantify what percent of time the Dutch Harbor is accessible to vessels with drafts up to 38 feet. Deep draft vessels employ various tactics to maximize their chances of being able to cross the bar without delay, such as timing their arrival at Dutch Harbor to coincide with high tide. Vessels with a draft at or exceeding 38 feet are likely to experience delays due to the stage of the tide. Further constraints include weather, such as times of high wind or heavy seas. Vessels with a draft exceeding 38 feet are likely to experience additional delays due to the stage of the tide. A vessel's maneuvering capabilities within the system come into play as well. During times of high wind and/or seas, vessels are required to wait either at dock or the pilot buoy.

Planned Development

The city has recently begun construction of a capital improvement project to expand the deep draft dock facilities at the UMC. The project replaced sections of dock between the UMC and the USCG station. As of January 2019, construction was still ongoing. Completion is scheduled for spring 2019. There are designs for dredging the docks at the UMC to a uniform depth of 45 feet; however, no action will be taken unless USACE dredges the bar. Therefore, it is not assumed to occur in the without-project condition. There is no future development planned at the APL dock, which will remain at a depth of 45 feet.

Future Without Project Scenarios

Under Future Without Project Conditions, the depth of the bar will not change and will continue to cause inefficiencies and safety concerns at Dutch Harbor. The bar will continue to constrain access to Dutch Harbor for deeper draft vessels, resulting in impacts to the commercial fishing, fuel, and international shipping industries, as well as economic activity in the region. Ships will continue to adjust ballast and fuel to safely cross the bar. Continued fuel lightering outside the bar will increase risks to environmental quality. Maintenance and emergency repair needs of deep draft ships will continue to be addressed in unimproved areas outside the bar, resulting in an increased risk to personal safety and environmental quality. Dangerous at sea rescues will continue for personnel of ships that cannot safely cross the bar.

Container companies are changing to deeper draft vessels. At least one company has already stopped calling on Dutch Harbor due to its inability to provide services to these deeper draft vessels. An increasing proportion of the future fleet of container vessels will not be able to access Dutch Harbor without deepening the bar.

Given the considerations surrounding the future vessel fleet, port traffic was simulated at three points in time during the period of analysis, using the HarborSym planning tool. Traffic was simulated based on the amount of forecasted tonnage moving through the port and the forecasted available vessel fleet. The first forecast point was the base year, or the first year that a completed project might yield benefits, 2022. The second year was 2032, and the third was 2042. Table 19 shows how the numbers of calls change for certain vessel classes over the period of study.

Table 19. Forecasted Annual Vessel Calls to Unalaska – Dutch Harbor by Class and Year

Vessel Class	Draft (ft)	2022	2032	2042
Aframax Tanker	49.0	2	2	2
Tanker-MR2	41.9-43.5	7	7	8
Tanker-Panamax	46.5	1	1	1
Regional Feeder	33.9-35.8	82	82	82
Feedermax	34.4-39.4	4	6	4
Panamax	41.3-44.7	17	6	6
Baby Post Panamax	41.0-45.9	33	41	41
Post-Panamax	46.0	1	2	2
Barge	24.3	9	5	11
Total		**156**	**150**	**157**

The shift to larger vessels to reduce costs is reflected in the increased number of Post-Panamax calls in 2032 and 2042, and the reduction in Panamax calls.

The estimated future vessel fleet and number of vessel calls was run through the HarborSym deepening model to calculate the transiting times and costs for the period of analysis for each of the increments evaluated (2022, 2032, 2042). Once the transiting times were calculated, the model calculated average vessel transit (voyage) costs based on the most recent set of USACE Deep-Draft vessel operating costs (DDVOCs).[7] The average vessel transit (voyage) costs in the without project condition for the base year, year 10, and year 20 of the period of analysis, are displayed in Table 20. These are outputs of the HarborSym model for the without project condition.

[7] Economic Guidance Memorandum, 17-04, DDNVOCs FY2016 Price Levels, Supplemental Guidance.

Table 20. Average Vessel Cost per Vessel Class by Year in Without Project Condition

	2022	2032	2042
Future Without Project Transportation Costs	$72,375,811	$61,022,814	$65,778,345

Dutch Harbor will remain a vital PPOR as there are no other suitable alternatives in the region. An increasing proportion of the fleet transiting the Great Circle Route will not be able to seek refuge, repair, and evacuations due to the draft limitations imposed by the bar. Since such instances are poorly documented, however, it is difficult to estimate likely relative increases in these occurrences.

Fisheries operating in the area will continue to be governed and forecast by science-based policies to ensure that population numbers remain sustainable over the foreseeable future. Subsistence and commercial fishing harvests could be adversely impacted by the continuation of performing maintenance and emergency repairs outside improved areas. There are Tribal concerns regarding impacts of increased traffic through the Great Circle Route upon environmentally sensitive areas used for subsistence activities. Improving access to Dutch Harbor will help alleviate these concerns as it will allow maintenance, repair, and fueling to occur safely at port facilities and increase harbor of refuge opportunities for vessels in distress.

4.3 Biological Environment

The biological environment surrounding the United States' most important commercial fisheries harbor is remarkably productive. Despite near continuous shipping operations and high-energy North Pacific and Bering Sea storms that can last for days, overall observed species richness and abundance are quite high. Seasonal migratory and resident marine mammals are commonly observed, seabirds congregate in seasonal abundances rarely witnessed in the lower 48 contiguous United States, and local fish stocks are relatively healthy. Regional habitat characteristics are intact, complex, and highly variable, from submerged rocky reef and kelp stands, sandy substrate bottoms and pebble beaches, to narrow, bouldered beaches abutting soaring craggy cliff faces, to the Aleutian sub-arctic tundra vegetation that dominates the rolling peaks and valleys of Unalaska and Amaknak Islands. Only a fraction of these habitats have been anthropogenically impacted.

Conceivably, the future of the biological environment at Unalaska and Amaknak Islands without implementation of USACE's proposed navigational improvements will remain as it exists at the writing of this document. While there are numerous potential sources of disturbance and habitat degradation, none of these are likely significant due to a rigorous protection and permitting process by various resource agencies. Around-the-clock vessel operations, occasional shipwrecks, minor oil and fuel spills, areas of degraded water quality resulting from waste generated by fish processing facilities, dockside facility development, and commercial fisheries operations do not seem to have offset the objective gains resulting from the implementation of Federal and state laws designed to protect biological resources and conserve their respective habitats in the surrounding areas. Aquatic development projects in this region are already heavily scrutinized for their impact to the natural environment primarily due to the conservation value placed upon the avian, fisheries, and marine mammals that are present throughout the region. Resident marine mammals, specifically the federally endangered northern sea otter, whose preference for proximal shoreline habitat make it a ubiquitous consideration for all shoreside and dockside infrastructure repair and improvement projects. The implementation of regulations governing the nearshore aquatic fate of commercial fisheries related waste streams has improved areas of historically poor water quality. It would be very difficult to identify any future impacts to the biological environment as a result of not implementing USACE's navigation improvement project.

4.4 Subsistence Activities

Subsistence practices on Unalaska Island are mainly characterized by the taking of salmon and to a much lesser extent sea mammals. Lack of implementation of USACE's proposed navigational improvements is not likely to impact subsistence activities carried out by the community of Unalaska. Without the project these activities would be expected to carry on in their current state.

4.5 Cultural Resources

Alaska has a vast and still relatively unexplored pre European contact history stretching back at least 15,000 years on Alaska's mainland and at least 9,000 years old in the Eastern Aleutian Islands. Cultural resources on Unalaska Island include both precontact resources and historic resources relating to Russian settlement in Alaska and the United States' war efforts in World War II. The vast majority of these resources occur on land and outside the potential project area. The USACE's proposed navigational improvements are not expected to impact any known cultural resources. Known cultural resources relevant to the project are located on Amaknak Island (west of the project area) and Unalaska Island (East and south of the project area), these occur on land and would not be affected directly by the dredging or indirectly by the blasting. Presumably, the known resources occurring around the project area would remain unhampered unless local construction needs dictated their mitigation. Furthermore, a future without projects condition is not expected to cause direct impacts to the Ounalashka Corporation or the Qawalangin Tribe of Unalaska. However any impacts to economics and the community in which both the corporation and the tribe reside as a result of a future without the project may have some indirect impacts on day to dayoperations. Any lack of implementation of the project is not expected to impact any cultural resources.

4.6 Summary of the Without Project Condition

Under Future Without Project Conditions, the depth of the bar will not change and will continue to cause inefficiencies and safety concerns at Dutch Harbor. The bar will continue to constrain access to Dutch Harbor for deeper draft vessels resulting in impacts to the commercial fishing, fuel, and international shipping industries, as well as economic activity in the region. As mentioned previously, while the city is in the process of completing improvements to the deep draft dock facilities at the UMC, dredging the docks at the UMC to a uniform depth of 45 feet will only occur if a channel is dredged through the bar. No other docks are planned to change.

5 FORMULATION & EVALUATION OF ALTERNATIVE PLANS*

5.1 Plan Formulation Rationale

Plan formulation is the process of building alternative plans that meet planning objectives and avoid planning constraints. Alternatives are a set of one or more management measures functioning together to address one or more planning objectives. A management measure is a feature or activity that can be implemented at a specific geographic location to address one or more planning objectives. A feature is a "structural" element that requires construction or assembly on-site whereas an activity is defined as a "nonstructural" action.

During the planning charette conducted in Unalaska September 21 – 22, 2016, participants developed descriptions of existing conditions and future without project conditions. Following this, management measures were identified and screened. Screened management measures were then used to develop alternative plans. Participation was facilitated through a combination of small and large group interactive exercises.

5.2 Plan Formulation Criteria

Alternative plans were formulated to address study objectives and adhere to study constraints. Each alternative plan shall be formulated in consideration of four criteria: completeness, efficiency, effectiveness, and acceptability.

- Completeness is the extent to which alternative plans provide and account for all necessary investments or other actions to ensure the realization of the planning objectives, including actions by other Federal and non-Federal entities.

- Effectiveness is the extent to which alternative plans contribute to achieve the planning objectives.
- Efficiency is the extent to which an alternative plan is the most cost-effective means of achieving the objectives.
- Acceptability is the extent to which alternative plans are acceptable in terms of applicable laws, regulations, and public policies. Mitigation of adverse effects shall be an integral component of each alternative plan.

In addition to these criteria used for all potential USACE water resource development project, a study specific criteria of minimizing potential conflicts with MECs has also been identified.

5.3 Individual Project Components Considered

A total of 19 potential measures (Table 21) were initially identified during the charette. These measures were screened to eliminate those not practical to meet the identified planning objectives.

Table21. Screening of Potential Management Measures with the Planning Objectives

Measure Name	Planning Objective	
	Decrease Transportation Inefficiencies	**Increase Vessel Access and Safety**
Non-Structural		
Divert to alternate port	No	No
Vessel draft limitations	No	Yes
Improved airport/air freight	No	No
Change to barges from ships	No	No
Traffic Management System	Yes	Yes
Improvement to alternate emergency vessel site	No	No
Structural		
New port facility	Yes	Yes
Deepening	Yes	Yes
Off-shore rig	No	No
Pipeline for fuel	No	No
Canal through island	No	No
Deep draft dock outside bar	Yes	Yes
Anchorage areas outside bar	No	No
Underwater reef	No	No
Breakwater	No	No

Lightering station	No	No
Cargo station	No	No
Shore protection	No	No
Draw bridge to allow access from south	No	No

5.4 Preliminary Array of Alternative Plans

Screening of measures resulted in the identification of six alternative plans to be carried forward for consideration.

1. No Action
2. Implementing a traffic management system (non-structural)
3. Implementing vessel draft restrictions (non-structural)
4. Deepening the bar in 2-foot increments beginning at -42 feet MLLW
5. Constructing a new deep draft dock facility outside bar
6. Constructing a new port facility

5.5 Screening of Preliminary Alternative Plans

5.5.1 Alternatives Eliminated from Detailed Analysis

Vessel Draft Restrictions (non-structural)

Vessel draft restrictions are not an alternative, but rather a best management practice that would be in place in both the with-and without project conditions. If a successful alternative is implemented, vessel draft restrictions will impact fewer vessels than under the future without project condition.

Construct New Deep Draft Dock Facility Outside Bar - Upgrade Captains Bay (structural)

Upgrading existing facilities at Captains Bay (Figure 2) to accommodate a deep draft fleet as an alternative to existing facilities at Dutch Harbor was considered. In addition to providing navigation improvements, many local service facility upgrades including road improvements, utility upgrades, and site improvements, would be required to make this a feasible alternative. Improving facilities at Captains Bay to serve a deep draft fleet would be expensive. Additionally, there is a lack of suitable land for development, known MEC is in the area, and important subsistence resources are in Captains Bay. Development of Captains Bay to serve as a deep draft port does not warrant further consideration.

New Port (structural)

Establishment of an entirely new port in locations with no current navigation improvements was also considered. Development of an entirely new port facility was estimated to cost in excess of $1 billion and does not warrant further consideration.

5.5.2 Alternatives Carried Forward

No Action

If no action is taken to improve navigation improvements at Unalaska (Dutch Harbor), economic development and stability for the region, nation, and the global seafood marketplace will continue to be limited; unsafe practices to deliver fuel, durable goods and exports will continue; and its ability to effectively serve as a PPOR will be limited.

Traffic Management System (non-structural)

A traffic management system could be implemented to improve tracking and scheduling of vessels utilizing the infrastructure at Dutch Harbor. Implementation of such a system would be contingent upon improved Internet connectivity in the region in order to provide real time information.

Deepening the bar in 2-foot increments beginning at -42 feet MLLW (structural)

Providing a deeper navigation channel through the bar would result in both bulk and container vessels experiencing a time savings in the form of reduction in transit time delays. A deeper channel allows containers and bulkers to gain efficiencies with their larger vessels. This would replace calls from smaller ships and barges.

6 COMPARISON & SELECTION OF PLANS*

6.1 Detailed Alternative Plans Descriptions

6.1.1 No Action

Under the No Action Alternative, the depth of the bar will not change and will continue to cause inefficiencies and safety concerns at Dutch Harbor. The bar will continue to constrain access to Dutch Harbor for deeper draft vessels, resulting in impacts to the commercial fishing, fuel, and international shipping industries, as well as economic activity in the region.

6.1.2 Traffic Management System.

A traffic management system is not suitable as a stand-alone alternative, but is suitable to be incorporated into an alternative plan meeting the objectives of the study.

6.1.3 Deepening the Bar in 2-foot Increments Beginning at -46 feet MLLW

Deepening the bar in 2-foot increments to improve access to Dutch Harbor was analyzed. All vessels currently calling on Dutch Harbor were represented. Vessels had a maximum design draft of 45.9 feet (14.0 meters); however, loading was limited to 44.0 feet (13.4 meters) by dock depths of 45 feet at both the APL and UMC City Dock, given a 1 foot clearance required at the dock. The optimum channel depth was determined by comparing economic benefits to costs for depths of 46, 48, 50, 52, 56, and 58 feet. Analysis was not performed at 54 feet because of optimization, as explained in Section 6.3.

Table 22 shows the estimated dredging quantities for depths from 48 feet to 66 feet in two foot increments.

Table 22. Potential Dredging Quantities

Dredge Depth *Feet*	Dredge Surface Area *Square Feet*	Dredge Quantity *Cubic Yards*
-48	211,000	36,000
-50	267,000	61,000
-52	311,000	88,000
-54	363,000	119,000
-56	408,000	154,000
-58	437,000	182,000
-60	457,000	227,000
-62	474,000	266,000
-64	488,000	306,000
-66	501,000	339,000

The design vessel used for design considerations in engineering the channel is a 68,000 Dead Weight Ton (DWT) Post-Panamax container vessel. APL Holland is an example of such a design vessel that calls on Dutch Harbor (Figure 26). Pertinent information on the design vessel is shown in Table 23.

Figure 26. APL Holland

Table 23. Design Vessel Dimensions

Design Vessel	
Parameter	*Feet*
Length Overall	909.6
Beam	131.4
Design Draft	45.9
Vessel Draft	44.0

6.2 With-Project Conditions

The National Economic Development (NED) benefits evaluated for the proposed channel deepening will result from savings in transportation costs accruing to deep draft vessels. Both bulk and container vessels will experience a time savings "with" project in the form of the reduction in transit time delays. A deeper channel allows containers and bulkers to gain efficiencies with their larger vessels. This would replace calls from smaller ships and barges. Other costs and practices, such as land side costs, would not change as a result of the project and are assumed to remain constant.

For this project, a total of six different alternatives were analyzed along with the existing/without project condition. These alternatives call for channel depths of 46, 48, 50, 52, 56, and 58 feet. The relative closeness of the benefits of the 52- and 56-foot alternatives precluded the need for analyzing benefits at 54 feet. All alternatives had channel dimensions of 600 feet long and 600 feet wide. Of the three deep draft docks that were modeled, the dimensions and capacities of only one changed from conditions at the beginning of the study. The City Dock at the Unalaska Marine Center increased its depth from 39 feet to 45 feet.

6.3 Alternative Plan Costs

6.3.1 Construction & Investment Costs

Rough Order of Magnitude (ROM) costs were developed for the initial construction costs for each alternative. The estimated costs of mobilization and demobilization, drilling and blasting, dredging and dredged material placement, and needed surveys were included in the ROM costs. Cost risk contingencies were included to account for uncertain items such as removal of MECs and construction shutdowns due to severe weather and marine mammals. The period of construction from contract award to contract close-out for all alternatives is approximately 8 months. Project costs were developed without escalation and are in FY2019 dollars.

6.3.2 Operations & Maintenance Costs

Assuming the deepest channel depth of 58 feet considered in this study, initial operations and maintenance dredging estimates are to remove 1 foot of sandy material (16,000 CY) every 25 years. It is anticipated some material from the 2:1 sloped north and south extents will slough into the channel. It is also anticipated that isostatic rebound will result in a sea level decrease of 0.46 feet over the 50 year project life. Table 24 displays the cost estimates for each channel alternative.

Table 24. Cost Estimates for all Channel Alternative (FY2019 dollars)

Cost Type	46ft	48ft	50ft	52ft	56ft	58ft
Dredging	$8,804,937	$12,786,723	$15,645,142	$21,361,979	$23,623,059	$26,790,034
OMRR&R	$4,214,940	$4,214,940	$4,214,940	$4,214,940	$4,214,940	$4,214,940
PED	$3,678,827	$3,678,827	$3,678,827	$3,678,827	$3,678,827	$3,678,827

6.3.3 Total Average Annual Equivalent Costs

Average annual costs were developed by combining the initial construction costs with the annual Operations and Maintenance costs for each potential alternative using the FY19 Federal Discount Rate of 2.875 percent along with a period of analysis of 50 years (Table 25).

Table 25. Average Annual Cost Summary Information per Alternative

Alternative	AAEQ Total Investment	AAEQ OMRR&R	Total AAEQ	Incremental AAEQ Costs
46ft Channel	$555,724	$78,747	$634,472	
48ft Channel	$708,442	$78,747	$787,190	$152,718
50ft Channel	$818,075	$78,747	$896,822	$109,632
52ft Channel	$1,037,339	$78,747	$1,116,086	$219,264
56ft Channel	$1,124,057	$78,747	$1,202,805	$86,719
58ft Channel	$1,244,607	$78,747	$1,323,354	$120,549

6.4 With-Project Benefits

Total annual project benefits were determined by calculating the average annual reduction in transportation costs for Unalaska-Dutch Harbor at FY19 price levels. Table 26 shows the average annual benefits generated by each alternative. For the calculation of benefits, the existing practice of maintaining a 4 foot under keel clearance while crossing the bar was assumed to be continued in the with-project condition. With the dock imposed draft limitation of 44 feet, benefits reach their maximum at a depth of 48 feet with no additional benefits realized at deeper depths. The annualized transportation costs savings were calculated using the total reduction in vessel operating costs for each alternative evaluated, discounted to FY19 price levels using the Federal discount rate of 2.875 percent, over a 50-year period of analysis. See the Economics Appendix for more details.

Table 26. Annual Benefits by Alternative

AAEQ Transportation Cost Reduction Benefit by Alternative ($)	
Alternative	**AAEQ Transportation Cost Reduction Benefit**
46ft Channel	$2,157,811
48ft Channel	$2,809,965
50ft Channel	$2,746,467
52ft Channel	$2,606,684
56ft Channel	$2,602,556
58ft Channel	$2,602,556

The benefits above were modeled using an underkeel clearance assumption of 4 feet beneath the keel for all vessels based on the general guidelines published by the Alaska Marine Pilots for Dutch Harbor.

During the course of the study, the UKC assumptions were revised based on additional pilot input. While calls did occur with 4 feet of UKC, this was extremely rare. It would need to be ideal conditions, which rarely occur at Dutch Harbor, combined with a flood tide to attempt to navigate the bar with only 4 feet UKC. This would indicate that a 4 foot UKC was more of an extreme minimum measurement than a reasonable assumption of normal operations, as is needed for economic modeling. An updated UKC was determined by Engineering, using the ship's motion from waves (pitch, roll, and heave), squat underway, and a safety clearance. These values were estimated with equations from the Engineering Manual (EM) 1110-2-1613, “Hydraulic Design of Deep-Draft Navigation Projects,” and the Permanent International Association of Navigation Congresses (PIANC) guidance for channel design. The resulting UKC was 14 feet, instead of the 4 feet used in the preliminary benefit estimates. This was approved by the pilots during Ship Simulation.

Since this UKC increase would not affect the behavior of the vessels in the economic model, just the depth at which benefits begin to accrue, the levels of benefits modeled did not change. Benefits were simply shifted 10 feet deeper. Also, since the preliminary results indicated that benefits would be maximized with the 48-foot alternative, this effect would now be present at the 58-foot alternative instead. Thus, only the 56- and 58-foot alternatives were displayed for decision-making purposes going forward (Table 27). The declines in benefits at deeper depths are the same as in the preliminary results.

Table 27 Final Average Annual Equivalent Benefits by Alternative

AAEQ Transportation Cost Reduction Benefit by Alternative ($)	
Alternative	**AAEQ Transportation Cost Reduction Benefit**
56ft Channel	$2,157,811
58ft Channel	$2,809,965

6.5 Net Benefits of Alternative Plans

The net benefits are determined by subtracting the average annual costs from the average annual benefits for each project alternative. Table 28 shows the net benefits and BCR at each project alternative along with net benefits. The project that maximizes net benefits is the 58-foot alternative.

Table 28. Net Benefits and Benefit/Cost Ratio

Alternative	Total AAEQ Costs	Total AAEQ Benefits	Total Net Benefits	Benefit/Cost Ratio
56-foot Channel	$1,202,805	$2,157,811	$955,006	1.8
58-foot Channel	$1,323,354	$2,809,965	$1,486,611	2.1

6.6 Summary of Accounts and Plan Comparison

Plan formulation was performed for this study with a focus on contributing to NED with consideration of all effects, beneficial or adverse, to each of the four evaluation accounts identified in the Principal and Guidelines. Plan selection was based on a weighting of the projected effects of each alternative on the four evaluation accounts. The PDT reviewed qualitative and quantitative information for major project effects and for major potential effect categories.

6.6.1 National Economic Development

The results of the NED analysis were discussed in the previous section with the 58-foot alternative maximizing net benefits.

6.6.2 Regional Economic Development (RED)

Economic benefits that accrue to the region but not necessarily the nation include increased income and employment associated with the construction of a project. Regarding construction spending, further analysis of regional economic benefits is detailed in the Economics Appendix. The RED analysis includes the use of regional economic impact models to provide estimates of regional job creation, retention, and other economic measures such as sales, or value added. Each alternative has a positive effect on RED commensurate with its construction expenditure.

6.6.3 Environmental Quality

Environmental Quality (EQ) displays the non-monetary effects of the alternatives on natural and cultural resources and is described more fully in the environmental assessment sections of this report. Generally, all alternatives will cause temporary changes, including underwater noise caused by dredging, blasting and placement of sediments, potential changes to dissolved oxygen, turbidity, sediments, and predator/prey dynamics for benthic feeders. Potential avoidance of the area by threatened and endangered species native to the project area is likely for all alternatives as well, but potential avoidance would be short-term due to construction. Reasonable and prudent measures required by the coordinating environmental agencies would be implemented for each scenario to mitigate its negative effects on EQ. Over the longer term, the project may reduce the requirement for fuel lightering and at-sea repair efforts resulting in a reduction for the potential for inadvertent release of petroleum, oils, and lubricants, and other locally persistent contaminants, into the local marine environment. Over the long-term, this potential reduction in the introduction of environmental contaminants could outweigh the short-term impacts of project construction.

6.6.4 Other Social Effects

Other social effects (OSE) displays the non-monetary effects of the alternatives on the population of the project area. These affected aspects are health and safety, quality of life, and educational, cultural, and recreational opportunities. No alternatives will affect educational, cultural, and recreational opportunities. Beneficial effects of each alternative include a temporary increase in jobs and migration of workers, associated demand for temporary housing, and spending of disposable income.

6.6.5 Four Accounts Evaluation Summary

Based on this qualitative analysis of the four accounts, each alternative has positive effects for the RED and OSE accounts, and negative effects for the EQ account. Thus, the Recommended Plan for Study is the 58-foot channel alternative, based on its maximizing NED benefits. The Table 29 shows a summary of the four accounts for all alternatives, with the Recommended Plan highlighted in yellow.

Table 29. Four Accounts Evaluation for Alternatives

Alternative	Net Annual NED Benefits (B/C Ratio)	Average Annual Cost	EQ	RED	OSE
No Action	$0	$0	Neutral	Neutral	Neutral
56-foot	$955,006 (1.8)	$1,202,805	Negative (short-term)	Increased employment and income for the region and state	Beneficial
58-foot	$1,486,611 (2.1)	$1,323,354	Negative (short-term)	Increased employment and income for the region and state	Beneficial

6.7 Principles and Guidelines Four Criteria Evaluation

As part of Federal guidelines for water resources projects, there are general feasibility criteria that must be met. According to the USACE Engineering Regulation (ER) 1105-2-100 for planning, any the USACE project must be analyzed with regard to the following four criteria:

1. **Completeness –** Does the alternative plan include all necessary parts and actions to produce the desired results?

Deepening the bar to 58 feet addresses the problems caused by the bar and meets the planning objectives identified for this project. It will decrease transportation inefficiencies and increase vessel access and safety. The plan includes a suitable placement area for dredged materials.

2. **Effectiveness –** Does the alternative plan substantially meet the objectives? How does it measure up against constraints?

Deepening the bar to 58 feet meets the planning objectives and avoids all constraints.

3. **Efficiency –** Does the alternative plan maximize net NED benefits?

Deepening the bar to 58 feet is the NED plan and the most cost effective means of achieving the planning objectives identified.

4. **Acceptability** – Is the alternative plan acceptable and compatible with laws and policies?

Deepening the bar to 58 feet is acceptable in terms of all known applicable laws, regulations, and public policies. Incorporation of appropriate mitigation of potential adverse effects from construction activities will be an integral part of construction planning and execution.

7 RECOMMENDED PLAN*

7.1 Description of Recommended Plan

Based on the NED analysis, the Recommended Plan deepens the existing bar to -58 MLLW providing one-way access for vessels with a draft up to 44 feet with waves up to 5.6 feet over the bar with tides above 0 feet MLLW. Initial estimates of deepening the channel to -58 feet MLLW would involve dredging approximately 182,000 cubic yards (CY) of sediment at an estimated cost of $30.5 million. This plan has a Benefit-to-Cost Ratio (BCR) of 2.1.

Deepening will allow currently calling light loaded Post-Panamax vessels to travel over the bar with drafts loaded up to 44 feet as compared to 38 feet under existing conditions. Current practice is for vessels to light load from point of origin to maintain an under keel clearance of 4 feet to clear the bar. Figure 27 describes the channel depth parameters used in channel design which resulted in a gross under keel clearance of 14 feet being incorporated into the channel design.

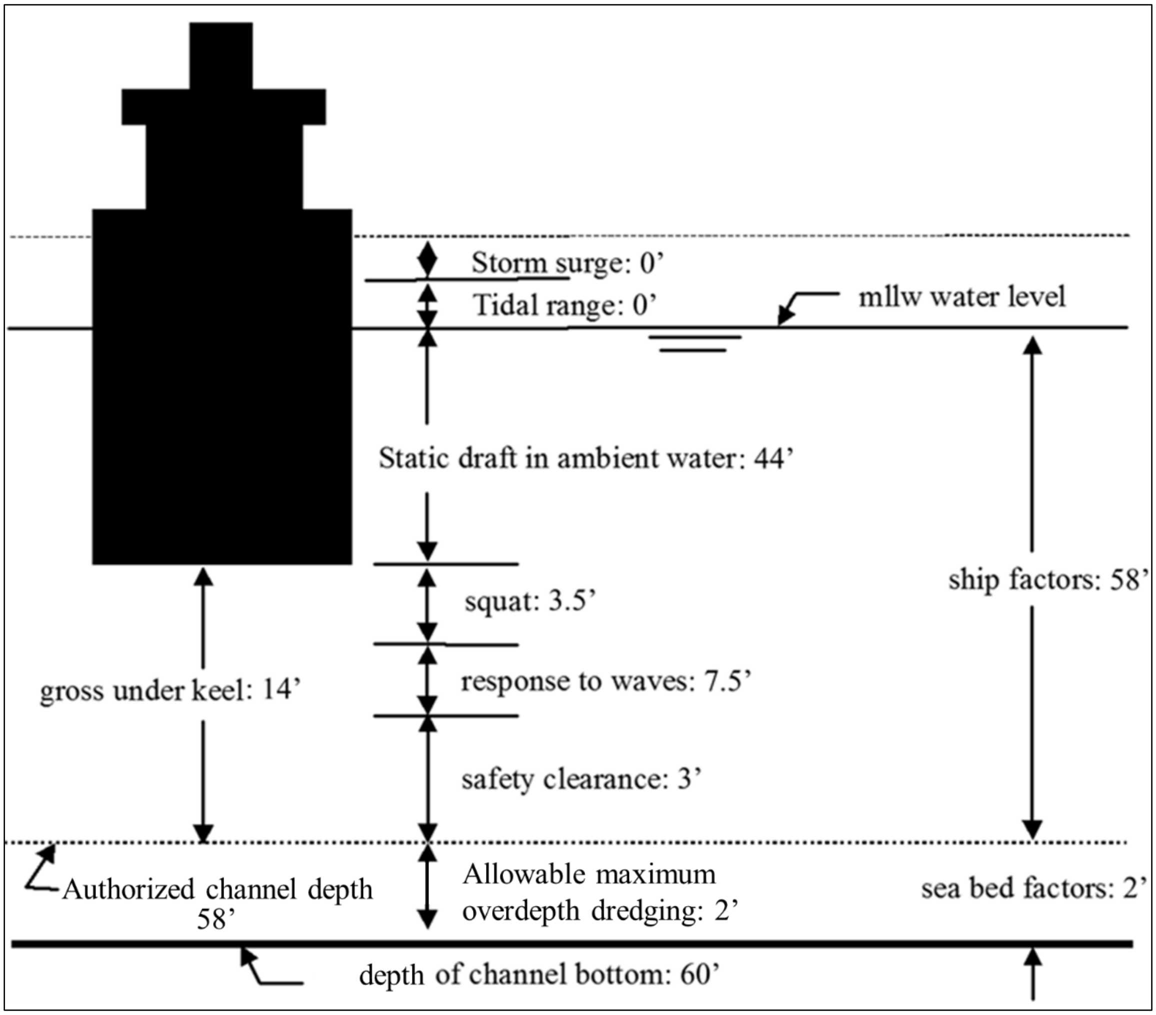


Figure 27. Channel Depth Design Parameters

Vessels moving in navigation channels must maintain clearance between their hulls and channel bottom. Navigational design parameters were analyzed including squat, safety clearance, vertical motion due to waves, and water density effects. Storm surge was not included as it is not commonly encountered at Dutch Harbor and results in a small incremental increase in depth that would benefit travel over the bar. Minimum gross under keel clearance was calculated from the sum of the depth requirement from each design parameter.

Channel design prior to ship simulation was a straight channel with a width of 600 feet. During ship simulation, it was found that instead of the approximately 1200 feet of width available over the bar, the channel restricted the pilots to a width of 600 feet. Current practice is for pilots to take vessels out of gear over the bar to slow to speeds of 4.5 to 6.5 knots. It was found that in order to maintain control of the vessel through the channel, speeds of 8 to 12 knots were necessary on inbound transits with the new channel. This resulted in an increase in ship squat from 1 foot at 4.5 knots to 3.5 feet at

8 knots. It is anticipated that tug assist will be required to slow down vessels and allow them to berth safely.

Steady-State Spectral Wave (STWAVE) model runs were made with the 1 year wave to determine the wave height at the bar (5.6 feet) to be used in the ship response to waves calculation. The calculations are based on USACE deep draft guideline equations and produced a ship response to waves of 7.5 feet.

USACE deep draft guidelines recommend a safety clearance of 3 feet for hard bottom conditions such as rock. The subtotal of squat (3.5 feet), response to waves (7.5 feet), and safety clearance (3.0 feet) for the channel provides a gross under keel clearance of 14.0 feet. This is for a 0.0' MLLW datum channel that is accessible 92.2 percent of the time. The bar would be deepened by approximately 16 feet to a depth of -58' MLLW.

Current practice dictates that vessels wait until winds are less than 25 knots and seas are less than 6 feet in order to cross the bar. The 58 foot design channel will allow vessels with up to six additional feet of draft (44 ft. vs. 38 ft.) to travel with 25 knots and a 5.6 foot wave over the bar (the one-year wave).

A plan differing from the Recommended Plan was identified as the Tentatively Selected Plan in the Draft Interim Feasibility Report distributed for review in May 2018. The Tentatively Selected Plan was for a dredged channel to a depth of only -48 feet MLLW. This depth was based upon the current practice for vessels to light load from point of origin to maintain an under keel clearance of 4 feet while drifting over the bar while not under power. Calculations were based on calm sea conditions with no ship motion due to waves. To maintain maneuverability within a dredged channel; however, vessels must transit under power at greater speeds than under current conditions as well as transiting during wave conditions. Accordingly, the under keel clearance was revised to accommodate these future practices. The Recommended Plan dredged channel depth of -58 feet MLLW incorporates all required USACE deep draft safety guidelines as confirmed through a ship simulation study. The results of the ship simulation study were to be incorporated into the design of the Tentatively Selected Plan; however, execution of the study was delayed due to a government shutdown.

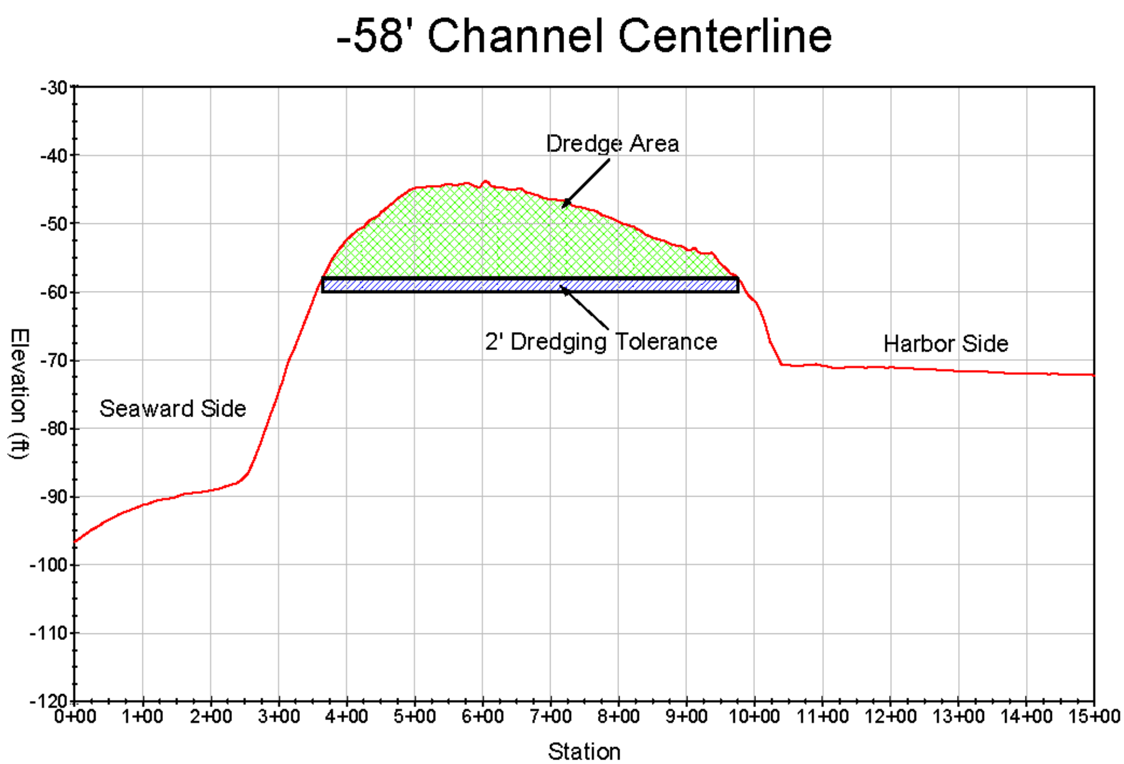
The channel layout is nearly perpendicular to the bar. The centerline of the design channel was placed to follow the centerline of the light loaded vessel tracks (Figure 22). The channel is approximately 600 feet long by 600 feet wide (Figure 29). Based upon results of ship simulation, the channel was optimized to include an extra cut on the northern extent to allow the pilots to make the inbound turn corner as well as a 4° rotation on the southern extent to allow more room for vessel drifting after the turn.

The channel would be dredged with a side slope of 1 vertical to 2 horizontal. The material to be dredged has been characterized as a dense, consolidated, glacial drift deposit overlying bedrock. It is anticipated that this material will have a high in-situ strength, requiring blasting prior to removal. It is anticipated that some of the side slope material will slough into the channel; maintenance dredging of 1 foot of material will be removed at year 25.

Dredging equipment and procedures cannot provide a smoothly excavated bottom at a precisely defined elevation. One foot of required overdepth and one foot of allowable overdepth dredging was added to the design depth of excavation to guarantee mariners a least-depth equivalent to the sum of ship factors. This allows for a deepening of the bar to a maximum of -60 feet MLLW.

Wave modeling for determining the wave height over the bar as well as the effects of the channel on Front Beach were performed using the STWAVE model. Runs were first made with the 30 year wave with and without the channel to determine if there was a perceivable difference in wave height across the bar and at Front Beach. It was determined that waves across the bar marginally increased by less than 0.3 feet with the channel, and no measurable difference (less than 0.1 foot) was observed at Front Beach.

Cross sections of the channel showing the dredged area and dredging tolerance are shown in Figure 28, with locations of where the cross sections are taken in Figure 29.



-58' Channel Centerline
Dredge Area
2' Dredging Tolerance
Harbor Side
Seaward Side
Elevation (ft)
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
0+00
1+00
2+00
3+00
4+00
5+00
6+00
7+00
8+00
9+00
10+00
11+00
12+00
13+00
14+00
15+00
Station

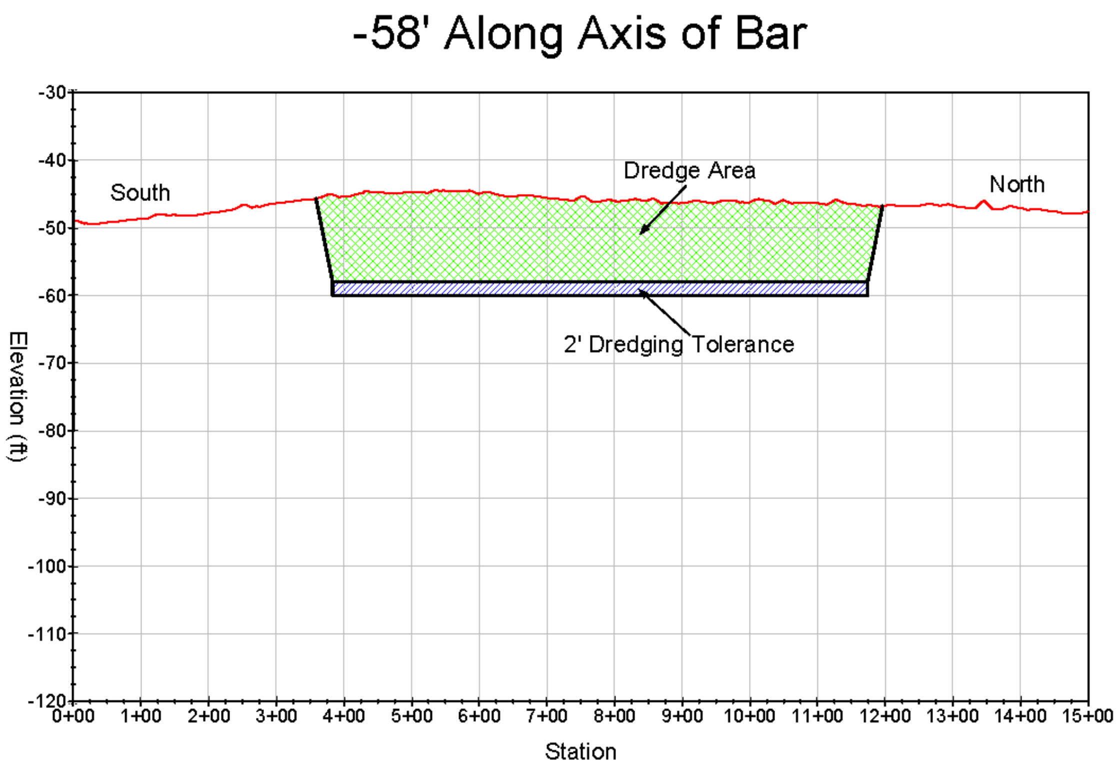


Figure 28. Profile View of Dredge Channel -58 feet MLLW Depth

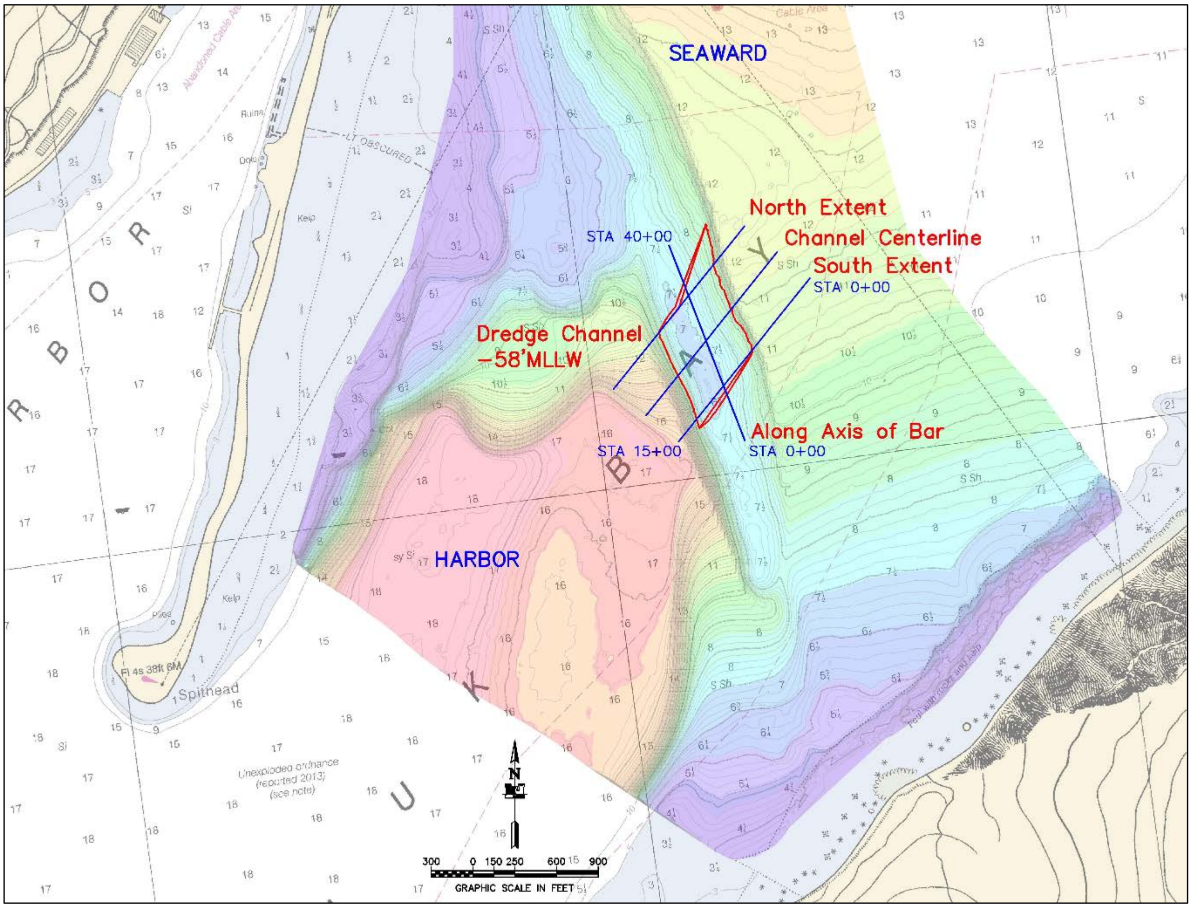


Figure 29. Plan View of Dredge Channel at -58 feet MLLW Depth

7.1.1 Plan Components and Construction of Recommended Plan

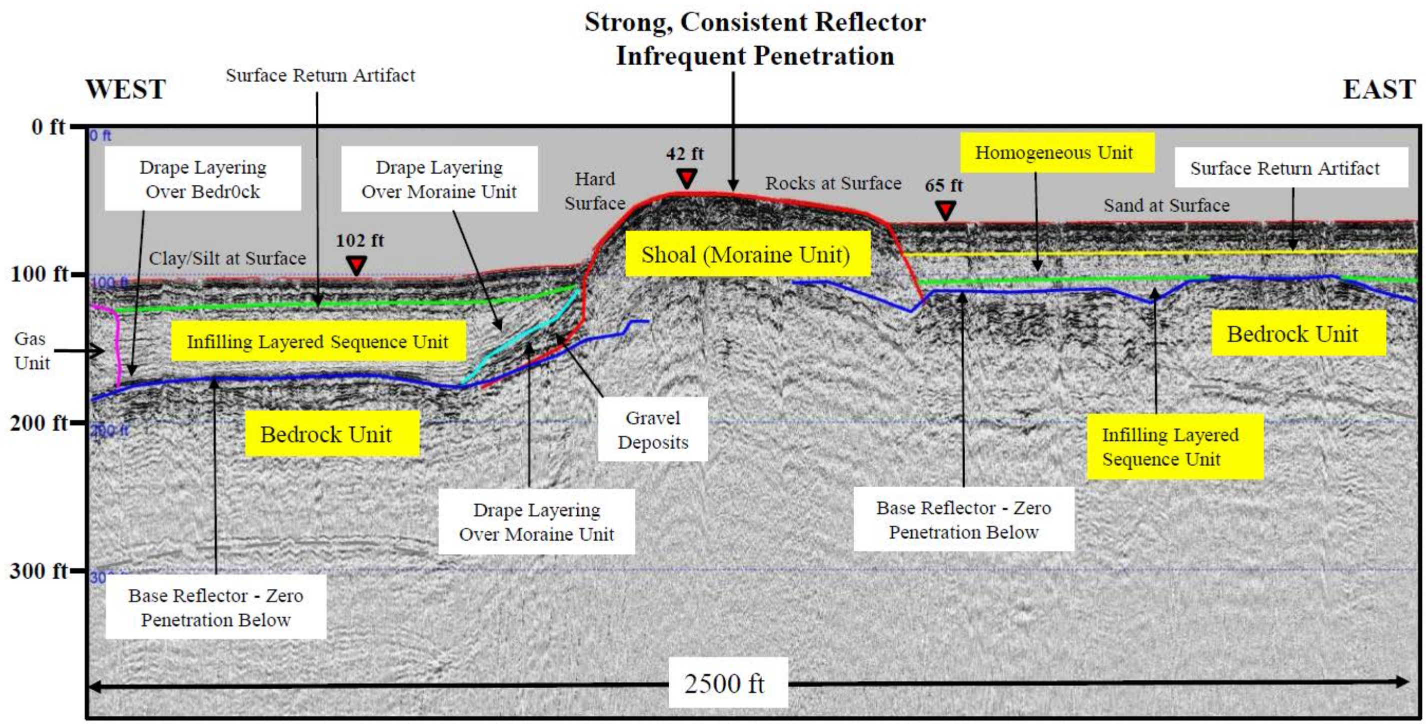
Based on findings from the initial geotechnical investigation performed at the site (see Appendix B), the shallow shoal obstruction crossing the proposed dredged channel consists of a hard, well-consolidated glacial moraine (Figure 30). The geotechnical investigation consisted of a comprehensive geophysical survey across the study area, with actual sampling of the moraine to take place by means of geotechnical borings during the PED phase. The moraine likely is composed of an unsorted and unstratified accumulation of clay, silt, sand, gravel, cobbles, and boulders. From the seismic velocity measurements recorded within the moraine, the material is considered rock-like and non-rippable, to be confirmed during PED. Accordingly, it is concluded at this time that drill and blast is the only feasible means to facilitate removal of the moraine material. Once the moraine is broken and loosened by drill and blast procedures, the material may be excavated by clamshell or long-reach excavator (backhoe), with the dredged material placed on a split hopper barge for transport to the offshore disposal site.

The dredging operation will be complicated by the probable presence of munitions and explosives of concern (MEC) within the dredging site. The probable presence of MEC, which includes the categories of unexploded ordnance (UXO) and discarded military munitions (DMM), is intimated by several suspect ferrous objects detected by the geophysical survey and by the documented evidence of MEC within the general Dutch Harbor area. Following initial excavation, it will be necessary to screen and separate any recovered MEC materials for controlled disposal in accordance with applicable regulations. The recovery, handling, and disposal of MEC will require special provisions for safety and qualified field oversight. Looking forward to the eventual need for periodic maintenance dredging of the constructed channel, the possibility of encountering MEC materials migrating in from the slopes and seaward end of the dredged channel will need to be considered in executing the work. Potential MEC as identified within the dredge limits from the geophysical survey will be further evaluated during PED using a remotely operated underwater vehicle (ROV).

In addition to MEC, there is the strong likelihood of non-hazardous ferrous and non-ferrous objects and debris (e.g. crab pots, buoys, anchors, chains, tires) and oversized rock materials being recovered during dredging. The man-made objects and debris may need to be screened and separated for land disposal rather than being disposed of offshore.

The blasting plan for this project would be developed in PED, but a reasonable scenario for this project for planning and NEPA purposes involves drilling boreholes for confined underwater blasting in a 12-foot by 12-foot grid pattern over the dredge prism. This would result in approximately 2, 500 bore holes drilled to -60 MLLW. Drilling to -60 MLLW would ensure that everything down to the design depth of -58 is completely fractured. Drilling would likely take place from a barge with a drilling template and a production rate of 40 holes per day, with one blast of those 40 holes daily. This would allow the entire drilling and blasting operation to take place over about 63 days for the 2,500 holes. The 40 holes in each shot would be separated by at least 15 milliseconds so that for fish and marine mammal impact assessment purposes each hole would be treated individually. The blasting plan would be developed to allow for continued shipping access and have a safety plan communicated to local mariners to cover associated signals and restricted access periods.

Preliminary design of the proposed dredging prism provides side slopes excavated at a ratio of 1 vertical to 2 horizontal (1V:2H) based on results of the geophysical survey. Configuration of the dredging prism to include the determination of safe side slope angles will be finalized during PED.



Notes:
1. Plot derived from bubble gun seismic profiler data.
2. Depths shown below MLLW.
3. Depth point. ▼

Figure 30. Stratigraphic Cross Section at the Southern Extent of the Channel

7.1.2 Operations & Maintenance

Initial estimates for maintenance dredging of the deepened channel assume that 1 foot of sandy material (16,000 CY) will be removed from the channel every 25 years. It is anticipated some material from the 2:1 sloped north and south extents will slough into the channel, as well as less than a half a foot of sea level decrease from isostatic rebound. This estimate is based upon the deepest channel depth of 58 feet considered in this study.

7.1.3 Mitigation Measures

Mitigation for this project would fall into different categories of potential impacts, with confined underwater blasting being the greatest concern. All underwater blasting would incorporate stemmed charges (i.e. crushed rock packed at the top of the hole above the explosive charge). Stemming helps to reduce the impact from blasting above the surface and maximizes the ability of the charge to fracture rock without wasting energy. Delays of several milliseconds would be planned between the charges to reduce the overall charge at one time while still retaining the effectiveness of the charges in the borehole.

Normally the first screening level for mitigation is avoidance. This would involve not blasting at all or only blasting during certain times of the year (timing windows). Blasting, especially underwater blasting, is typically avoided when possible due to potential environmental impacts, especially to fish and marine mammals. For this project, confined underwater blasting is considered the only construction method available to break up the heavily consolidated glacial moraine material, so avoiding blasting is not a viable option.

Avoidance can also be achieved by implementing timing windows for species of concern. Due to weather and daylight limitations, construction for this project would likely not take place in winter. While some marine mammals, such as humpback whales, could be avoided by blasting in winter, Steller sea lions, harbor seals, and sea otters are present year round. Timing windows are not practical for avoiding impacts to marine mammals. Likewise, it is not possible to completely avoid potential impacts to fish. It is not practical or possible to remove and exclude all the fish from the affected habitat prior to blasting. Ideally, blasting would not occur during the summer months when salmon are returning to natal stream in Unalaska and Iliuliuk Bay and large schools of herring could be present. Though the intent is to conduct blasting in the spring and have it completed before summer, there are too many variables that could alter the schedule to commit to this restriction. However, there are realistic options to minimize impacts to salmon and herring.

When avoidance is not possible or practical, minimization of impacts is the next level in the mitigation hierarchy. Minimization for blasting impacts to marine mammals would involve obtaining Incidental Harassment Authorizations (IHA) from NMFS and USFWS. These IHAs would have a relatively small exclusion zone where blasting could not occur if a marine mammal was present surrounded by a much larger zone where marine mammals could be present as long as intensive monitoring occurred. The extensive coordination necessary to obtain IHAs, would be conducted during the PED phase of this project when detailed blasting plans are developed, a timeframe particularly important since IHAs have a limited 1-year period of validity and will need to remain valid throughout the period of project construction.

Potential impacts to certain fish, namely salmon and herring, could be minimized during the summer with aerial surveys for herring so that large schools could be spotted and blasting could be delayed until the school(s) move out of the impact area. Aerial surveying for herring is a common technique used in herring fishery management and would likely be effective in Dutch Harbor. These aerial surveys would likely be conducted immediately prior to blast activities to monitor the more distant parts of the marine mammal observation zones dictated by the IHAs. Aerial surveys are unlikely to be effective for detecting large aggregations of salmon, though sonar surveys could be done to ensure that any large aggregations of fish, be they salmon or other fish, are not present in the area before blasting. Precise details of mitigation measures to minimize potential impacts to fish and marine mammals would be developed during PED as the details of the blasting plan emerge alongside resource agency coordination.

7.1.4 Integration of Environmental Operating Principles

USACE, Alaska District is proud to have integrated its core Environmental Operating Principals into every applicable aspect of its project planning process for assessing the feasibility of implementing navigational improvements at Dutch Harbor. Every attempt was made to reduce waste and redundant behavior, foster sustainability, consider all possible environmental consequences, and to comply with all applicable laws, orders, and directives. Environmental data requirements were identified early in the project planning process and obtained between April and October 2018 with comprehensive environmental surveys and collaboration with regulatory agencies. Field data collection efforts were completed in October 2018 and summarized to the resource agencies in December. Collaboration between stakeholders has been rigorous and transparent. Based upon the results of the environmental surveys and resource agency coordination, USACE will comply with the required consultation procedures, permits, terms, and conditions.

7.2 Real Estate Considerations

Public access is currently available to the project site. There are no non-Federal Sponsor real estate requirements for this project. The Government’s dominant right of navigation servitude will be exercised for project tidelands below the Mean High Water line for the General Navigation Feature (GNF) portion of the project, which consists of 600 feet x 600 feet of tideland for dredging of the channel and a dredge disposal site. The project area and dredge disposal area are within navigational servitude and are not to be acquired nor eligible for credit. No known utilities or facilities are located in this area and no relocations are required. Public Law 91-646 relocations (relocation of persons) are not anticipated; nor is any utility relocation anticipated. Please see the Real Estate Appendix for further information.

7.3 Risk & Uncertainty

Due to military activity during World War II, the presence of MECs within the project area must be better determined. Geophysical techniques were utilized to conduct a survey for UXOs and other marine debris that could complicate dredging efforts. Use of a remotely operated underwater vehicle (ROV) to visually observe and further characterize identified seafloor targets of concern will be required during PED to further reduce this uncertainty.

ECB-2018-2 describes resilience principles that should be implanted in the engineering and construction community of practice (USACE, Implementation of Resilience Principles in the

Engineering & Construction Community of Practice, 2018). Wind, wave, and currents in and around Dutch Harbor are not anticipated to change in the 50 year project life. It is anticipated that some side slope sloughing will occur and the north and south channel cuts. In order to reduce risk and limit loss of function of the project, it is recommended that 1 foot depth, or 16,000 cubic yards of maintenance dredging be performed at year 25.

As discussed in Section 4.1, there is uncertainty regarding sea level change estimates which could influence the ability of Dutch Harbor to serve as a maritime hub over the next 50 years. This risk is not perceived to be sufficient to require any mitigation incorporated into the design of the project beyond maintenance dredging at year 25.

7.4 Cost Sharing

The Table 30 provides cost sharing based upon certified MCACES cost estimates. The total project cost is estimated to be $30,445,557 with the Federal share $15,019,962 and the Non-Federal share $15,425,595. The portion of the construction executed in support of channel depths of 50 feet and deeper are cost shared 50% Federal/50% Non-Federal while those in support of depths between 20 feet and 50 feet are cost shared 75% Federal/25% Non-Federal. Adjustments to the apportionment of effort between the different cost-sharing criteria could impact the final cost shared amounts.

Table 30. Estimated Cost Sharing for Recommended Plan

Description	Total	Federal	Non-Federal
Mobilization/Demobilization (deeper than -20FT MLLW and up to -50FT MLLW)	$2,014,712	$1,511,034	$503,678
Mobilization/Demobilization (deeper than -50FT MLLW)	$2,014,712	$1,007,356	$1,007,356
General Navigation Features (deeper than -20FT MLLW and up to -50FT MLLW)	$6,004,888	$4,503,666	$1,501,222
General Navigation Features (deeper than -50FT MLLW)	$16,730,811	$8,365,406	$8,365,405
LERR	$0	$0	$0
Aids to Navigation	$24,910	$24,910	$0
Local Service Facilities	$0	$0	$0
Preconstruction Engineering & Design	$1,833,211	$1,145,757	$687,454
Supervision, Inspection, & Overhead	$1,845,616	$1,153,510	$692,106
Project Cost Apportionment	$30,468,860	$17,711,639	$12,757,221
10% over time adjustment (less LERR)*		($2,676,512)	$2,676,512
Final Allocation of Costs	$30,468,860	$15,035,127	$15,433,733

***10% over time adjustment ($4,029,424 mob/demob + $22,711698 GNF = $26,765,123 x 10% = $2,676,512 - $0 = $2,676,512)

8 POTENTIAL ENVIRONMENTAL IMPACTS *

The range of potential impacts in this section are:

- **No Effect –** This means that the species or environmental attribute (e.g. water quality) will not be affected, directly or indirectly, by the project. This level of impact, or lack of impact in this case, is due to:
  - The species either not being in the project area year-round
  - Not in the area during the construction window and not having any habitat overlap with the project area during the period of the year when they are in the region.
- **Insignificant Effect –** These effects relate to the size or severity of the impact and include those effects that are undetectable, not measurable, or so minor that they cannot be meaningfully evaluated.
- **Discountable Effect –** Are effects are those that are extremely unlikely to occur.
- **Beneficial Effect –** This means an immediate positive effect without any adverse effects to the species or habitat. This situation would typically occur after construction is completed. For example, the dredged material placement site could provide improved foraging habitat for a bird, fish, or marine mammal.
- **Minor Adverse Effect –** This means a species or environmental attribute would be affected by the project, or an aspect or the project, but the effects are likely very low level in the short or long term and be in a similar range to many of the existing impacts in the area. For instance, the proposed project will create vessel activity during construction, but it is a relatively small increase over a short period of time in an area that already has similar activities with animals that are presumed to have become habituated to this activity.
- **Moderate Adverse Effect –** This means a species or environmental attribute would be affected by the project, or an aspect or the project, and would be impacted with a noticeable but temporary change in habitat use or behavior. For example, a species might avoid the immediate area during drilling and dredging and for a few hours after blasting. This could lead to lost foraging opportunities in the immediate area that could be made up elsewhere, albeit at some energetic cost or increase in stress.
- **Major Adverse Effect –** This means a species or environmental attribute would be affected by the project, or an aspect or the project, and would be impacted in a way that ranges from long-term displacement (after project completion) to lethal effects. An extreme example of this would be conducting an underwater blast when a marine mammal is within what is called a Level A radius where permanent hearing loss or death is predicted. A less extreme example would be the displacement of a species from the

entire level B zone for the duration of the project whereby they forego foraging opportunities that cannot be made up for elsewhere in the general area.

Descriptions of potential consequences are provided for information and consistency when used later on throughout this section.

8.1 Physical Environment

Several physical conditions described in Chapter 3 (Baseline Conditions\Affected Environment) are presented to describe the regional and local setting for the proposed project. Due to the nature and scale of several of these conditions, they are not affected be either the no action or action alternatives. There are no anticipated changes expected to the climate, geology/topography, seismicity, ice conditions or tides and currents in the project area from either the no action or action alternatives. There would be no change to bathymetry from the no action alternative. Bathymetry would change at the dredge site in that it would be approximately 16 feet deeper than the existing conditions, which is consistent with the purpose of a dredging project. Bathymetry in the disposal area would become more irregular in profile and be up to a few feet shallower depending on the exact placement of the material by the dump scow. This decrease in depth would not pose a hazard to navigation at the disposal site as the area is already approximately 100 feet deep.

8.1.1 Water Quality

No action Alternative

While there are potential sources of water quality degradation, none of these are likely to be significant due to an existing protection and permitting process by various resource agencies. The no action alternative would have no effect on water quality, and water quality would not be subjected to any impacts. Water quality would not be adversely affected by this alternative.

Action Alternatives

All of the action alternatives (different dredging depths) would have a similar type of impact on water quality: temporary turbidity increases in the immediate area of the dredging site and the disposal site. Impacts to the water quality of Iliuliuk Bay and its surrounding waters as a result of USACE's proposed navigation improvement project will be highly localized in nature, dependent upon tidal actions and current cycles to mobilize, transport, and deposit suspended sediments. USACE expects that localized increases in turbidity as a function of confined underwater blasting, dredging the blasted material, and disposal of the dredged material in deeper waters will generate plumes or columns of non-toxic, turbid water that will be temporary in nature. The different channel depth alternatives would all likely lead to increased turbidity during dredging, though the deeper alternatives would require more dredging and disposal and thus extend the time period and overall extent of increased turbidity. However, all of the increased turbidity scenarios from different dredging alternatives are expected to lead to minor temporary impacts.

Confined underwater blasting will liberate some of the finer sediments associated with the Iliuliuk Bar material into the lower water column where it will be mobilized by the currents. Nevertheless, these localized increases in turbidity should be short lived due to the size and timing of the confined blast and the prevailing local currents and tides. At the preparation of this document, the confined underwater blasting plan has not been developed (number of bore holes, size and number of charges). However, USACE believes that industry standard mitigation measures such as stemming the charges, implementing bubble curtains, and minimizing the overall number of actual blasting events will decrease the overall impact on water quality. It is possible that unexploded ordinance at dredging site could be fragmented during dredging and release small amounts of old powder, but any effects from this on water quality are likely very minor and short lived.

Excavation of the blast-loosened bar sediments, most likely by bucket dredge, will liberate finer sediments throughout the entire water column and increase localized turbidity levels for a short period of time. Mechanically lifting a bucket of unconsolidated sediment through the entirety of the water column increases the probability that finer sediments will be mobilized by forces acted upon them by water currents and the action of the dredge itself. Sediments from the Iliuliuk Bar are not annotated in the ADEC catalog of contaminated sites. Sediments liberated by dredging activities would most closely resemble the sediments of the surrounding areas and would not be harmful to those benthic habitat areas adjacent to the proposed project footprint. The degree of increased turbidity is a function of the amount of time required to dredge the project's required volume of material and the physical characteristics of the sediment itself. USACE's geophysical report characterizes these sediments as being expected to consist of a consolidated, unsorted, and unstratified heterogeneous mixture of clay, silt, sand, gravel, and cobbles and boulders ranging widely in size and shape. Impacts to water quality as a result of dredging activities are not expected to reach a level of significance because the sediments are not known to be contaminated, are most similar to the immediately proximate sediments, and are expected to rapidly return to ambient conditions once dredging activities cease. Potential effects from dredging to water quality are expected to be minor and temporary.

Disposal of dredged sediments, likely via open-bottomed scow in 17 to 19 fathoms of water, will cause lighter sediments to dissociate and suspend throughout the entirety of the water column as heavier sediments, boulders and cobbles, impacting the soft sandy bottom may have the propensity to mobilize sediments from the surface of the substratum. Suspended sediments will be mobilized and settled by the currents of the prevailing area, and although their ultimate fate cannot be modeled at this time, USACE believes that because the sediments are not known to be contaminated, the impact on water quality will be temporary in nature and would be minor and temporary.

The area offshore of Summer Bay already experiences increased turbidity due to mobilization of nearshore sediment during intense onshore winds. This situation is visible in Figure 11 in section 3.1.6. Additionally, there is an area closer to the mouth of Unalaska Bay than the proposed disposal site where seafood waste is discharged from vessel holding tanks during the summer. The seafood waste discharge, leaves a visible milky-colored plume that gradually disperses and disappears over several hours in calm sea conditions and more quickly during rougher conditions. This is another indication that the area mixes rapidly and the presence of a sediment plume, comprised of heavier and coarser material, will likely last for a very short time.

8.1.2 Sediments

No action Alternative

While there are potential sources of sediment quality degradation, none of these are likely significant due to a rigorous protection and permitting process by various resource agencies. The no action alternative would have no effect on sediments and sediments would not be subjected to any impacts. Sediments would not be adversely affected by this alternative.

Action Alternatives

All of the action alternatives (different dredging depths) would have similar types of impacts on sediment. Overall, the likelihood of contamination of the material that would be dredged is low due to both the location (i.e. not adjacent to infrastructure or wrecks) and the impermeability of the sediment. After dredging, the bottom of the channel would likely resemble the existing conditions in that it would also be an irregular rocky substrate. Sediments are discussed further in the water quality section (8.1). The different channel depth alternatives would all likely lead to increased turbidity, though the deeper alternatives would require more dredging and disposal and thus extend the time period and overall extent of increased turbidity. The increased turbidity scenarios from different dredging alternatives are expected to lead to minor temporary effects to sediment.

8.1.3 Air Quality

No action Alternative

While there are potential sources of air quality degradation, none of these are likely significant due to a rigorous protection and permitting process by various resource agencies. The no action alternative would have no effect on the environment and air quality would not be subjected to any impacts. Air quality would not be adversely affected by this alternative.

Action Alternatives

All of the action alternatives (different dredging depths) would have a similar impact on air quality. The primary source or air quality degradation would be from exhaust from the construction equipment and vessels used to construct this project. These sources are few in number, and potential output is relatively small in the context of other output sources (commercial fishing vessels, cargo ships burning bunker oil, trucks, municipal and industrial power generation, etc.) in Dutch Harbor. The duration of construction is also likely to be only around 5 months. Air quality impacts are expected to be minor and temporary.

8.1.4 Noise

No action Alternative

While there are existing sources of noise, none of these are likely significant due to a rigorous protection and permitting process by various resource agencies. The no action alternative would have no effect on the environment and noise, both airborne and underwater, would not be impacted. The noise environment would not be adversely affected by this alternative.

Action Alternatives

All of the action alternatives (different dredging depths) would have similar types of impacts on noise. However, deeper channel depths would result in longer dredging duration and extend the time period that noise is generated and potentially impact a greater number and variety of species. Airborne noise from this project would be from construction equipment (cranes, excavators, generators) on the barge(s) and from and tugs and support vessels associated with the dredging and disposal. These sounds would be noticeable by humans and animals from shore on calm days but would not likely be detectable on days with strong winds or rough water. These sounds are typical in the industrial setting of Dutch Harbor and would not present a significant addition to the airborne noise environment. Airborne noise from underwater blasting would likely be noticeable from shore under most conditions; however, confined upland blasting on a cliffside adjacent to the airport in Dutch Harbor was barely noticeable and did not appear to trigger a startle or flight response from birds except those in the immediate area (Chris Hoffman, personal observation). The significance of the potential impacts of airborne noise generated by underwater blasting will require further evaluation during the PED phase when further permitting for potential impacts to marine impacts will be completed.

Underwater noise from dredging and disposal activities (except underwater confined blasting) would not be a significant impact for marine mammals, birds, and fish. The greatest source of noise from dredging and disposal would be propeller cavitation noise from tug boats that are used to move barges near the dredging site and the dump scows to and from the disposal area. These sorts of sounds are common and pervasive in the area and would not represent a significant addition to the underwater noise environment.

Underwater confined blasting is a different situation. Confined blasting means that the charges are placed inside bore holes drilled into rock and then “stemmed.” Stemmed means that there is packing material above the charges within the holes so that most of the energy from the blast is directed towards breaking rock and not causing an explosion in the water column. The primary concern for underwater blasting, confined or unconfined, is the rapid change in pressure that occurs along the shock wave produced by the blast rather than the actual sound. Underwater blasting would not pose a risk to the public since this is not an area where people typically swim, although information would be provided to the public so that commercial and recreational divers would know about the blasting and the danger zones. Blasting would not commence until it is confirmed that the danger zone is clear of all non-project personnel. The size of the danger zone for humans would be determined as the engineering design is developed with the blasting contractor and public outreach would commence before construction. Potential blasting impacts to marine mammals are covered in section 8.5.1.4 (marine mammals) and section 8.5.2 (threatened and endangered species) of this document. Impacts will be assessed and mitigation measures for all marine mammals will be developed and coordinated with the NMFS and USFWS as the engineering design process develops. This would result in the application for an Incidental Harassment Authorization (IHA) by USACE, Alaska District to fully permit underwater confined blasting for this project. The terms of the IHA would be expected to reduce the risk of mortality or permanent impacts on marine mammals to non-significant levels. The intent is to conduct underwater confined blasting periodically several times over an approximately 12-week period beginning in April of the year of construction. Potential impacts to fish and aquatic birds would also be coordinated with NMFS and USFWS as the engineering design process continues, though the permitting process is far less rigorous than is required for marine mammals. Overall, effects to the noise environment are moderate and temporary.

8.2 Biological Resources

8.2.1 Marine Habitat

Birds

No action Alternative

The no action alternative would have no effect on the environment and birds would not be subjected to any impacts. Birds would not be adversely affected by this alternative.

Action Alternatives

All of the action alternatives (different dredging depths) would have similar impacts on birds; the only difference is a slight increase in the length of the construction timeline for deeper depths. Seabirds and waterfowl could be in the area during dredging, disposal, and blasting. Disturbance during dredging and blasting would be minimal and limited to displacement from the relatively small footprint of the work area during dredging and from vessel traffic between the dredged area and the disposal area. Given the existing impacts in the area, the addition of this source of disturbance over a short period of time (approximately 5 months) would represent an insignificant impact. Timing is targeted towards late spring and early summer when most of the waterfowl have departed Dutch Harbor for breeding grounds elsewhere. Bird density in the dredging area is very low throughout the year and vessel activity around the blast area would minimize the number of birds in the immediate area. These factors reduce the potential impacts to birds to a minor level for a short period of time.

Submerged Aquatic Vegetation

No action Alternative

The no action alternative would have no effect on the environment, and submerged aquatic vegetation would not be subjected to any impacts. Submerged aquatic vegetation would not be adversely affected by this alternative.

Action Alternatives

All of the action alternatives (different dredging depths) would have the same impact on submerged aquatic vegetation since the vegetation would be destroyed once the surface layer is removed regardless of how deeply the area is dredged. The vegetation at the bar site within the dredging prism would be completely removed. Over time, algae would likely colonize the newly exposed bottom substrate since it is well within the photic zone. The dredged material placed at the disposal site would not likely colonize with algae due to the depth, though it would likely colonize with invertebrates. The long term impacts on the benthic habitat would be minor and temporary.

Marine Fish

No action Alternative

The no action alternative would have no effect on the environment and marine fish would not be subjected to any impacts. Marine fish would not be adversely affected by this alternative.

Action Alternatives

All of the action alternatives (different dredging depths) would have the same impact on marine fish since the benthic habitat would be destroyed once the surface layer is removed regardless of how deeply the area is dredged, and confined underwater blasting would be required for all depth alternatives.

Marine fish could be impacted by habitat alteration from dredging and disposal as well as from confined underwater blasting. At the dredging site, habitat would be altered by removing the existing surface of the bottom and creating a new surface several feet deeper. The impacts would be similar regardless of the dredging depth, and the new bottom surface would likely be similar to the existing surface. Since the existing surface is relatively poor habitat in that it has very little sediment, structure, or marine vegetation, there should be little difference between the existing and future substrate conditions on the bar area. The depth change for any alternative would not be enough to influence the species that could use the area or be beyond the depth where existing algal species exist. In all, potential impacts at the bar area dredging site would be minimal, and the area would probably look and function similar to the existing habitat in a short period of time.

Habitat changes at the selected disposal area would change the existing habitat. Five disposal site alternatives were investigated with bottom trawls, pot fishing, and underwater video. Despite indications on the NOAA charts, none of the disposal site alternatives had bottom conditions similar to the bar area. The two sites near the Ulakta Head on Unimak Island were the closest in terms of substrate composition, but one of these sites was also the most productive for rock sole during some of the bottom trawls, so this area was avoided since there were times when it was productive. Another alternative site in about 32 fathoms of water had a large colony of sea pens (a colonial coral) that can serve as nursery habitat for fish including juvenile rock fish. Accordingly, these sites were not selected as dredged material disposal sites. Two potential disposal sites on the east side of the mouth of Iliuliuk Bay (sites 2 and 3 in Figure 6) were considered for disposal, and the closer one (labeled site 2 in Figure 6) is the proposed site since sites 2 and 3 were similar in both substrate composition and low fish and invertebrate catch rates.

Dredged material disposal at this site would cover the existing coarse sand bottom and potentially kill some flat fish that were unable to move away from the dredged material that would fall through the water column from above. However, the dredged material would alter a flat plain of sandy bottom with some small sand waves and make a rock outcropping that would add habitat diversity to the area. The dredged material would add vertical complexity to a very flat and featureless area and the rock would likely be colonized with invertebrates and form a new reef structure.

Confined underwater blasting impacts fish primarily due to the rapid changes in water pressure that accompany the shock wave from the blast. As a reference for potential impacts to fish in Dutch Harbor, a similar confined underwater blasting project was completed in the Columbia River in 2009-2010 by the Portland District of USACE. Like the proposed project, the Columbia River project necessitated drilling and confined underwater blasting. Charge sizes used in the Columbia River project ranged from 65 to 95 lbs. per delay, which is in the same range of the charge sizes that are likely to be used in Dutch Harbor. Over the course of blasting in the Columbia River, the take of adult salmon was essentially zero based on the low number of adult salmon migrants and the very low level of blast pressures. Observed absolute peak blast pressure ranged from 4.78 psi (33 kPa) to 48 psi (330 kPa) with a mean and median of 22 and 19 psi (153 and 133 kPa), respectively. These values were measured at a location 10 feet above the bottom and 140 feet away from the blasting location. As shown in Figure 31, the probability of mortality for most of these blasts was near zero for a 4,536 gram (10 lb.) fish. Observed blast pressures and impulses were low compared to in-water blast pressures for the equivalent weights of explosive because the charges were located in massive rock and were further confined by 10 feet of pea gravel (stemming). In addition, the charges within an array were detonated with time delays between the charges (Carlson et al., 2011). The reason that impacts to adult salmon were described in Carlson et al., 2011 as “essentially zero” is because each blast had a level of impact based on Table 31 and the number of fish known to be in the area based on concurrent sonar observations. During the entire blasting project, these low-level impacts (i.e. low probability of mortality) and low numbers of adult salmon present added up to a cumulative take over the course of the 3-month monitoring period of 0.563 adult salmonids (Carlson et al., 2011). Based on the low level of effects observed in the Columbia River on a similar project it is likely that the potential effects for the proposed action in Dutch Harbor are also minor.

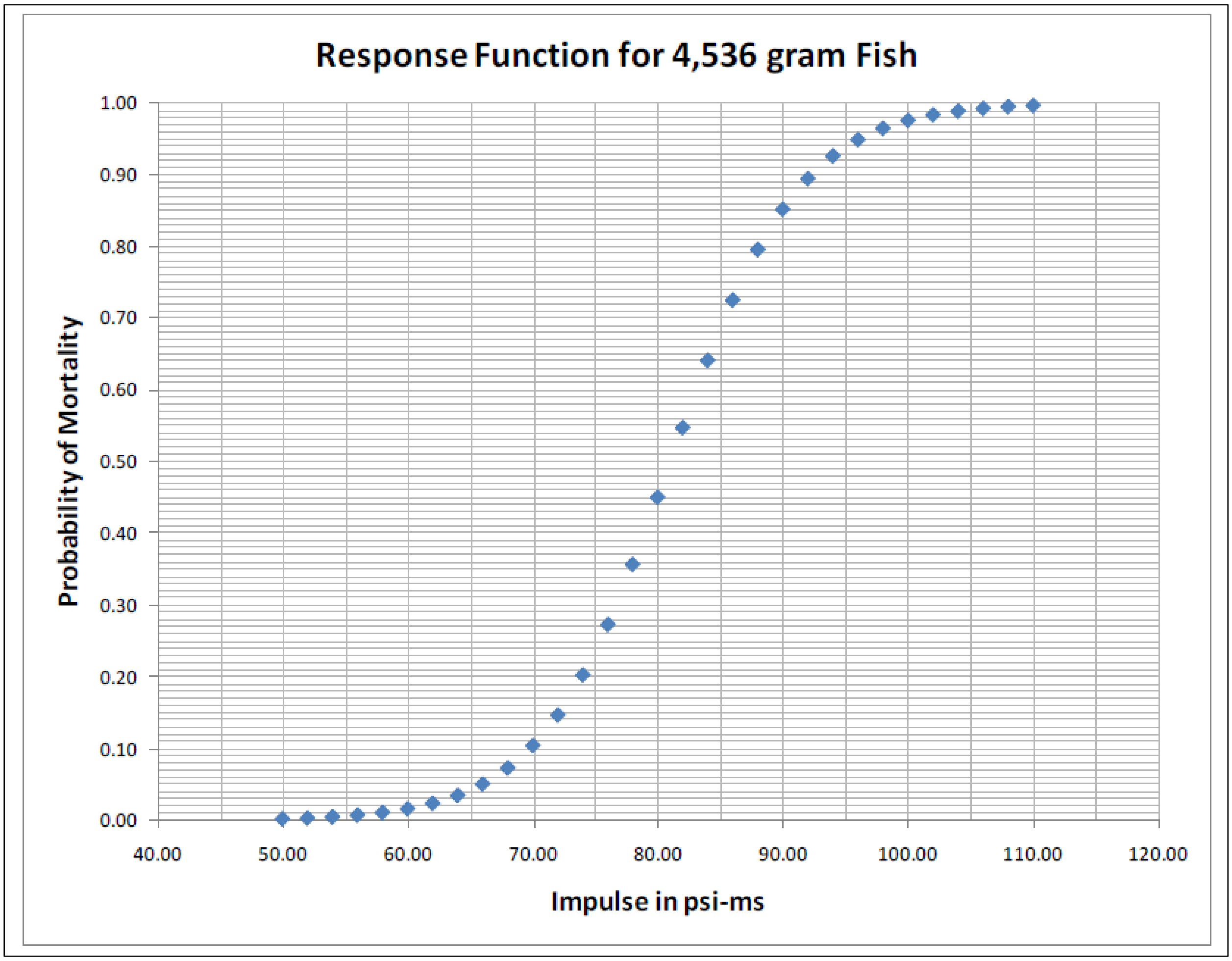


Figure 31. Logistic Relationship between Blast Impulse and Probability of Mortality for Adult Salmonids (4,436 grams = 10 lbs.)

Figure from Carlson et al., 2011

A summary of the agency coordination conducted to-date is provided in Section 9.2.

Marine Invertebrates & Associated Habitat

No Action Alternative

The no action alternative would have no effect on the environment and marine invertebrates would not be subjected to any impacts. Marine invertebrates would not be adversely affected by this alternative.

Action Alternatives

At the dredging site, habitat would be altered by removing the existing surface of the bottom and creating a new surface several feet deeper. The impacts would be similar regardless of the dredging depth, and the new bottom surface would likely be similar to the existing surface. Since the existing surface is relatively poor habitat in that it has very little sediment, structure, or marine vegetation, there should be little difference between the existing and future substrate conditions on the bar area. The depth change for any alternative would not be enough to influence the species that could use the area or be beyond the depth where existing algal species exist. In all, potential impacts at the bar area dredging site would be minimal, and the area would probably look and function similar to the existing habitat in a short period of time. Soft sediment does not currently exist at the bar area and is unlikely to exist after dredging, so this habitat feature would remain the same. Slow moving invertebrates (e.g. snails) would be lost to dredging at the bar site, although faster moving invertebrates such as crabs would likely move out of the area one dredging began and suffer only minor losses.

Marine habitat at the dredged material placement site would be changed from waves of coarse sand and gravel to an irregularly shaped pile of dredged material ranging from gravel to boulders. The slow moving invertebrates at the placement site would be lost as the material from the dump scow is discharged and falls to the bottom, but most faster-moving invertebrates would depart the area while material is being placed. In the months and years following placement, the new substrate would likely colonized with a range of invertebrates to include snails, crabs and octopuses.

Sea pens identified on a deep water placement site alternative would not be impacted by either dredging or placement of dredged material at the selected site which is nearly 1 mile away.

8.2.2 Threatened & Endangered Species

The greatest source of potential impact for threatened and endangered marine mammals is confined underwater blasting. Although permitting scenarios have been discussed with both NMFS and USFWS, additional project design details are necessary to complete the permitting process, namely information on charge sizes and borehole spacing for confined underwater blasting. These data will not be available until PED, so although the action (blasting) is something that is permittable, the process cannot proceed until the design details are developed. An impact analysis is provided in this section for threatened and endangered marine mammals, based on a reasonable scenario for blasting. A more detailed blasting scenario will be developed during PED and that scenario will inform the more detailed IHA application. Impact summary tables are provided below for each species.

Incidental Harassment Authorizations (IHA) would be sought from both NMFS and USFWS to cover all of the marine species likely to be present in the project area (i.e. ESA listed species plus harbor seals). There are two levels of impact possible for marine mammals: Level A impacts are either lethal or non-lethal but permanent (typically related to hearing loss), or Level B, which involves solely behavioral disturbance. Level A impacts are not allowed by NMFS or USFWS, and authorization for these sort of impacts would not be requested. In practice, this means there will be a relatively small zone around the blasting site where blasting will not be allowed if a marine mammal is present. The reason IHAs would be sought is to allow for blasting to take place when marine mammals are present in the large Level B (behavioral disturbance, temporary, non-lethal) area. For blasting in Dutch Harbor, the Level B zone could easily be a radius up to 8 kilometers depending on the charge size due the most sensitive species (humpback whale). If the project was conducted without an IHA, blasting could not commence unless the entire 8-kilometer zone was free of marine mammals. Due to the abundance of marine mammals in the area, it is very unlikely that such a large zone would ever be clear so that blasting could commence. The same issue holds true for sea lions although the extent of their Level B area would likely be closer to 200 meters based on their less sensitive hearing thresholds. Long periods of time between the charges being ready and actually detonated are undesirable because longer water exposure times increase the risk of misfires. With IHAs in place, blasting can commence with a rigorous monitoring program in place and as long as the relatively small Level A zone is clear of marine mammals. In addition to the IHAs, formal consultation under the Endangered Species Act is required to assess the impacts of implementing the IHAs on threatened and endangered species since the IHAs are issued under the provisions of the Marine Mammal Protection Act.

Coordination with the NMFS and the USFWS is ongoing; the agencies are aware of the proposed action, and of the USACE's intention to pursue an IHA. A summary of agency coordination to-date is provided in Section 9.2.

The assessment of potential effects provided in this section will likely be very close to what is included in the forthcoming BA. Because this project requires an IHA, a BA will have to be completed once the number of potentially impacted animals are worked out in the IHA process. The IHA will be completed in PED as essential project details are developed. Given that an IHA will be requested, there will be adverse effects to certain species and a Biological Opinion (BO) will need to be prepared by both NMFS and USFWS for the species they manage in the project area.

No action Alternative

The no action alternative would have no effect on the environment and threatened and endangered species would not be subjected to any impacts. Threatened and endangered species would not be affected by this alternative. Threatened and Endangered birds and marine mammals would continue to be subject to the current array of activity and noise from vessels and shore-side infrastructure in an industrial harbor area. Marine mammal abundance and distribution is anticipated to remain relatively consistent in the future under the no-action alternative. Steller's have experienced a drastic decline along the Alaska Peninsula since the 1960s. This decline is range-wide and the cause is unknown. The number of Steller's eiders wintering in Dutch Harbor has declined since USACE surveys began in 2000 and it is likely that this range-wide trend will continue in the future. The presence or absence of the proposed project would not influence this trend.

Action Alternatives

All of the action alternatives (different dredging depths) and the proposed action (-58 feet) would have similar impacts on threatened and endangered species, though deeper dredge depths would lead to longer dredge duration and more material for in-water placement. Therefore, the magnitude of the impacts would be greater with deeper dredge depth alternatives. Potential impacts include temporary displacement and disturbance of fish, birds, and marine mammals during construction. At the dredge site, the habitat would be altered similarly for all alternatives in that the surface of the excavated channel would likely resemble the existing environment except for being deeper. Placement of dredged material would lead to permanent alteration of existing habitat by converting an area of coarse sand and gravel substrate to an irregular mound of primarily cobble and boulders.

Birds

Short-tailed Albatross

The proposed project would have no effect on short-tailed albatross. These birds are not found near shore and have not been observed in the project area in any season during surveys by Corps biologists over the past two decades. The nearest reported sighting of short-tailed albatross in the North Pacific Pelagic Seabird Database (U.S. Geological Survey [USGS], 2005) is approximately 30 miles from the project location (1 bird of unknown age). These birds occupy pelagic habitat throughout their range and are not common near shore. There would be no effect from this project to short-tailed albatross or their habitat.

Steller's eider

There would be no effect to Steller's eider since they are present in Dutch Harbor between November and March and would be out of the area prior to spring construction and not arrive back in the area until construction was completed. The dredged area would not overlap with habitat used by Steller's eiders, so there would be no effect to their habitat when they return the following fall. This disposal area is well beyond their typical dive depth of approximately 35 feet, so there would be no effect to Steller's eiders or their habitat in the dredged material disposal areas. There nearest critical habitat for Steller's eider is approximately 165 miles to the northeast in Izembeck Lagoon, so there would be no effect to critical habitat from the proposed project.

Marine Mammals

Confined Underwater Blasting Considerations Common to All Marine Mammals

Confined underwater blasting has the potential to affect marine mammals due to in-water shock waves. As shown in Table 31, explosions can have effects to marine mammals ranging from behavioral disturbance, through temporary or permanent threshold shift and other physical injury to mortality. As with sound waves, potential effects to marine mammals depend on the distance of the animal from the source. The NMFS regulatory threshold for confined underwater blasting for sea lions is 195 dB re 1µpa.

Table 31. Explosive Criteria for Marine Mammals

<table>
<tr><th rowspan="2">Group</th><th rowspan="2">Species</th><th colspan="2">Behavior</th><th colspan="3">Slight Injury</th><th rowspan="2">Mortality</th></tr>
<tr><th>Behavioral (for ≥2 pulses/24 hours)</th><th>TTS</th><th>PTS</th><th>Gastro-Intestinal Tract</th><th>Lung</th></tr>
<tr><td>Low-frequency Cetaceans</td><td>Mysticetes

(e.g. humpback whale)</td><td>167 dB SEL (LF_{II})</td><td>172 dB SEL (LF_{II}) or 224 dB peak SPL</td><td>187 dB SEL (LF_{II}) or 230 dB peak SPL</td><td rowspan="3">237 dB SPL or 104 psi</td><td rowspan="3">$39.1\ M^{1/3} (1+[D_{Rm}/10.081])^{1/2}$

Pa-sec

Where: M = mass of the animals in kg

D_{Rm} = depth of the receiver (animal) in meters</td><td rowspan="3">$91.4\ M^{1/3} (1+[D_{Rm}/10.081])^{1/2}$

Pa-sec

Where: M = mass of the animals in kg D_{Rm} = depth of the receiver (animal) in meters</td></tr>
<tr><td>Mid-frequency Cetaceans</td><td>Most delphinids, medium and large toothed whales</td><td>167 dB SEL (MF_{II})</td><td>172 dB SEL (LF_{II}) or 224 dB peak SPL</td><td>187 dB SEL (MF_{II}) or 230 dB peak SPL</td></tr>
<tr><td>High-frequency Cetaceans</td><td>Porpoises and *Kogia* spp.</td><td>141 dB SEL (HF_{II})</td><td>146 dB SEL (HF_{II}) or 195 dB peak SPL</td><td>161 dB SEL (HF_{II}) or 201 dB peak SPL</td></tr>
</table>

Phocidae	Hawaiian monk, elephant, and harbor seal	172 dB SEL (P_{WI})	177 dB SEL (P_{WI}) or 212 dB peak SPL	192 dB SEL (P_{WI}) or 218 dB peak SPL			
Otariidae	Sea lions and fur seals	195 dB SEL (O_{WI})	200 dB SEL (O_{WI}) or 212 dB peak SPL	215 dB SEL (O_{WI}) or 218 dB peak SPL			

Source: Finneran and Jenkins 2012

Confined blasts have up to a 60-90 percent decrease in the strength of the shock wave released to the water compared to open water blasts of the same charge weight (Nedwell and Thandavamoorthy, 1992; Hempen *et al*., 2007).

USACE used a recently developed “underwater blast effects” model (Goldstein *et al.* 2015) to determine effects of blasting associated with a harbor project in Valdez, Alaska. The same criteria for the model are planned for the Dutch Harbor project, so the model outputs from that project provide a good indication of what can be expected when blasting in Dutch Harbor for this dredging project. This model is specifically designed to calculate safety radii for shock waves from confined underwater explosives with sequential delays -- the identical blasting scenario proposed in Dutch Harbor. As well as considering confined charges, the new model takes into account the number of charges in a shot (a shot is all of the charges strung together with delays between each charge), the timing separation (delays) between the charges (~15ms for this project), the physical separation distance between charges (12 foot by 12 foot borehole spacing), and the maximum potential total charge weight in a shot (weight of each charge times the number of charges). The model produces an output for a single charge as well as an output for a shot with multiple charges with delays.

The model was run with four charge sizes (22, 55, 110, and 220 lbs) with a number of sequential charges, up to a total shot weight of approximately 5000 lb., with15 millisecond delays between each charge on a 12 foot by 12 foot grid pattern. The resulting radii, out to the behavioral threshold decibel levels for humpback whales, Steller sea lions, and harbor seals (167dB, 195dB and 172 dB SEL respectively) were used to calculate potential effects on marine mammals for this project. The anticipated charge size for the confined underwater blasting in Dutch Harbor is approximately 110 lbs.

The survey and potential impact assessment approach used in this project is very different from the manner used for most other marine construction projects. For example, a project that involved in-water pile driving would typically take the number of a marine mammal species observed over perhaps 100 hours of observation effort in a month (e.g. 10 sea lions) an then multiply that number by 3 since there would be 300 hours of pile driving in a month and the result would be 30 sea lions exposed to underwater noise from pile driving. Confined underwater blasting is a completely different scenario; the effects of a single shot might last 1 second, so even 30 individual shots in a month would only lead to 30 seconds of exposure. If we treated underwater blasting like pile driving, we would have to assume that 10 sea lions observed in 100 hours of observation would equate to 0.0008 sea lions exposed in 30 seconds of blasting. This is clearly not a realistic approach since it means the action would essentially impact zero marine mammals no matter when blasting occurs. As a result, Corps biologists chose to approach the survey data in a very conservative manner in terms of potential impacts by assuming the maximum number observed at any one time in each month would be present for each shot during that month. Thirty shots per month is a realistic assumption for this project. Each shot would involve 40 boreholes with 15 milliseconds between each hole. This would appear as one blast, but the temporal separation between holes means that the impact to marine mammals from the charge is not additive.

Steller Sea Lions

Steller sea lions observations during the 2018 field surveys and the 2017 construction monitoring efforts are detailed in Table 4 in Section 3.2.1. Though there are several ways to utilize the survey data, the most useful and conservative way for determining potential impacts to marine mammals from confined underwater blasting is to present the greatest number seen at any one time in each zone per month. This approach essentially considers that if a blast occurred during that month there would be X animals exposed to the effects of that blast. If there were 30 shots that month, then there would be 30X exposures, albeit mostly to the same animals if the 30 shots occurred in a short period. This approach is very conservative since the numbers in Table 4 show the maximum numbers observed at any one time in the particular zone for that month. In most cases, a shot would occur when fewer animals are present.

Displacement of threatened and endangered marine mammals would occur only over a very small area (~ 3 square miles) for approximately 5 months (2 months for drilling and blasting and

3 months for dredging). Habitat for foraging and other activities is abundant in Iliuliuk Bay and Unalaska Bay, and both the dredging area and the disposal area are not foraging hot spots or associated with other key features such as rookeries or haul outs for Steller sea lions. For sea lions that use benthic habitat at the dredging site for foraging, there would be a period after dredging when this area would likely be unproductive. This period might last for a year or two until the area recolonizes with fish and invertebrates.

For confined underwater blasting, the model output for Steller sea lion regulatory threshold (187-dB threshold) for a single 110 lb. charge is 313 meters. When delays are used between charges, the 187-dB threshold for forty 110 lb. charges (with 15 millisecond delays) is only 519 meters. 519 meters is the projected extent of the behavioral effects (Level B) zone for this project for Steller sea lions using the anticipated blasting scenario.

The likely Level B zone for Steller sea lions for this project is approximately 519 meters. Sixty total shots are planned for this project, with 30 shots per month for a total blasting period of approximately two months. Given the 519-meter radius from the project site and the worst-case scenario for the two months with the greatest abundance of sea lions, approximately 1,170 sea lions would be exposed to Level B harassment from confined underwater blasting assuming a total of approximately 60 shots. This number is extremely conservative; the greatest number seen on one occasion in the entire green zone in July was 32 (therefore 30 shots X 32 sea lions) and the second greatest month had a maximum of 7 sea lions at one time (30 shots X 7 sea lions) in the entire green zone. It would be very unlikely for the maximum number seen at one time in a given month to be present every single time a shot was detonated, so the actual number that might be exposed to Level B harassment is likely far less than 1,170. No blasting would be allowed when sea lions are present in the Level A zone. The size of this zone has not been calculated at this time, but it would be much smaller than the 519-meter Level B zone.

The anticipated potential impacts from the proposed project are presented in Table 32.

Table 32. Potential Project Impacts to Steller Sea Lions

Activity	Potential Impact Level
Drilling (for blast holes)	Sound levels are below in-water threshold levels for noise. Moderate adverse effects for disturbance due to the presence of the drill barge and associated traffic. Potential effects would be limited to the period of construction.
Blasting	Moderate effects due to disturbance from pressure waves in the Level B zone, no blasting allowed in with animals in Level A zone. Disturbance from blasting could lead to displacement from the Level B zone for a short period of time. Potential effects are limited to a short duration after the blast. Up to 1,170 Steller sea lions could be disturbed over a roughly two-month period, thought the actual number is likely far lower. Disturbance could trigger responses ranging from leaving the area to no visible response at all.
Dredging	Dredging would take place after the area is drilled and blasted and would likely occur in blasted areas concurrent with drilling in other areas of the footprint. Underwater noise is anticipated to be audible, but not above regulatory thresholds for marine mammals. Dredging would likely be by clamshell or hydraulic extended-reach excavator**.**
Dredged Material Placement	Moderate adverse effects during disposal due to vessel activity and temporary increases in turbidity. Beneficial effects as the area is used by fish and invertebrates with the benefits increasing over time.

Overall, the potential impacts to Steller sea lions from this action are moderate and limited to the time period of construction. Beneficial impacts from the placement of the dredged material are likely to increase over time as the material colonizes with fish and invertebrates. The project area is at the outer extent of the 20 nautical mile distance from major haulouts and rookeries that are considered critical habitat. Changes in the habitat at the project site and potential impacts during construction would have minimal effects on designated critical habitat.

Northern Sea Otters

Sea otter observations during the 2018 field surveys and the 2017 construction monitoring efforts are detailed in Table 5 in Section 3.2.1. Though there are several ways to utilize the survey data, the most useful and conservative way for determining potential impacts to marine mammals from confined underwater blasting is to present the greatest number seen at any one time in each zone per month. This approach essentially considers that if a blast occurred during that month there would be X animals exposed to the effects of that blast. If there were 30 shots that month, then there would be 30X exposures, albeit mostly to the same animals if the 30 shots occurred in a short period. This approach is very conservative since the numbers in table 5 show the maximum numbers observed at any one time in the particular zone for that month. In most cases, a shot would occur when fewer animals are present.

Displacement of threatened and endangered marine mammals would occur over a very small area (~ 3 square miles) for approximately 5 months (2 months for drilling and blasting and 3 months for dredging). Habitat for foraging and other activities is abundant in Iliuliuk Bay and Unalaska Bay, and both the dredging area and the disposal area are not primary foraging habitat. For sea otters that use benthic habitat at the dredging site for foraging, there would be a period after dredging when this area would likely be unproductive. This period might last for a year or two until the area recolonizes with fish and invertebrates. Since almost all sea otter observations were within 200 meters of shore, it is unlikely that they would be impacted by changes to either the dredge site or the dredge placement site.

For confined underwater blasting, the model output for the sea otter regulatory threshold (187-dB threshold) for a single 110 lb. charge is 313 meters. When delays are used between charges, the 187-dB threshold for forty 110 lb. charges (with 15 millisecond delays) is only 519 meters. Five hundred and nineteen meters is the projected extent of the behavioral effects (Level B) zone for this project for sea otters using the anticipated blasting scenario in Dutch Harbor.

The likely Level B zone for sea otters for this project is approximately 519 meters. Sixty total shots are planned for this project, with 30 shots per month for a total blasting period of approximately two months. Given the 519-meter radius from the project site and the worst-case scenario for the two months with the greatest abundance of sea otters, approximately 600 sea otters would be exposed to Level B harassment from confined underwater blasting assuming a total of approximately 60 shots. This number is extremely conservative; the greatest number seen on one occasion in the entire green zone was 100 (July) and the second greatest month (September) had a maximum of 92 sea otters at one time in the entire green zone. Unlike sea lions, sea otters in this area are typically located within 200 meters of shore. Because of this, it is inaccurate to assume that all of the sea otters observed in green zone during any one survey would be impacted by blasting. A 519 meter radius from either edge of the dredge prism does not come closer than 300 meters to shore meaning very few of the maximum number of sea otters ever observed the entire green zone would actually be exposed to Level B harassment. Using 10% of the total number observed in the green zone is still conservative and leads to the 600 figure stated above. It would be very unlikely for the maximum number seen at one time in a given month to be present every single time a shot was detonated, so the actual number that might be exposed to Level B harassment is likely far less than 600. No blasting would be allowed when sea otters are present in the Level A zone. The size of this zone has not been calculated at this time, but it would be much smaller than the 519-meter Level B zone.

The anticipated potential impacts from the proposed project are presented in Table 33.

Table 33. Potential Project Impacts to Sea Otters

Activity	Potential Impact Level
Drilling (for blast holes)	Sound levels are below in-water threshold levels for noise. Moderate adverse effects for disturbance due to the presence of the drill barge and associated traffic. Potential effects would be limited to the period of construction.
Blasting	Moderate effects due to disturbance from pressure waves in the Level B zone, no blasting allowed in with animals in Level A zone. Disturbance from blasting could lead to displacement from the Level B zone for a short period of time. Potential effects are limited to a short duration after the blast. Up to 600 sea otters could be disturbed over a roughly two-month period, thought the actual number is likely far lower. Disturbance could trigger responses ranging from leaving the area to no visible response at all.
Dredging	Dredging would take place after the area is drilled and blasted and would likely occur in blasted areas concurrent with drilling in other areas of the footprint. Underwater noise is anticipated to be audible, but not above regulatory thresholds for marine mammals. Dredging would likely be by clamshell or hydraulic extended-reach excavator. Vessel traffic for this activity is outside of areas typically occupied by sea otters.
Dredged Material Placement	Moderate adverse effects during disposal due to vessel activity and temporary increases in turbidity. Vessel traffic for this activity is outside of areas typically occupied by sea otters. Beneficial effects as the area is used by fish and invertebrates with the benefits increasing over time. The placement site is in120 feet of water and therefore is on the deeper end of their typical foraging depths.

Overall, the potential impacts to sea otters from this action are moderate and limited to the time period of construction. Beneficial impacts from the placement of the dredged material are likely to increase over time as the material colonizes with fish and invertebrates. Sea otter critical habitat would be altered at the dredge site. The depth at this site would change from -42 feet MLLW to -58 MLLW, but would still be within foraging depth range for sea otters. Sea otters have not been observed foraging in the dredge site during the field surveys for this project; observations indicate most sea otters spend their time foraging and resting closer to shore. It is anticipated that impacts to critical habitat for sea otters will be minimal from all aspects of the proposed action.

Humpback whales

Humpback whale observations during the 2018 field surveys and the 2017 construction monitoring efforts are detailed in Table 6 in Section 3.2.1. Though there are several ways to utilize the survey data, the most useful and conservative way for determining potential impacts to marine mammals from confined underwater blasting is to present the greatest number seen at any one time in each zone per month. This approach essentially considers that if a blast occurred during that month there would be X animals exposed to the effects of that blast. If there were 30 shots that month, then there would be 30X exposures, albeit mostly to the same animals if the 30 shots occurred in a short period. This approach is very conservative since the numbers in Table 7 show the maximum numbers observed at any one time in the particular zone for that month. In most cases, a shot would occur when fewer animals are present.

Displacement of threatened and endangered marine mammals would occur only over a very small area for approximately 5 months (2 months for drilling and blasting and 3 months for dredging). Habitat for foraging and other activities is abundant in Iliuliuk Bay and Unalaska Bay, and both the dredging area and the disposal area are not foraging hot spots. Humpback whales do not forage on the bottom, so alterations to the benthic habitat at the dredge and dredged material placement site are not relevant considerations for humpback whales.

For confined underwater blasting, the model output for the humpback regulatory threshold (167-dB re 1µPa threshold) for a single 110 lb. charge is 3,130 meters. When delays are used between charges, the 187-dB threshold for forty 110 lb. charges (with 15 millisecond delays) is 5,185 meters. This distance is the projected extent of the behavioral effects (Level B) zone for this project for humpback whales using the anticipated blasting scenario in Dutch Harbor.

The likely Level B zone for humpback whales for this project is approximately 5,185 meters. Approximately sixty shots are planned for this project, with 30 shots per month for a total blasting period of approximately two months. Given the 5,185-meter radius from the project site and the worst-case scenario for the two months with the greatest abundance of humpback whales, approximately 1,890 humpback whales would be exposed to Level B harassment from confined underwater blasting assuming a total of 60 shots. This number is extremely conservative; the greatest number seen on one occasion in the entire orange and red zone was 49 (September) and the second greatest month (August) had a maximum of 44 whales at one time in the entire red and orange zone. Since the orange zone extends to 8,000 meters from the project site and the Level B zone only extends to 5,185 meters, a correction factor of 0.65 was used to more accurately estimate the number of whales that might be exposed to Level B disturbance. This is also conservative at it assumes uniform distribution in the orange zone where in fact most of the observations in the orange zone were closer to the outer edge near 8,000 meters. It would be very unlikely for the maximum number seen at one time in a given month to be present every single time a shot was detonated, so the actual number that might be exposed to Level B harassment is likely far less than 1,890 whales. Given the intent to construct this project in the spring and early summer, it is likely that far fewer whales would be exposed to Level B harassment since the humpback whale numbers are very low in the spring and early summer. No blasting would be allowed when whales are present in the Level A zone. The size of this zone has not been calculated at this time, but it would be much smaller than the 5,185-meter Level B zone.

The anticipated potential impacts from the proposed project are presented in Table 34.

Table 34. Potential Project Impacts to Humpback Whales

Activity	Potential Impact Level
Drilling (for blast holes)	Sound levels are below in-water threshold levels for noise. Moderate adverse effects for disturbance due to the presence of the drill barge and associated traffic. Potential effects would be limited to the period of construction.
Blasting	Moderate effects due to disturbance from pressure waves in the Level B zone, no blasting allowed in with animals in Level A zone. Disturbance from blasting could lead to displacement from the Level B zone for a short period of time. Potential effects are limited to a short duration after the blast. Up to 1,890 humpback whales could be disturbed over a roughly two-month period, thought the actual number is likely far lower. Most of the whales disturbed would be exposed to Level B harassment on a recurrent basis rather than 1,890 different whales. Disturbance could trigger responses ranging from leaving the area to no visible response at all.
Dredging	Dredging would take place after the area is drilled and blasted and would likely occur in blasted areas concurrent with drilling in other areas of the footprint. Underwater noise is anticipated to be audible, but not above regulatory thresholds for marine mammals. Dredging would likely be by clamshell or hydraulic extended-reach excavator.
Dredged Material Placement	Moderate adverse effects during disposal due to vessel activity and temporary increases in turbidity. Beneficial effects as the area is used by fish and invertebrates with the benefits increasing over time. While humpback whales would not forage on the reef directly, they could benefit by an overall enrichment in the area.

Overall, the potential impacts to humpback whales from this action are moderate and limited to the time period of construction. The proportion of whales that might be impacted by this project (which is very conservatively estimated) is only a small portion of the overall number or humpback whales that forage throughout the much larger area of Unalaska Bay. The whales observed in the survey areas were always passing through over time, likely chasing aggregations of zooplankton or small fish (e.g. herring) in the water column. There is no indication that whales that have any foraging site fidelity to the area inside the 5,185 meter zone. Instead, they appear to be opportunistically foraging on mobile prey. Additionally, of the conservatively estimated 1,890 whales exposed to exposed to Level B harassment, only about 15 percent of the humpback whales in the Aleutians are listed as threatened or endangered under the Endangered Species Act. Accordingly, only 284 listed whales might be exposed to Level B harassment, although all 1,890 are protected under the Endangered Species Act.

Marine Mammals

No action Alternative

The no action alternative would have no effect on the environment and marine mammals would not be subjected to any impacts. Marine mammals would not be adversely affected by this alternative. Marine mammals would continue to be subject to the current array of activity and noise from vessels and shore side infrastructure in an industrial harbor. Marine mammal abundance and distribution is anticipated to remain relatively consistent in the future under the no-action alternative.

Action Alternatives

All of the action alternatives (different dredging depths) would have similar impacts on marine mammals. Potential impacts include temporary displacement and disturbance during construction and alteration of habitat. Displacement would only occur over a very small area for approximately 5 months. Habitat for foraging and other activities is abundant in Iliuliuk Bay and Unalaska Bay, and both the dredging area the disposal area are not foraging hot spots or associated with other key features such as rookeries or haulouts. For marine mammals that use benthic habitat at the dredging site for foraging, there would be a period after dredging when this area would likely be unproductive. This period might last for a year or two until the submerged aquatic vegetation recolonizes in the area. This algae often provides cover to small fish and crab and can also be used by snails and urchins. Soft sediment does not currently exist at the bar area and is unlikely to exist after dredging, so this habitat feature would remain the same.

Confined underwater blasting impacts marine mammals primarily due to the rapid changes in water pressure that accompany the shock wave from the blast. If the animal is close enough, these rapid pressure changes can lead to mortality or a permanent hearing threshold shift (i.e. permanent hearing loss over some or all of their hearing range). At greater distances, effects on marine mammals can range from a temporary hearing threshold shift to disturbance that might cause them to leave the area or alter their behavior. Blasting would not be allowed in a near field zone where permanent impacts (e.g. hearing loss) or lethal impacts would be anticipated. These effects would occur over a relatively small area for part of one spring/summer/fall season. The details of the permitting process that will occur before construction is explained earlier in the Threatened and Endangered species section (8.5.2). All marine mammals are covered under the Marine Mammal Protection Act, including those listed as threatened and endangered. The Incidental Harassment Authorization application that will be prepared for this project will cover all marine mammals that are likely to be present in the area, many of which are listed as threatened or endangered. Subsequent to the issuance of IHAs from the NMFS and USFWS if granted, the ESA consultation process will be complete and requirements for the Endangered Species Act consultation process will have been met. A more detailed discussion on the potential impacts to marine mammals from confined underwater blasting is presented earlier in the Threatened and Endangered Species section of this document (8.5.2).

Consultation for the potential adverse effects on marine mammals anticipated during confined underwater blasting will be made during the IHA permitting process and subsequent ESA Section 7 consultation process. A detailed blasting plan will be developed during the Preconstruction Engineering and Design (PED) phase of this project.

Harbor Seals

Harbor seal observations during the 2018 field surveys and the 2017 construction monitoring efforts are detailed in Table 9 in section 3.2.1.

Displacement of threatened and endangered marine mammals would occur only over a very small area for approximately 5 months (2 months for drilling and blasting and 3 months for dredging). Habitat for foraging and other activities is abundant in Iliuliuk Bay and Unalaska Bay, and both the dredging area and the disposal area are not foraging hot spots. For harbor seals that use benthic habitat at the dredging site for foraging, there would be a period after dredging when this area would likely be unproductive. This period might last for a year or two until the area recolonizes with fish and invertebrates. Since almost all harbor seal observations were within 200 meters of shore, it is unlikely that they would be impacted by changes to either the dredge site or the dredge placement site. For confined underwater blasting, the model output for the harbor seal regulatory threshold (172-dB threshold) for a single 110 lb. charge is 1,760 meters. When delays are used between charges, the 172-dB threshold for forty 110 lb. charges (with 15 millisecond delays) is 2,916 meters. This distance is the projected extent of the behavioral effects (Level B) zone for this project for harbor seals using the anticipated blasting scenario in Dutch Harbor.

The likely confined underwater blasting Level B zone for harbor seals for this project is approximately 2,916 meters. Approximately sixty shots are planned for this project, with 30 shots per month for a total blasting period of approximately two months. Given the 2,916-meter radius from the project site and the worst-case scenario for the two months with the greatest abundance of harbor seals, approximately 2,040 harbor seals would be exposed to Level B harassment from confined underwater blasting assuming a total of 60 shots. The 2,916 meter radius zone covers the entirety of the green zone and portions of the red, yellow, and orange zone. To be conservative, all observations from the red and yellow zone are included in the exposure estimate of 2,040 harbor seals. However, the numbers from the orange zone are not included as nearly all of these seals were hauled out of the water (beyond the 2,916 meter radius zone) and the others were in the water outside the zone. This number (2,040 seals exposed) is extremely conservative; the greatest number seen on one occasion in the entire 2,916 meter exposure zone was 39 (September) and the second greatest month (October) had a maximum of 29 sea otters at one time in the same area. Additionally, the estimate of 2,040 seals is conservative because most of the observations within the green, yellow and red zones were of seals that were hauled out of the water where they would not be exposed to the pressure change effects of an underwater blast. No blasting would be allowed when harbor seals are present in the Level A zone. The size of this zone has not been calculated at this time, but it would be much smaller than the 2.916-meter Level B zone.

The anticipated potential impacts from the proposed project are presented in Table 35.

Table 35. Potential Project Impacts to Harbor Seals

Activity	Potential Impact Level
Drilling (for blast holes)	Sound levels are below in-water threshold levels for noise. Moderate adverse effects for disturbance due to the presence of the drill barge and associated traffic. Potential effects would be limited to the period of construction.
Blasting	Moderate effects due to disturbance from pressure waves in the Level B zone, no blasting allowed in with animals in Level A zone. Disturbance from blasting could lead to displacement from the Level B zone for a short period of time. Potential effects are limited to a short duration after the blast. Up to 2,040 harbor seals could be disturbed over a roughly two-month period, thought the actual number is likely far lower. Disturbance could trigger responses ranging from leaving the area to no visible response at all.
Dredging	Dredging would take place after the area is drilled and blasted and would likely occur in blasted areas concurrent with drilling in other areas of the footprint. Underwater noise is anticipated to be audible, but not above regulatory thresholds for marine mammals. Dredging would likely be by clamshell or hydraulic extended-reach excavator. Vessel traffic for this activity is outside of areas typically occupied by sea otters.
Dredged Material Placement	Moderate adverse effects during disposal due to vessel activity and temporary increases in turbidity. Vessel traffic for this activity is outside of areas typically occupied by harbor seals. Beneficial effects as the area is used by fish and invertebrates with the benefits increasing over time.

Overall, the potential impacts to harbor seals from this action are moderate and limited to the time period of construction. Beneficial impacts from the placement of the dredged material are likely to increase over time as the material colonizes with fish and invertebrates.

8.3 Special Aquatic Sites

This project does not occur within a special aquatic site, so both the no action alternative and the action alternatives (different dredging depths) have no effect on special aquatic sites.

8.4 Essential Fish Habitat

8.4.1 No action Alternative

The no action alternative would have no effect on the environment and Essential Fish Habitat (EFH) would not be subjected to any impacts.

8.4.2 Action Alternatives

Marine fish could be impacted by habitat alteration from dredging and disposal as well as from confined underwater blasting. At the dredging site, habitat would be altered by removing the existing surface of the bottom and creating a new surface several feet deeper. The impacts would be similar regardless of the dredging depth, and the new bottom surface would likely be similar to the existing surface. Since the existing surface is relatively poor habitat in that it has very little sediment, structure, or marine vegetation, there should be little difference between the existing and future substrate conditions on the bar area. The depth change for any alternative would not be enough to influence the species that could use the area or be beyond the depth where existing algal species exist. In all, potential impacts at the bar area dredging site would be minimal, and the area would probably look and function similar to the existing habitat in a short period of time. Likely minimal impacts would include benthic species, groundfish, and invertebrates, such as the weathervane scallop, but would be expected to colonize restored bottom habitat.

Dredged material disposal at the selected disposal area would change the existing habitat. Dredged material disposal at this site w1ould cover the existing coarse sand bottom and potentially kill some flat fish, benthic or scallops that were unable to move away from the dredged material that would fall through the water column from above. However, the dredged material would alter a flat plain of sandy bottom with some small sand waves and make a rock outcropping that would add habitat diversity to the area. The dredged material would add vertical complexity to a very flat and featureless area and the rock would likely be colonized with invertebrates and form a new reef structure.

Confined underwater blasting impacts fish primarily due to the rapid changes in water pressure that accompany the shock wave from the blast. As a reference for potential impacts to fish in Dutch Harbor, a similar confined underwater blasting project was completed in the Columbia River in 2009-2010 by the Portland District of USACE. Based on the low level of effects observed in the Columbia River on a similar project it is likely that the potential effects for the proposed action in Dutch Harbor are similarly minimal.

EFH impacts through all of the phases of dredging, blasting, and disposal are expected to be minimal with the bulk of those impacts upon the demersal species. Most impacted could be the weathervane scallops through potential and unavoidable fatalities from substrate disruption. Benthic species such as flounder, sculpin, and sole may have potential impacts from the possibility of burial through disposal or blasting injuries, however, their motility is expected to aid in their avoidance of conducted work. Similarly, open ocean or pelagic species such as cod and salmonids are expected to have little impact from the proposed work through their motility and avoidance. Squid and skates are expected to have no adverse impacts due to their preference for deeper waters than the project footprint.

Potential impacts expected towards Essential Fish Habitat by the U.S. Army Corps of Engineers in the Unalaska Dutch Harbor Channel expansion in regards to dredging, disposal, and blasting are expected to be both minimal and temporary.

8.4.3 Subsistence Activities

No action Alternative

The no action alternative would have no impact on known subsistence activities. These activates will remain foreseeably unchanged.

Action Alternative

All of the action alternatives (different dredging depths) would have similar impacts on subsistence, although these are expected to be limited.

Sea Mammals

Marine mammals hunted and collected as part of local subsistence activities include Steller Sea Lions, Northern Fur Seals, and Sea Otters. A Steller Sea Lion Rookery is located at Cape Morgan on Akutan Island, 22 miles east of the project area. Major haulout areas for Steller Sea Lions include Lave Reef off of Akutan Island, Old Man Rocks northeast of Sedanka Island, and Cape Sedanka (see Figure14). Other haulout areas for Steller Sea Lions are located at Priest's Rock on Cape Kalekta Sarana Bay on Akutan Island, and the Baby Islands located just east of Unalga Island (see Figure 14). Steller Sea Lions were also documented as occurring along southwest Amaknak Island near Arch Rock and the South Channel. A list of Steller sea lion numbers observed during USACE field surveys is available in Table 4. Northern Fur Seals are occasionally seen in Unalaska Bay during migration to the Pribilof Islands in the spring and fall. Sea Otters are present in Unalaska Bay year round and have been observed during USACE winter surveys between 2000 and 2012 at Iliuliuk Harbor and Dutch Harbor (see Figure 16). Any boat launching out of Iliuliuk Bay for subsistence purposes occurring in Iliuliuk Bay and the surrounding area may be hindered by dredging or blasting activities as the project area is located in a well-traveled waterway. Any hindrance to travel related to subsistence in this area is expected to insignificant. Direct impacts on subsistence would be reflected in the projects impacts to sea mammals in the area is defined in section 8.5.3 Potential Environmental Impact to Marine Mammals.

Fish and Invertebrates

Resources in Unalaska are used in recreation and are sources of food for al1 members of the community of Unalaska. Subsistence activities that take place within vicinity of the project area include fishing for Pacific Halibut (*Hippoglossus stenolepis)* and salmon (*Oncorhynchus)*. Pacific Halibut occurs both nearshore and offshore. A 2001 survey by the State of Alaska on household use shows that 62 percent of salmon are harvested using non-commercial nets and 34 percent are taken using rod and reel (ADF&G 2001). Salmon are harvested in Reese Bay, along the Nateekin River in Nateekin Bay, Broad Bay, Captains Bay, and Summer Bay. Any boat launching, fishing, or gathering activates in Iliuliuk Clams, mussels, sea urchins, and chitons are hand picked off rocks and collected off the beach or intertidal zones. Some collecting of crab and shrimp is conducted using crab pots and nets near shore. Local collections of invertebrates along the shoreline would not be hampered by the project, however any travel by boat may be temporarily unavailable during project operation. Any hindrance to travel related to subsistence in this area is expected to insignificant. Bay may be temporarily hindered by blasting or dredging activities associated with the project. Additionally any blasting and dredging effects to fish and invertebrates in the project area would directly affect subsistence activity. Direct impacts on subsistence would be reflected in the projects impact on fish and invertebrates which is captured in section 8.5.1.4 Potential Environmental Impacts to Marine Invertebrates & Associated Habitat.

Birds

Geese (*Chen canagica and Branta canadensis)* and Ducks (*Histrionicus histrionicus)* are available seasonally and hunted outside the city limits. Ducks are abundant in all habitat types and wave exposure zones in Iliuliuk Bay from late summer into spring. Geese are common along the outer shore of the Dutch Harbor spit and in nearshore waters. Impacts to subsistence travel by water may occur during blasting and dredging operations. Any hindrance to travel related to subsistence in this area is expected to insignificant. Direct impacts on subsistence would be reflected in the projects impacts to birds which is captured in section 8.5.1.1 Potential Environmental Impacts to Birds.

Plants

Terrestrial plants are collected on land around Captains Bay, Summer Bay, Nateekin Bay, and Broad Bay. Dredging or blasting activates associated with the project may temporarily affect overwater travel by boat to these locations. Any hindrance to travel related to subsistence in this area is expected to insignificant.

8.5 Cultural Resources

8.5.1 No action Alternative

The no action alternative would have no impact on known cultural resources, tribes, or tribal corporations.

8.5.2 Action Alternatives

All alternatives (different dredging depths) would have no adverse effects on known cultural resources. The potential for impact to unknown cultural resources within the APE is low. There are multiple known cultural resources in the vicinity of the project area, but none are known to occur directly in the dredging or disposal locations (Table 36). Trawl surveys conducted in 2017 were digitally recorded using a waterproof camera attached to a trawling net and clearly show a lack of cultural resources on the ocean floor within the surveyed areas of the APE (Figure 7).

Table 36. Cultural Resources Identified in the Vicinity of the APE.

AHRS No.	Site Name	NRHP Status
UNL-055	Tanaxtaxak	Eligible
UNL-092	Summer Bay Site	Eligible
UNL-119	Fort Schwatka	Contributing property
UNL-120	Dutch Harbor Naval Operating Base and For Mears, U.S. Army	NHL
UNL-208	Summer Bay Flake Scatter	No Determination
UNL-314	Humpy Cove Village	No Determination
UNL-332	Summer Bay Bridge	Eligible
UNL-467	WWII Quonset Hut, Elephant Steel Magazines	No Determination
UNL-468	WWII Bunker and Submarine Net Anchor	No Determination
UNL-470	WWII Bunker (Amaknak Spit)	Eligible
UNL-576	Second Priest Rock, Ft. Brumback Searchlights #7 and #8	Contributing property
UNL-582	Quonset Barracks Foundation (Ft. Schwatka)	Contributing property
UNL-583	Wooden Foundation (Ft. Schwatka)	Contributing property

During World War II, a submerged anti-submarine net extended across the entrance to Dutch Harbor from Little Priest Rock on Unalaska Island to an anchor (UNL-468) located on the Tanaxtaxak midden (UNL-055) on Amaknak Island (Figure 32). The net was intended to prevent Japanese submarines from entering into Iliuliuk Bay. The submarine net anchor is regarded as a non-contributing feature within the boundaries of site UNL-055 (AHRS 2018). Construction of the net began in the summer of 1942, which also included the construction of a boom depot and naval facilities on Amaknak Island. Construction lasted through January 1, 1943, when the Dutch Harbor Naval Operating Base was commissioned. By the time the naval base was completed in 1944, additional facilities included 17 office buildings, a hospital, net depot, and a facility for supplying fleets (Faulkner et al. 1987:19).

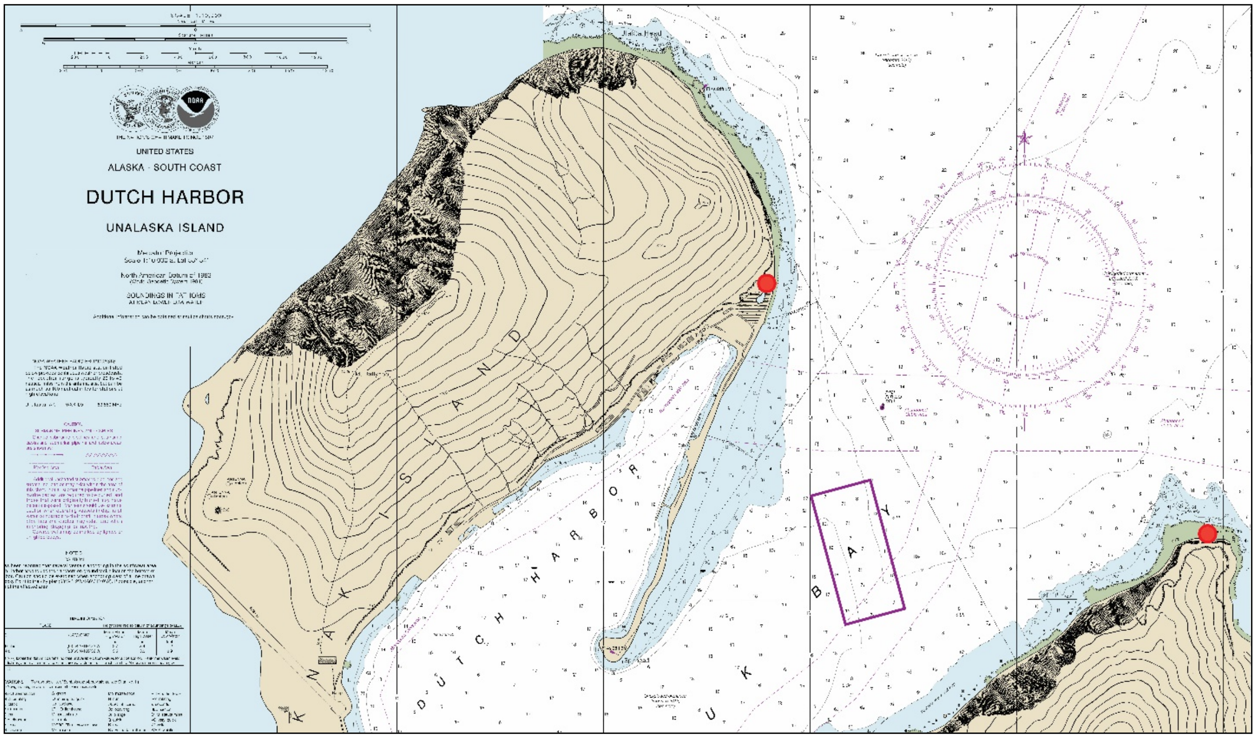


Figure 32. Map Showing End Points of World War II Anti-Submarine Net (red dots) and Approximate Dredging Area (purple).

A search of the NOAA Wrecks and Obstructions database revealed two obstructions in the general vicinity of the project area (one in Iliuliuk Bay the other in Dutch Harbor proper) and two shipwrecks on the north side of Ulakta Head (NOAA 2017). An additional search of the Bureau of Ocean Energy Management (BOEM) database (Table 37) shows 21 shipwrecks within a 35-mile radius of Dutch Harbor. No shipwrecks are known to occur in the APE.

Table 37. BOEM Shipwreck Database Search Wrecks in Vicinity of Dutch Harbor (BOEM 2011).

Name	Type	Year	Location	Narrative
Eliza Anderson	Sidewheel Steamer	1898	Beach at Dutch Harbor	Broke mooring stranded on beach then broken up
No.6	Barge	1898	Near Dutch Harbor	Foundered
No.8	Barge	1898	Near Dutch Harbor	Foundered
Mermaid	Whaling bark	1899	At Dutch Harbor	Lost in Storm, later rebuilt
Fearless	Chilean steam-whaling bark	1901	South Side Dutch Harbor	Aground in blizzard, total wreck, sold at auction
Louis Walsh	Ship	1902	Near Dutch Harbor	Wrecked then blown ashore then broken up
Victoria	Steamer	1927	In Dutch Harbor	Engine Damage, not at total loss
Arthur J. Baldwin	Steamer	1935	At Dutch Harbor	Stranded, not a total loss
Number Four	Scow	1942	Vicinity of Dutch Harbor	War loss, sunk by enemy action
Number Two	Scow	1942	Vicinity of Dutch Harbor	War loss, sunk by enemy action
Northwestern	Steamer barracks ship	1942	At Dutch Harbor	Burned and damaged by Japanese's aircraft
Putco-2	Barge, steel	1959	Near Dutch Harbor	Stranded and lost
Royal Fisher	Crabber	1972	At Dutch Harbor	Rammed and sunk by runaway barge
Sea Foam	F/V	1981	Near Dutch Harbor (Summer Bay)	Ran aground and lost
Kaiyo Maru No. 12	Fish Processor	1982	15 mi. north of Dutch Harbor	Caught fire and sank

Arctic Dreamer	F/V	1983	10 mi. north of Dutch Harbor	Capsized and sank
Comet	Halibut trawler	1983	25 mi. north of Dutch Harbor	Took on water sank when engine room flooded
Ocean Grace	Crabber	1983	22 mi. north of Dutch Harbor	Capsized and sank
Silver Clipper	F/V	1984	28 mi. NW of Dutch Harbor	Sank after engine room flooded
Olympic	Crabber	1989	North of Dutch Harbor	Sank
Louise	F/V	1991	Near Dutch Harbor	Sank

There are no known shipwrecks or obstructions inside the APE. Additionally, digitally recorded footage of the shoal and disposal areas shows no significant cultural resources within the APE. A consultation letter per Section 106 of the NHPA outlining the details of the proposed undertaking and assessing the effect of the project on known cultural resources was sent to the Alaska State Historic Preservation Officer (SHPO) and other interested parties on February 6, 2018. The letter states that the project will result in “no historic properties affected” [36 CFR § 800.4(d)(1)]. USACE received concurrence on this assessment of effect from the SHPO on March 6, 2018, and from the National Park Service, who manages the National Historic Landmark (UNL-120), on March 5, 2018. Copies of the consultation letter to the SHPO outlining the project details and expected effects were sent to the City of Unalaska, Ounalashka Corporation, and Qawalangin Tribe of Unalaska, the Aleut Corporation, the Aleutian Pribilof Island Association, Inc., and the Unalaska Historic Commission. No formal responses were received from any of these interested parties. Additionally, public meetings conducted in September 2016 did not receive any comment on potential impacts to cultural resources in the project area. Any changes to the proposed plan will require further consultation with the SHPO and interested parties.

Tribes and Corporations

The action alternative is not expected to affect the Ounalashka Corporation or the Qawalangin Tribe of Unalaska. Furthermore no comments were received from either entity though formal correspondence or public meetings on any potential effects to tribes or cultural resources.

8.6 Environmental Justice and Protection of Children

8.6.1 No action Alternative

The no action alternative would have no effect on minority or low income populations. Children would not be disproportionately negatively affected by this alternative.

8.6.2 Action Alternatives

Executive Order 12898 directs Federal agencies to identify and address the disproportionately high and adverse human health or environmental effects of their actions on minority and low-income populations, to the greatest extent practicable and permitted by law. The City of Unalaska, which is in the Aleutians West Census Area, has a Diversity Index of 0.70. The population is approximately 43 percent Asian American, 31 percent White, 6 percent African American, 4 percent Native American, 2 percent Native Hawaiian/Pacific Islander, 12 percent "mixed" or "other" race (ADCRA 2018a). The per capita income in Unalaska is $35,299. The median household income is $92,083. Approximately 304 of the 4,693 persons with a Poverty Status Determination are below poverty level (ADCRA 2018b). Implementation of the USACE's preferred alternative does not disproportionately negatively affect minority or low-income populations of Unalaska or the Aleutians West Census Area. Rather, the project as proposed seeks to reduce inefficiencies inherent to the existing fuel and freight supply infrastructure, the implementation of which would reduce costs to end users in Unalaska. Although access to subsistence resources may be temporarily impacted during construction activity, no long term impacts to subsistence resources or procurement methods are expected. During construction activity, confined underwater blasting would occur over a short time period and best management practices would be followed to ensure personal and commercial waterborne traffic is aware of the blast timing and safety signals.

Executive Order 13045 directs Federal agencies to identify and address any potential environmental health or safety risk that may disproportionately affect children. The USACE believes that is preferred alternative would not disproportionately negatively impact children. The proposed project has no on-land footprint, and any impact to air and water quality in the region will only be temporary during construction activity; no long term impacts to Unalaska's existing air and water quality are expected. Children, as part of the community as a whole, will benefit from the expected lowered cost of fuel and goods resulting from implementation of the project.

8.7 Unavoidable Adverse Impacts

8.7.1 No action Alternative

The no action alternative may not have any other readily apparent unavoidable adverse impacts upon the human or natural environments at Unalaska and Dutch Harbor other than the ecological threat posed by the continued practice of open-water fueling and fuel lightering. Ultimately, under the no action scenario, the potential exists for reduced economic opportunity at Dutch Harbor as global shipping fleets increase the overall size and draft of their vessels, which may lead to the abandonment of shoreside facilities that may incur some degree of environmental reconciliation. Within the regional context, however, under the no action alternative, the inability of deeper draft vessels to take refuge at Dutch Harbor would result in unavoidable adverse impacts to both the human and natural environment via reduced access to emergency medical and maintenance facilities. No similar deep draft port of refuge exists within the region.

8.7.2 Action Alternative

Unavoidable adverse impacts occurring under the action alternative are envisioned to be temporary in nature and will almost exclusively affect the marine environment and its inhabitants.

Water quality throughout the water column at the confined underwater blasting and dredging site as well as the dredged material disposal site will be unavoidably adversely impacted by USACE's project actions and will experience elevated levels of turbidity. Elevated turbidity levels are expected to be greatly affected by the currents and are expected to return to ambient conditions at the conclusion of diurnal tidal cycles.

An unknown quantity of fish and their respective habitat will unavoidably be negatively affected by actions associated with USACE's project implementation. Confined underwater blasting, dredging, and placement of the dredged material will result in a small number of fish mortalities and will temporarily force other fishes to vacate their preferred habitats in the area of the bar and dredged material disposal area. Furthermore, fish habitat in the aforementioned areas will be heavily disturbed, and likely unusable for fishes for a short time. USACE contends that unavoidable adverse impacts to fishes and their habitats will be temporary in nature and is currently engaged with NMFS Habitat Division and ADFG concerning EFH and developing conservation measures to reduce its overall impact to fishes and their habitat.

Similarly, unavoidable adverse impacts to marine mammals are possible as a result of the necessity to utilize confined underwater blasting to prepare material at the Iliuliuk Bar site for dredging. Some marine mammals would be disturbed by blasting. Intense monitoring will ensure that no marine mammals are killed or permanently injured in the near field area of the blast. Disturbance at greater distances would be unavoidable since blasting is necessary to dredge in the terminal glacial moraine. This disturbance would be non-lethal, occur no more than once per day and be limited to a couple of months during one season. The effects of this are anticipated to be moderate and temporary.

8.8 Cumulative Impacts

Cumulative impacts are those impacts on the environment that result from the incremental impact of an action when added to past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individual minor but collectively significant actions taking place over a period of time [40 CFR § 1508.7].

8.8.1 No Action Alternative

Cumulative impacts associated with the no action alternative are difficult to quantify. Without dredging a deeper channel for deeper drafting vessels, the port of Dutch Harbor would be limited to its existing fleet, which at some point in the future may stop calling on Dutch Harbor due to its compounding economic and physical restraints.

The local ecology appears tolerant of the existing operational tempo at Dutch Harbor and may remain without the existing cargo fleet loading vessels to their full capacity. Arguably, the most important aspect of maintaining ecological integrity in this particular setting is limiting or totally preventing the inadvertent release of petroleum products. Fuel tankers routinely anchor in Unalaska Bay and fuel is lightered by barges into Iliuliuk Harbor to be transferred to upland above ground storage tanks. Fuel lightering is widely recognized as a potential pathway for the environmental release of petroleum products and is expected to continue in the long term. The risk of fuel spills from lightering would persist under the no action alternative.

Similarly, the depth of the Iliuliuk Bar poses an impassible barrier to deep drafting vessels and their respective crews that may require emergency medical or maintenance services that Unalaska-Dutch Harbor provides. This existing condition has already necessitated the requirement for emergency personnel to render service to vessels and crews in dangerous sea conditions via helicopter and tug boat; under the no action alternative this condition is not expected to be resolved. Within the regional context, there are no similar facilities that are capable of large vessel maintenance services.

8.8.2 Action Alternative

Cumulative impacts upon the natural environment as a result of navigational improvements at Dutch Harbor are not anticipated.

Cumulative impacts associated with the action alternative specifically include those related to an expected sustained level of commerce as described in section 4.2. of this feasibility report. According to USACE's economic models utilized in this report, the sustained level of commerce at Dutch Harbor will be facilitated by improvements in navigation efficiency directly resulting from dredging a deeper draft channel at the Iliuliuk Bar. An increase in vessel traffic is not expected because of this project or past, present, and reasonably foreseeable future actions.

Unalaska Island's surrounding waters support high densities of large whales during peak spring, summer, and fall seasons. Whale strikes by large commercial vessels are common worldwide; they occur with great frequency in proximity to important commercial deep draft ports (Jensen, A.S. and G.K. Silber, 2003). In many cases, vessel strikes result in the mortality or severe injury of the struck animal. World-wide, whale populations are rebounding from the historic effects of whaling, and the probability of vessel/whale interactions increases over time, to what degree this future condition is applicable in Iliuliuk Bay, however, is uncertain at this time.

Existing navigational conditions at the Iliuliuk Bar carry with them an inherent level of risk of inadvertent release of petroleum products and other persistent aquatic pollutants common to the shipping industry. The proposed project would likely decrease the likelihood of some of the more risk-prone activities, such as fuel lightering. These risks decrease when deeper draft vessels can directly offload fuel instead of lightering it in barges from the west side of Unalaska Bay. An increase in the risk of fuel spills is not expected because of this project or past, present, and reasonably foreseeable future actions.

8.9 Summary of Mitigation Measures

Mitigation for this project could involve a combination of avoidance (i.e. timing windows) and minimization. Timing windows would be used to the most practical extent for avoiding impacts to certain fish species, though aerial or sonar surveys may be necessary if confined underwater blasting occurs during summer months.

Shut down zones would be implemented for marine mammals near the blasting site to prevent lethal or permanent impacts, while a comprehensive monitoring program would be implemented for the behavioral disturbance zone. These zones and monitoring protocols would be coordinated with NMFS and USFWS prior to construction as part of the IHA and ESA consultation process.

9 PUBLIC AND AGENCY INVOLVEMENT*

9.1 Public\Scoping Meetings

The planning charette conducted in Unalaska September 21-22, 2016 was advertised by the local sponsor as a public meeting. We received comments from the public regarding potential erosion impacts to Front Beach. These concerns have been assessed as part of the study and are located in the Hydraulics and Hydrology appendix. Additional public feedback was solicited during concurrent review of the Draft Interim Feasibility Report in May 2018 and public meetings conducted in Unalaska in October 2018.

9.2 Federal & State Agency Coordination

In-person meetings were held between biologists from the Environmental Resources Section and biologists with the National Marine Fisheries Service (Protected Resource Division and Habitat Division), U.S. Fish and Wildlife Service (Project Planning and Marine Mammal Management Divisions) and the Alaska Department of Fish and Game (Marine Mammals, Sport Fish, Commercial Fish, and Habitat Divisions). Email coordination was also initiated with the Environmental Protection Agency regarding proposed dredged material disposal locations. Key dates associated with major decision making processes and information exchanges are annotated in the following text:

21 November 2017: Meeting with NMFS Protected Resources Division staff to discuss USACE's decision to acquire an IHA and subsequent ESA Section 7 consultation concurrence for species managed under the purview of NMFS. In summary, NMFS understood the project and its constraints, and agreed that acquisition of an IHA was appropriate.

28 December 2017: Meeting with USFWS Marine Mammal Management Office and Project Planning staff regarding the application for an IHA and subsequent ESA Section 7 consultation concurrence for marine mammals managed under the purview of the UFSWS. USFWS staff understood the project and its constraints, and were willing to work hand-in-hand to assist USACE in the required processes.

10 January 2018: USACE formally requested from Anchorage USFWS, concurrence regarding the level of historic and perceived future requirement for coordination under the MMPA and ESA as satisfying the precepts of the Fish and Wildlife Coordination Act, without the generation of a Coordination Act Report or Planning Aid Letter by USFWS, a concept originally agreed upon during USACE phone conversations with the Anchorage USFWS Ecological Services Branch Chief. As of 30 January 2019, no formal response to this request has been provided.

19 January 2018: Meeting with Alaska Department of Fish and Game (ADF&G) Commercial Fisheries, Sport Fisheries, Marine Mammals, and Habitat Division staff members. ADF&G staff were briefed on USACE's envisioned overall project plan and coordination actions to date. ADF&G primary concerns were impacts associated with project elements upon salmon species returning to spawn in summer and perceived impacts upon Pacific Herring.

12 February 2018: Meeting with NMFS Habitat division staff. Staff were briefed on the tentatively selected plan and its potential impacts upon Essential Fish Habitat. NMFS requests that fishes killed by blasting be collected for subsequent analysis at Auke Bay Laboratory, pending further coordination with the lab. NMFS also requested that dredged material placed at the disposal area be monitored using an underwater camera at years one, three, and five after project construction to determine whether it is being utilized as habitat.

26 March 2018 – 29 March 2018: Site visit to Dutch Harbor with NMFS to collect underwater video of the proposed disposal site and look at potential marine mammal survey vantage points and discuss survey conceptual design.

4 Dec 2018: Transmission of an environmental update to USFWS and NMFS to inform them of our general survey results from the six-month marine mammal survey and developments on the plans for confined underwater blasting. An updated date for release of the EA was also communicated.

9.3 Status of Environmental Compliance

Federal Statutory Authority	Compliance Status	Compliance Date/Comment
Clean Air Act	FC	
Clean Water Act	PC	Upon receipt of 401 certification from the Alaska Department of Environmental Conservation (AKDEC)
Coastal Zone Management Act	N/A	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.
Endangered Species Act	PC	Formal consultation cannot be concluded under section 7 of the ESA until USACE's application for an Incidental Harassment Authorization (IHAs) from NMFS and USFWS is processed and an IHA is issued.
Marine Mammal Protection Act	PC	Pending acquisition of IHAs from NMFS and USFWS
Magnuson-Stevens Fishery Conservation and Management Act	PC	Pending EFH effects determination
Fish and Wildlife Coordination Act	PC	Pending concurrence from USFWS. Request for concurrence sent Jan.10, 2018.
Marine Protection, Research, and Sanctuaries Act	FC	

Migratory Bird Treaty Act	PC	Pending conservation measures developed for blasting plan
Submerged Lands Act	NA	This project does not involve resource extraction.
National Historic Preservation Act	FC	Completed, received concurrence from SHPO and NPS on 5 and 6 March, 2018.
National Environmental Policy Act	FC	
Rivers and Harbors Act	FC	
Executive Order 11990: Protection of Wetlands	FC	
Executive Order 12898: Environmental Justice	FC	
Executive Order 13045: Protection of Children from Environmental Health Risks and Safety Risks	FC	
Executive Order 13112: Invasive Species	FC	
Executive Order 13186 Protection of Migratory Birds	PC	Pending conservation measures developed for blasting plan

FC = Full Compliance, PC = Partial Compliance
Note: This list is not exhaustive.

9.4 Views of the Sponsor

The non-Federal sponsor for this study, the City of Unalaska, Alaska, is supportive of the Recommended Plan and passed a resolution expressing their support which is included in Appendix H.

10 CONCLUSIONS & RECOMMENDATIONS

10.1 Conclusions

Based upon NED analysis, the recommended plan is a dredged channel to a depth of -58 feet MLLW providing one-way access for vessels with a draft up to 44 feet with waves up to 5.6 feet over the bar with tides above 0 feet MLLW. The benefits of the proposed channel deepening will result from savings in transportation costs accruing to deep draft vessels. Both bulk and container vessels will experience a time savings "with" project in the form of the reduction in transit time delays. A deeper channel allows containers and bulkers to gain efficiencies with their larger vessels. This would replace calls from smaller ships and barges.

Ongoing coordination with Federal and State resource agencies shall seek to ensure that all practical means to avoid or minimize adverse environmental effects will be analyzed and incorporated into the recommended plan. Pursuant to Section 7 of the ESA, as amended, USACE expects to concurrently coordinate with NMFS and USFWS during the application process for an Incidental Harassment Authorization during the PED Phase. Pursuant to the Marine Mammal Protection Act of 2007, as amended, USACE will apply for an Incidental Harassment Authorization during the PED Phase for confined underwater blasting required during the construction and implementation of the preferred alternative that would reach level B harassment values for disturbance to marine mammals.

While incorporation of reasonable and prudent measures will likely be required by the coordinating environmental agencies to mitigate potential short-term environmental impacts, over the longer term, the project may reduce the requirement for fuel lightering and at-sea repair efforts resulting in a reduction for the potential for inadvertent release of petroleum, oils, and lubricants, and other locally persistent contaminants, into the local marine environment. Over the long-term, this potential reduction in the introduction of environmental contaminants could outweigh the short-term impacts of project construction.

The recommended plan has a total first construction cost with contingency of approximately $30.5 million (FY19 dollars). This plan maximizes total net benefits and has a Benefit-to-Cost Ratio (BCR) of 2.1. The recommended plan is supported by the City of Unalaska which is the non-Federal sponsor.

10.2 Recommendations

I recommend that the selected navigation improvements plan at Unalaska (Dutch Harbor), Alaska be constructed generally in accordance with the selected plan herein, and with such modifications thereof as in the discretion of the Director of Civil Works may be advisable at an estimated FY19 certified project first cost with contingency of $30,500,000.

Federal implementation of the recommended project would be subject to the non-Federal sponsor agreeing to enter into a written Project Partnership Agreement (PPA), as required by Section 221 of Public Law 91-611, as amended, to provide local cooperation satisfactory to the Secretary of the Army. Entering into the PPA will ensure compliance with Federal laws and policies, including but not limited to:

a. Provide, during the periods of design and construction, funds necessary to make its total contribution for commercial navigation equal to:

(1) 10 percent of the cost of design and construction of the general navigation features attributable to dredging to a depth not in excess of -20 feet mean lower low water (MLLW), plus

(2) 25 percent of the cost of design and construction of the general navigation features attributable to dredging to a depth in excess of -20 feet MLLW but not in excess of -50 feet MLLW, plus

(3) 50 percent of the cost of design and construction of the general navigation features attributable to dredging to a depth in excess of -50 feet MLLW.

b. Provide all lands, easements, rights-of-way, and relocations, including those necessary for the borrowing of material and placement of dredged or excavated material, and perform or assure performance of all relocations, including utility relocations, as determined by the Federal government to be necessary for the construction or operation and maintenance of the general navigation features;

c. Pay with interest, over a period not to exceed 30 years following completion of the period of construction of the general navigation features, an additional amount equal to 10 percent of the total cost of construction of the National Economic Development Plan general navigation features less the amount of credit afforded by the Federal government for the value of the lands, easements, rights-of-way, and relocations, including utility relocations, provided by the non-Federal sponsor for the general navigation features. If the amount of credit afforded by the Federal government for the value of lands, easements, rights-of-way, and relocations, including utility relocations, provided by the non-Federal sponsor equals or exceeds 10 percent of the total cost of construction of the general navigation features, the non-Federal sponsor shall not be required to make any contribution under this paragraph, nor shall it be entitled to any refund for the value of lands, easements, rights-of-way, and relocations, including utility relocations, in excess of 10 percent of the total costs of construction of the general navigation features; Provide 50 percent of the excess cost of operation and maintenance of the project over that cost which the Secretary determines would be incurred for operation and maintenance if the project had a depth of 50 feet;

d. Prevent obstructions or encroachments on the project (including prescribing and enforcing regulations to prevent such obstructions or encroachments) such as any new developments on project lands, easements, and rights-of-way or the addition of facilities which might reduce the outputs produced by the project, hinder operation and maintenance of the project, or interfere with the project's proper function;

e. Provide, operate, and maintain, at no cost to the Federal government, the local service facilities in a manner compatible with the project's authorized purposes and in accordance with applicable Federal and state laws and regulations and any specific directions prescribed by the Federal government;

f. Give the Federal government a right to enter, at reasonable times and in a reasonable manner, upon property that the non-Federal sponsor owns or controls for access to the project for the purpose of completing, inspecting, operating, maintaining, repairing, rehabilitating, or replacing the project.

g. Hold and save the United States free from all damages arising from the construction or operation and maintenance of the project, any betterments, and the local service facilities, except for damages due to the fault or negligence of the United States or its contractors;

h. Keep, and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the project, for a minimum of 3 years after completion of the accounting for which such books, records, documents, and other evidence are required, to the extent and in such detail as will properly reflect total cost of the project, and in accordance with the standards for financial management systems set forth in the

Uniform Administrative Requirements for Grants and Cooperative Agreements to State and local governments at 32 CFR, Section 33.20;

i. Perform, or ensure performance of, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 USC 9601-9675, that may exist in, on, or under lands, easements, rights- of-way, relocations, and disposal areas that the Federal government determines to be necessary for the construction or operation and maintenance of the general navigation features. However, for lands, easements, or rights-of-way that the Federal government determines to be subject to the navigation servitude, only the Federal government shall perform such investigation unless the Federal government provides the non-Federal sponsor with prior specific written direction, in which case the non-Federal sponsor shall perform such investigations in accordance with such written direction;

j. Assume complete financial responsibility, as between the Federal government and the non-Federal sponsor, for all necessary cleanup and response costs of any hazardous substances regulated under CERCLA that are located in, on, or under lands, easements, rights-of-way, relocations, and disposal areas required for the construction or operation and maintenance of the project;

k. Agree, as between the Federal government and the non-Federal sponsor, that the non-Federal sponsor shall be considered the operator of the local service facilities for the purpose of CERCLA liability, and, to the maximum extent practicable, perform its obligations related to the project in a manner that will not cause liability to arise under CERCLA;

l. Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended, (42 U.S.C. 1962d-5b) and Section 101(e) of the WRDA 86, Public Law 99-662, as amended, (33 U.S.C. 2211(e)) which provide that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until the non-Federal sponsor has entered into a written agreement to furnish its required cooperation for the project or separable element;

m. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended, (42 U.S.C. 4601- 4655) and the Uniform Regulations contained in 49 CFR Part 24, in acquiring lands, easements, and rights-of-way necessary for construction, operation, and maintenance of the project including those necessary for relocations, the borrowing of material, or the disposal of dredged or excavated material; and inform all affected persons of applicable benefits, policies, and procedures in connection with said act;

n. Comply with all applicable Federal and state laws and regulations, including, but not limited to: Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C. 2000d), and Department of Defense Directive 5500.11 issued pursuant thereto; Army Regulation 600- 7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army"; and all applicable Federal labor standards requirements including, but not limited to, 40 U.S.C. 3141-3148 and 40 U.S.C. 3701-3708 (revising, codifying and enacting without substantive change the provisions of the Davis- Bacon Act (formerly 40 U.S.C. 276a et seq.), the Contract Work Hours and Safety Standards Act (formerly 40 U.S.C. 327 et seq.), and the Copeland Anti-Kickback Act (formerly 40 U.S.C. 276c)); and

o. Not use funds from other Federal programs, including any non-federal contribution required as a matching share therefore, to meet any of the non-Federal sponsor's obligations for the project unless the Federal agency providing the funds verifies in writing that such funds are authorized to be used to carry out the project.

p. Accomplish all removals determined necessary by the federal government other than those removals specifically assigned to the federal government;

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