US Army Corps of Engineers
-Alaska District

Draft Interim Integrated Feasibility Report and Environmental Assessment and Draft Finding of No Significant Impact

Unalaska (Dutch Harbor) Channels
Unalaska, Alaska

March 13, 2018

Draft Integrated Feasibility Report
and Environmental Assessment

Unalaska (Dutch Harbor) Channels
Unalaska, Alaska

Prepared by
U.S. Army Corps of Engineers
Alaska District

March 13, 2018

PERTINENT DATA

Recommended Plan	
Project Component	
Dredge Channel to -48 feet MLLW (See Figure 26)	
Dredge Volume	27,540 CY
Length of Channel	400 Feet
Width of Channel	600 Feet
Maintenance Dredging	TBD (see section 6.4.2)

Economics	
Item	
Total Annual NED Cost	$1,023,941
Total Annual NED Benefit	$2,801,315
Net Annual NED Benefits	$1,777,374
Benefit/Cost Ratio	2.7

Total Project Costs			
Description	**Total**	**Federal**	**Non-Federal**
Mobilization/Demobilization (deeper than -20FT MLLW and up to -50FT MLLW)	**$6,628,725**	**$4,971,544**	**$1,657,181**
General Navigation Features (deeper than -20FT MLLW and up to -50FT MLLW)	**$7,052,309**	**$5,289,232**	**$1,763,077**
LERR	**$24,000**	**$0**	**$24,000**
Project Cost Apportionment	**$13,705,034**	**$10,260,776**	**$3,444,258**
Aids to Navigation	**$29,102**	**$29,102**	**$0**
Local Service Facilities	**$2,041,650**	**$0**	**$2,041,650**
10% over time adjustment (less LERR)*		**($1,344,103)**	**$1,344,103**
Final Allocation of Costs	**$15,775,786**	**$8,945,775**	**$6,830,011**
***10% over time adjustment ($6,628,725 mob/demob + $7,052,309 GNF = $13,681,034 x 10% = $1,368,103 - $24,000 = $1,344,103)			

Annual Project Costs			
Item	**Federal ($)**	**Non-Federal ($)**	**Total ($)**
Annual Maintenance and Operations Costs	TBD (see section 6.4.2)		

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 Tentatively Selected Plan (TSP) 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). 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 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.

Based on the preliminary National Economic Development (NED) analysis, the TSP deepens the existing bar to -48 MLLW providing one-way access for vessels with a draft up to 44 feet during calm conditions with tides above 0 feet MLLW. This plan has a total construction cost with contingency of approximately $15.8 million (FY18 dollars). This plan maximizes total net benefits and has a Benefit-to-Cost Ratio (BCR) of 2.7.

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
Corps	U.S. Army Corps of Engineers
CWA	Clean Water Act
CY	Cubic Yards
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/EA	Feasibility Report and Environmental Assessment
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
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

TABLE OF CONTENTS

*Indicates NEPA required section.

LIST OF TABLES

LIST OF FIGURES

APPENDICES

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 Tentatively Selected Plan (TSP) 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*". ER 200-2-2, "*Procedures for Implementing NEPA*" directs the contents of environmental assessments. This document presents the information required by both regulations as an integrated Feasibility Report and Environmental Assessment (FR/EA). It also complies with the requirements of the Council on Environmental Quality regulations for implementing the National Environmental Policy Act of 1969 (42 USC 4341 et seq.).
This draft FR/EA documents the analysis and coordination conducted to determine whether the Federal government should participate in constructing deep draft navigation improvements in Iliuliuk Bay at Unalaska-Dutch Harbor, Alaska. Studies of this nature consider a wide range of alternatives and the environmental consequences of those alternatives.

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 to 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.

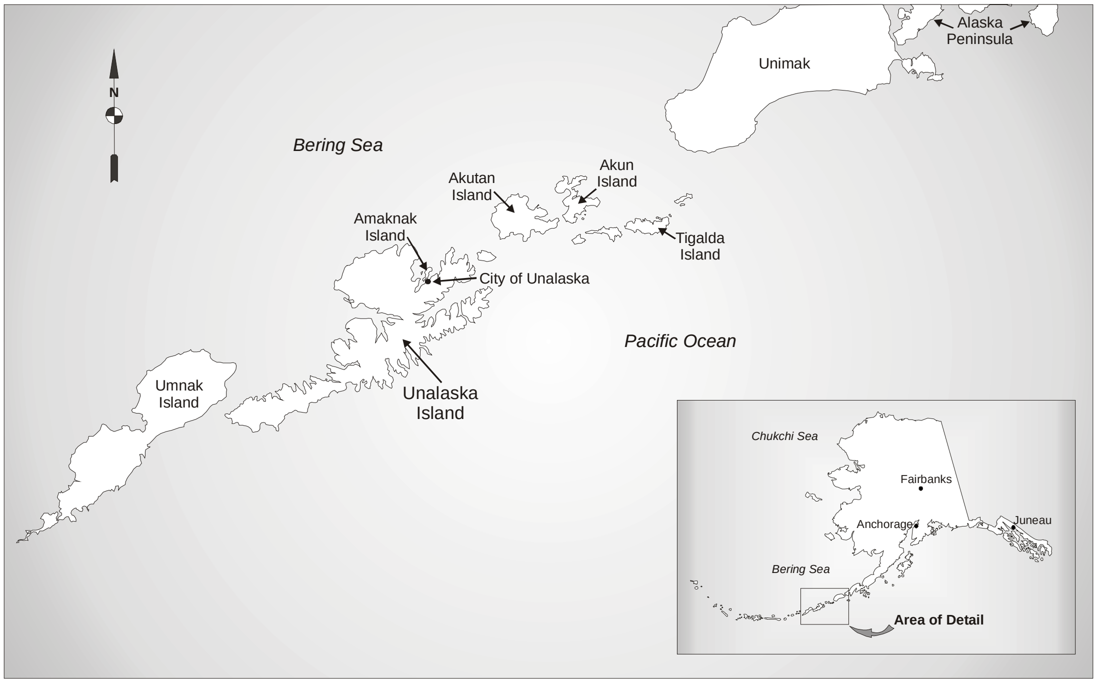

Figure 1. Vicinity Map, Unalaska, Alaska

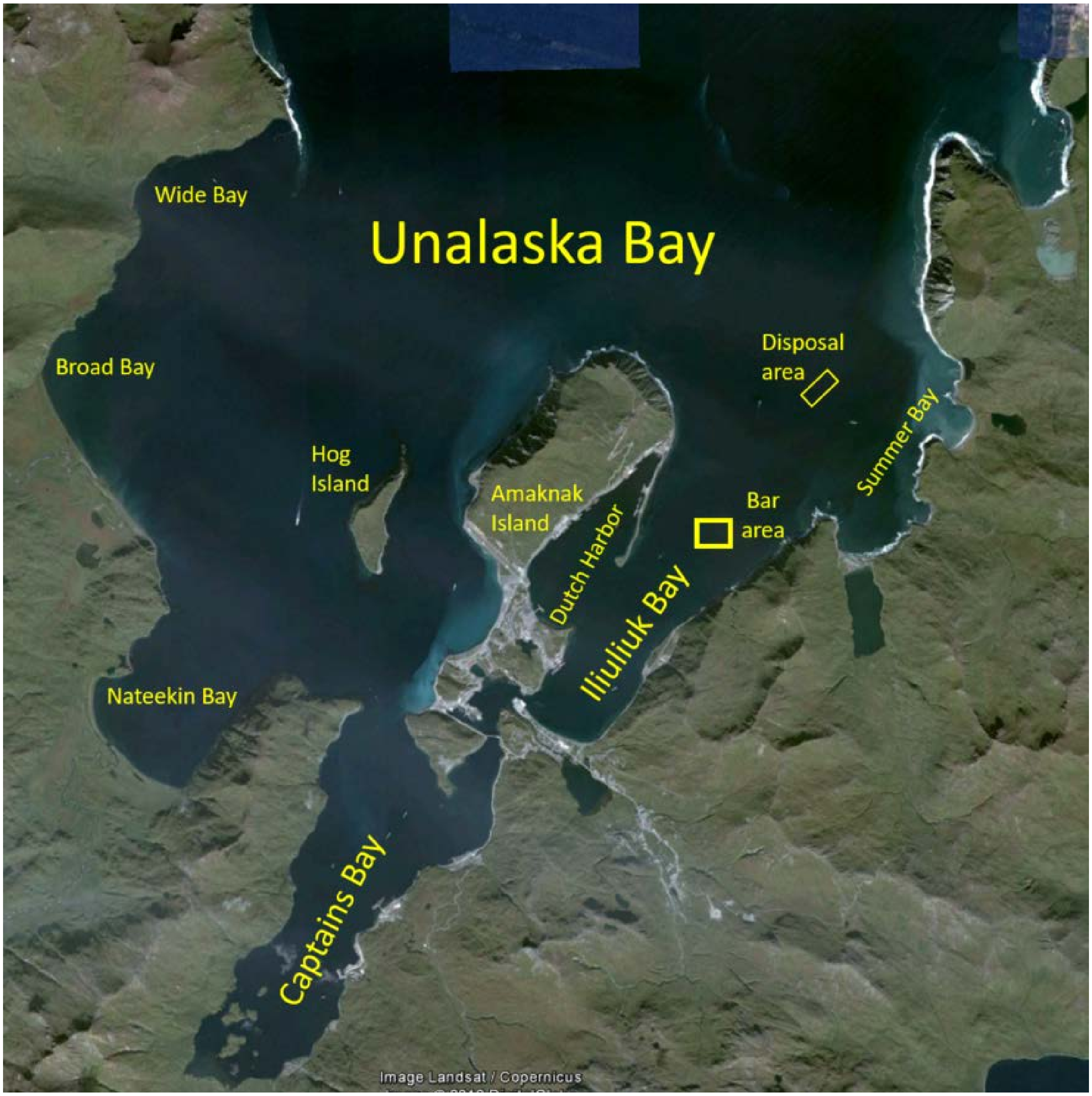

Figure 2. Dutch Harbor

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[1]. For more than 30 years,

[1] 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

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 recommended construction of a 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, U.S. Army Corps of Engineers. 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, discussed various concepts for expanding the Spit Dock in Dutch Harbor.

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

1995 Unalaska-Dutch Harbor Navigation Improvements: Supplement to the Northern Sea 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 non-Federal entity agreed to share costs of further studies and construction so no further action was taken.

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

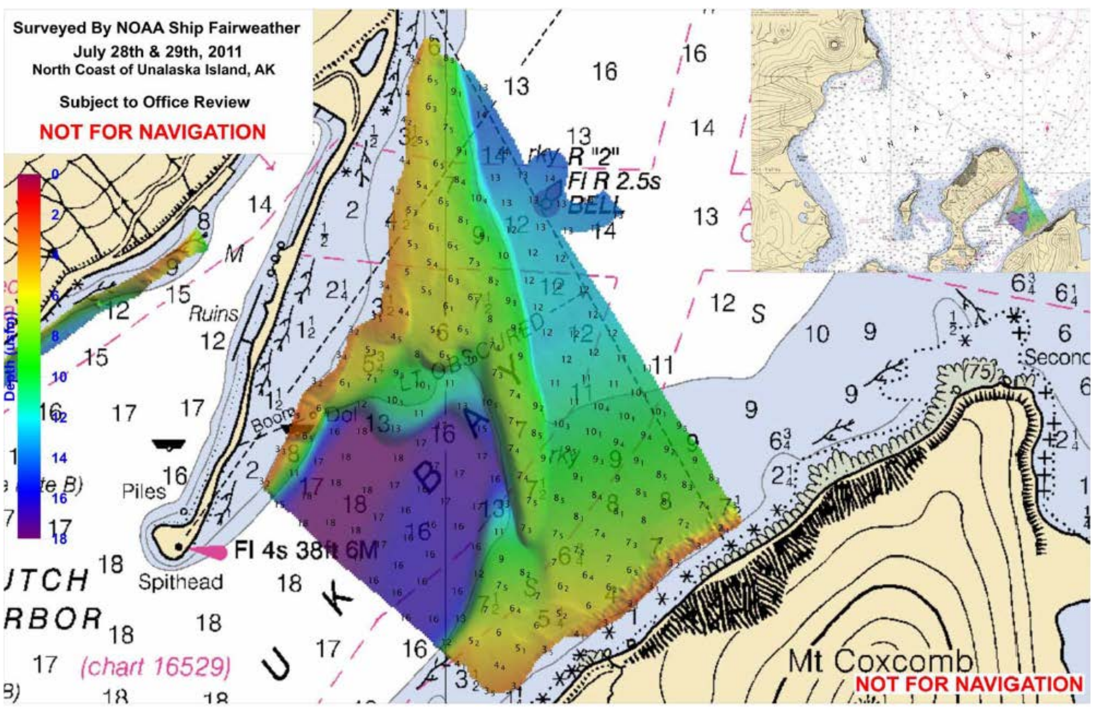

Figure 3. National Oceanic and Atmospheric Administration bathymetry of the shallow bar

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 Fiscal Year (FY) 2018 (October 2017) price levels and then converted to Average Annual Equivalent (AAEQ) values using the FY 2018 Federal discount rate of 2.750 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.

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 below (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 project related geophysical investigations, the Iliuliuk bar itself is believed to be a product of geological processes: a recessional glacial moraine. 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.

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.

In 2017, a marine geophysical survey investigation of Dutch Harbor was performed by eTrac Inc. (Figure 4). Historic nautical chart records show that the bar has existed for at least 80 years. 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).

A comparison is currently being made between the three historical NOAA surveys conducted in 1934, 1991, and 2011, and the eTrac Inc. survey conducted in 2017. Preliminary findings indicate that the area has changed little in nearly 100 years. The results generated will be used for estimating operation and maintenance dredging quanitities and reoccurance intervals.

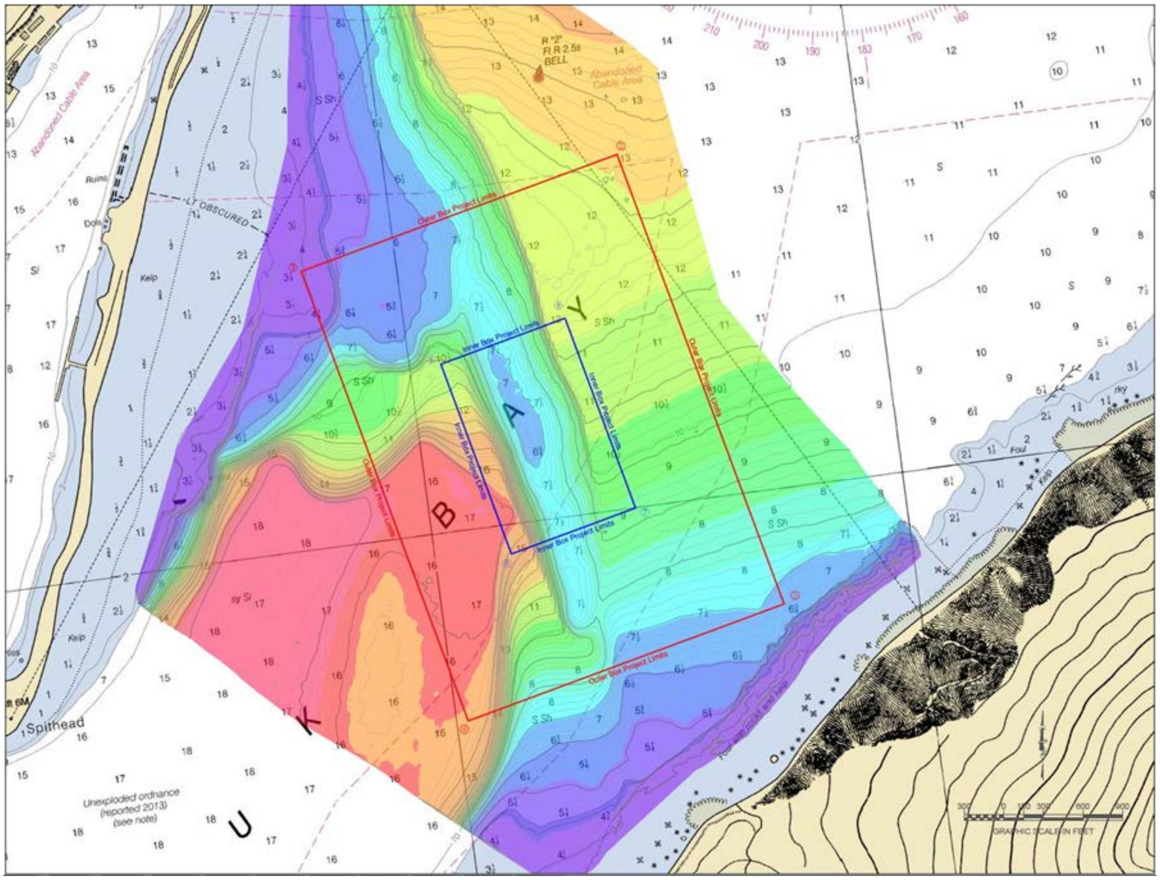

Figure 4. Dutch Harbor Marine Geophysical Bathymetric Survey

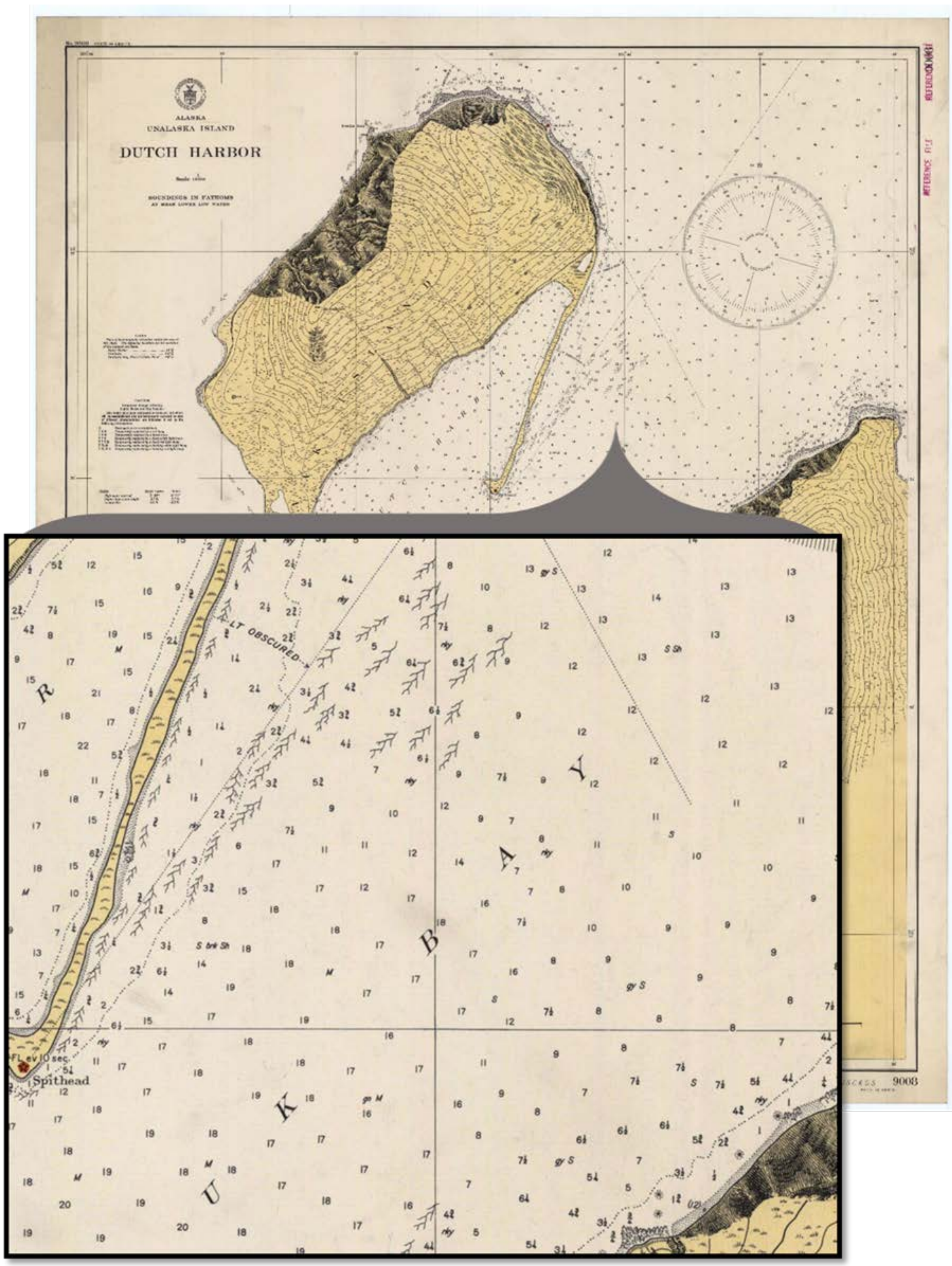

Figure 5. Historical Bathymetry of Dutch Harbor, 1937 (Survey, 2017)

The 2017 marine geophysical survey investigation indicates that the shoal consists of a dense, consolidated, glacial drift deposit overlying bedrock (R&M Consultants, 2017). The material is not expected to be rippable by a bulldozer in a terrestrial setting, which would necessitate drill and blast methods to be used followed by dredging to remove the material.

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.

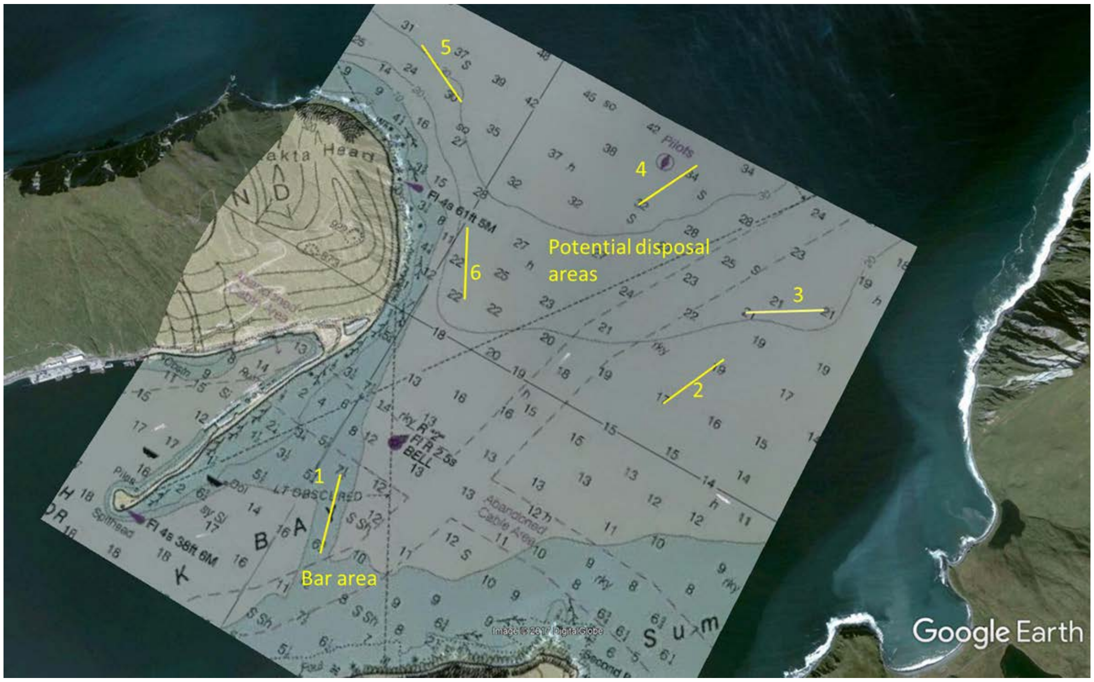

Figure 6. Potential Dredged Material Placement Areas

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. 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.

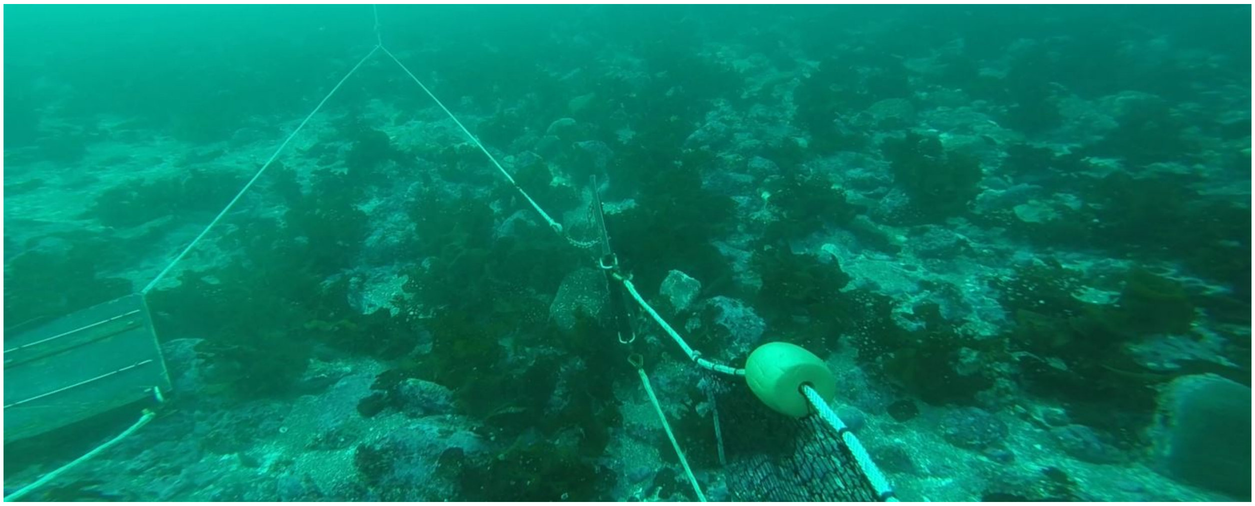

Figure 7. Bottom composition on the bar where dredging would occur. This photo was obtained with a camera mounted in a bottom trawl used for fish sampling.

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.

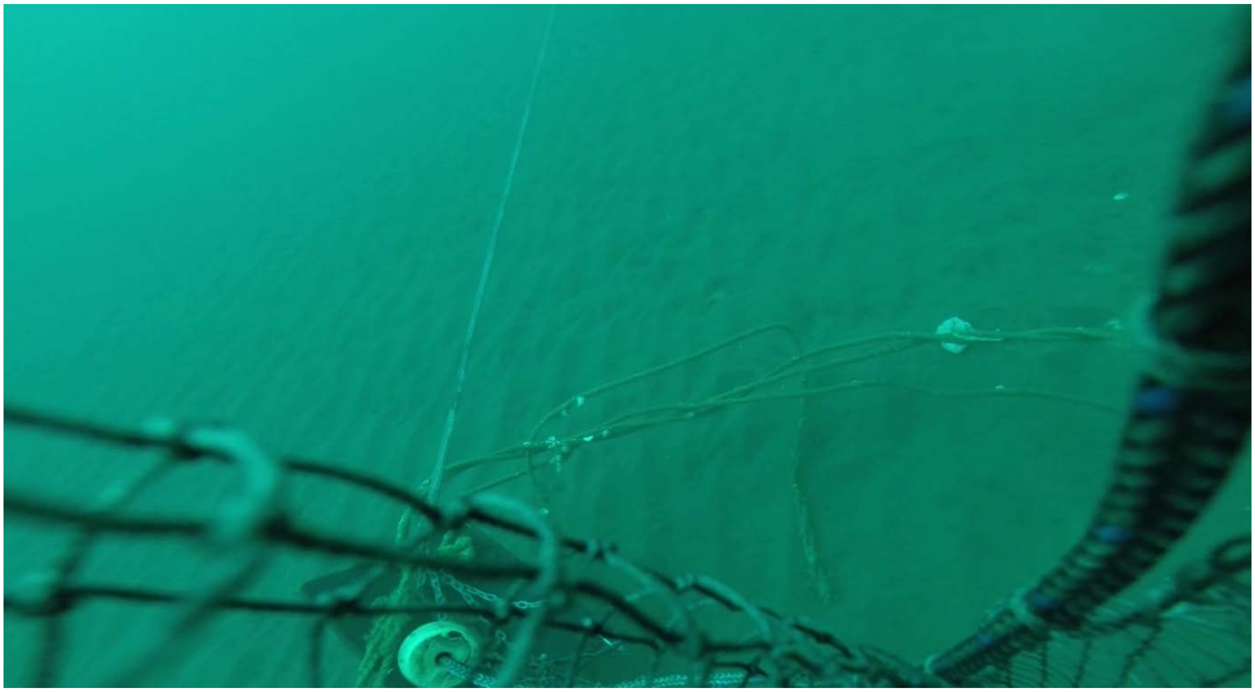

Figure 8. Proposed disposal site. This is sample site number 2 as shown in figure 6.

Figure 8 shows a sandy bottom with small sand waves characteristic of the bottom in the area of potential disposal sites 2 and 3. This photo was taken from video during a trawl when the net became entangled on some derelict fishing gear and the tow vessel was in neutral. This site is in approximately 120 feet of water.

Figure 9. Sediment Composition at Site 5

Coarse gravel and shell litter with some fines dominate the entire tract at site 5. This site was approximately 180 feet deep.

Figure 10. Potential Disposal Site 6

Potential disposal site number 6 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.

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).

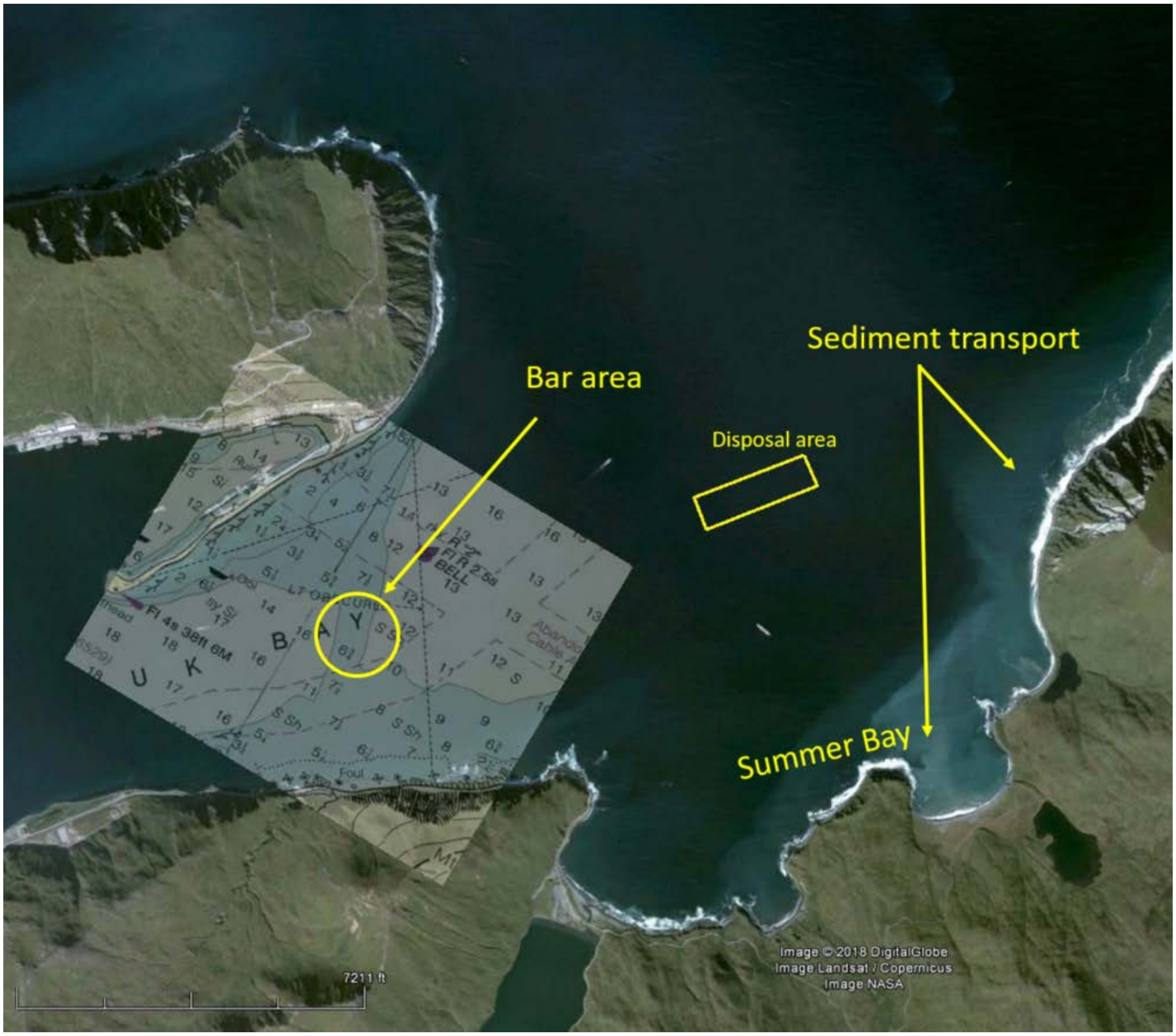

Figure 11. Bar area and evidence of littoral drift of sediment from Summer Bay. The disposal area shown is the proposed disposal area for this project (sample area 2 from figure 6). The bottom in the proposed disposal area is sandy.

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 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 Marine Species and Habitat

3.2.1.1 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 12.

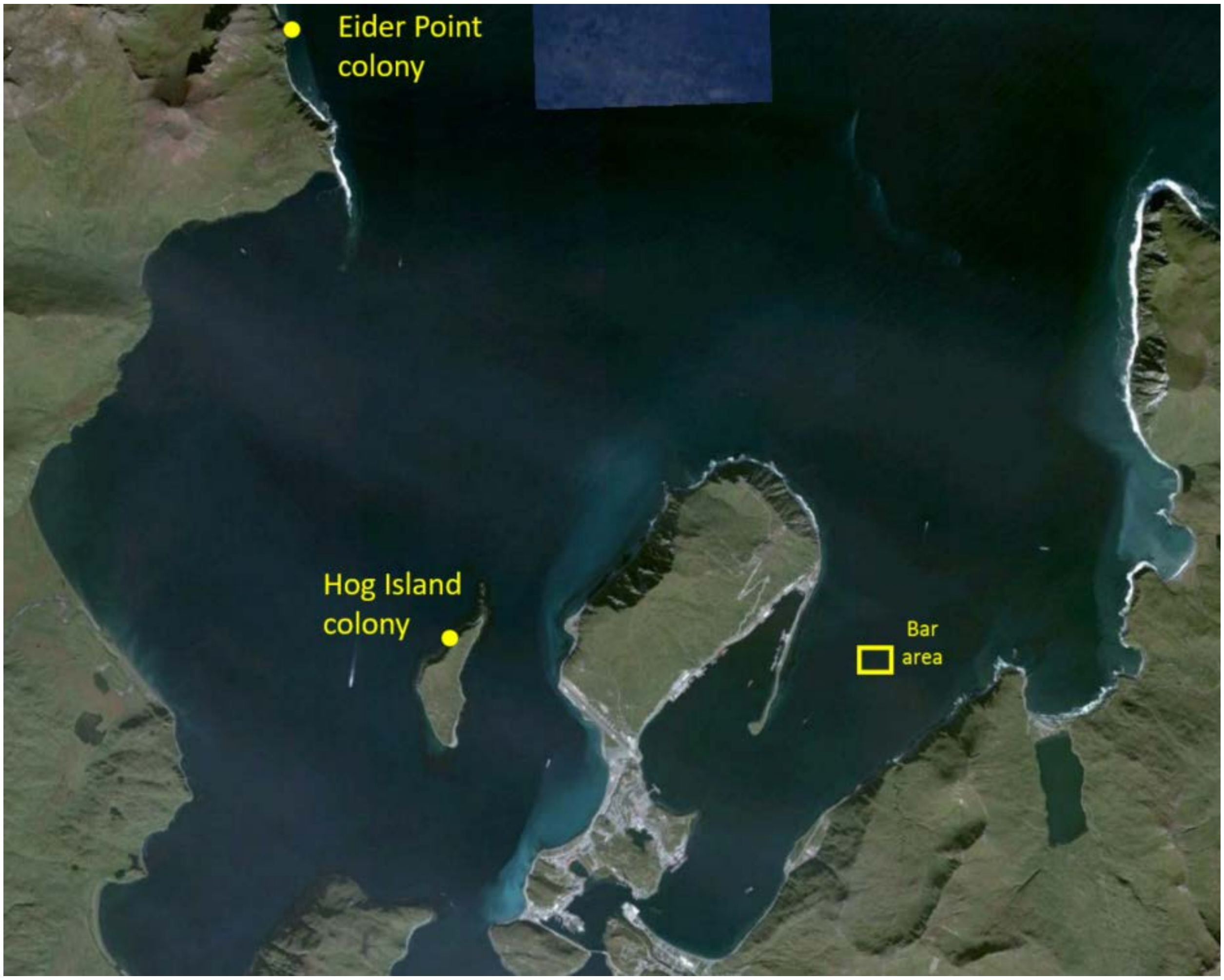

Figure 12. Seabird colonies in the vicinity of the project site.

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.

Waterfowl. 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 3. All notes on species are based on extensive surveys in the area by USACE biologists since January 2000. Additional species have been observed inconsistently or in small numbers.

Table 3. 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 Iliuiluk Bay in small numbers, often solitary or in small groups.
Pacific loon	*Gavia pacifica*	Occasionally observed in Iliuiluk Bay in small numbers, often in small groups.
Yellow-billed loon	*Gavia adamsii*	Uncommon and typically only observed in small numbers.

3.2.1.2 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.

3.2.1.3 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 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*.

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.

3.2.1.4 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%) 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)*.

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.

3.2.1.5 Marine Mammals

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 typically only 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 13). The three haulouts are small and can support from one to approximately 12 seals and are only usable during calm conditions.

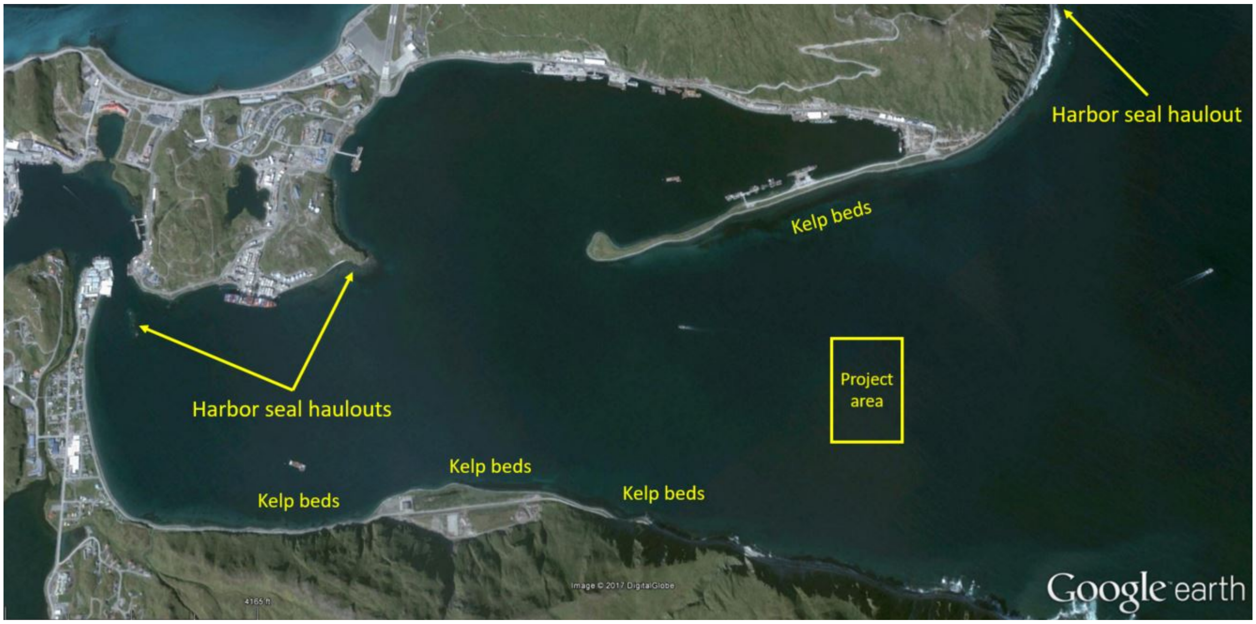

Figure 13. Harbor seals can sometimes be found hauled out in small numbers at three different locations in Iliuliuk Bay. They can be found anywhere along the shoreline, but are more commonly seen near kelp beds.

Northern sea otters *(Enhydra lutris kenyoni)* are common in Iliuliuk Bay as well as the larger area of Unalaska and are usually found near shore where they forage near kelp beds, especially bull kelp (*Nerocystis luetkeana*) and dragon kelp (*Eularia fistulosa*). Sea otters can also be found along the entire coastline of Iliuliuk Bay, even when kelp beds are absent, and often occur in the industrialized area inside the Dutch Harbor spit. Sea otters rapidly deplete sea urchins and other preferred prey in areas where the otters feed intensively. This depletion of sea urchins can allow kelp abundance to rebound over time, setting the stage for a resurgence in sea urchins and thus another localized increase in sea otter abundance. Accordingly, sea otter abundance tends to fluctuate at specific areas over time and often varies between seasons, with sea otters often moving to more remote areas of Unalaska Bay or beyond in the summer. Sea otters frequent the same kelp beds identified in figure 13 as harbor seals, though they do not haul out of the water anywhere in Iliuliuk Bay. Sea otters often haul out of the water on both the rubble mound breakwater and the floating breakwaters at the Carl E. Moses small boat harbor in Captains Bay.

Northern sea otters are listed as *Threatened* under the Endangered Species Act and their status is discussed further in Section 3.2.2.

Steller sea lions *(Eumetopias jubatus)* are common year round in Iliuliuk Bay and the larger Unalaska Bay. They are often observed as individuals, though sometimes are encountered in larger groups when they use both the nearshore habitat and more open water areas of Iliuliuk and Unalaska Bays. Steller sea lions are discussed further in Section 3.2.2.

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 have collectively spent over 3,000 hours between April 2017 and January 2018 observing the entirety of Dutch Harbor and the portion of Iliuliuk Bay from the spit south to Front Beach and have not observed 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.

Humpback whales *(Megaptera novaeangliae),* are common in Unalaska Bay from April through October, with peak numbers in late summer and early fall. While they exist throughout Unalaska Bay and Iliuliuk Bay, they are most often observed on the west side of Unalaska Bay and the outer portion of this bay from Amaknak Island northward towards where the mouth of the bay meets the pass.

Several other species of whales including finback (*Balaenoptera physalus*), Minke (*Balaenoptera acutorostrata*), 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.

3.2.2 Threatened & Endangered Species

Short-tailed Albatross

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 has 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.

Survey sectors for the USACE surveys are shown in figures 14 and 15. Waterfowl and marine mammal surveys were conducted by USACE biologists during the winters of 2000-2001, 2001-2002, 2002-2003 and 2005-2006. Survey sectors with high eider densities are shown in yellow in figure 15. Of these sectors, sector 19 was by far the greatest. During the multi-year survey period, a total of 3,656 Steller's eiders were observed during 61 individual survey periods in sector 19. The maximum number observed during any of these surveys in sector 19 was 542 Steller's eiders. The mean number of Steller's eiders per survey in sector 19 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.

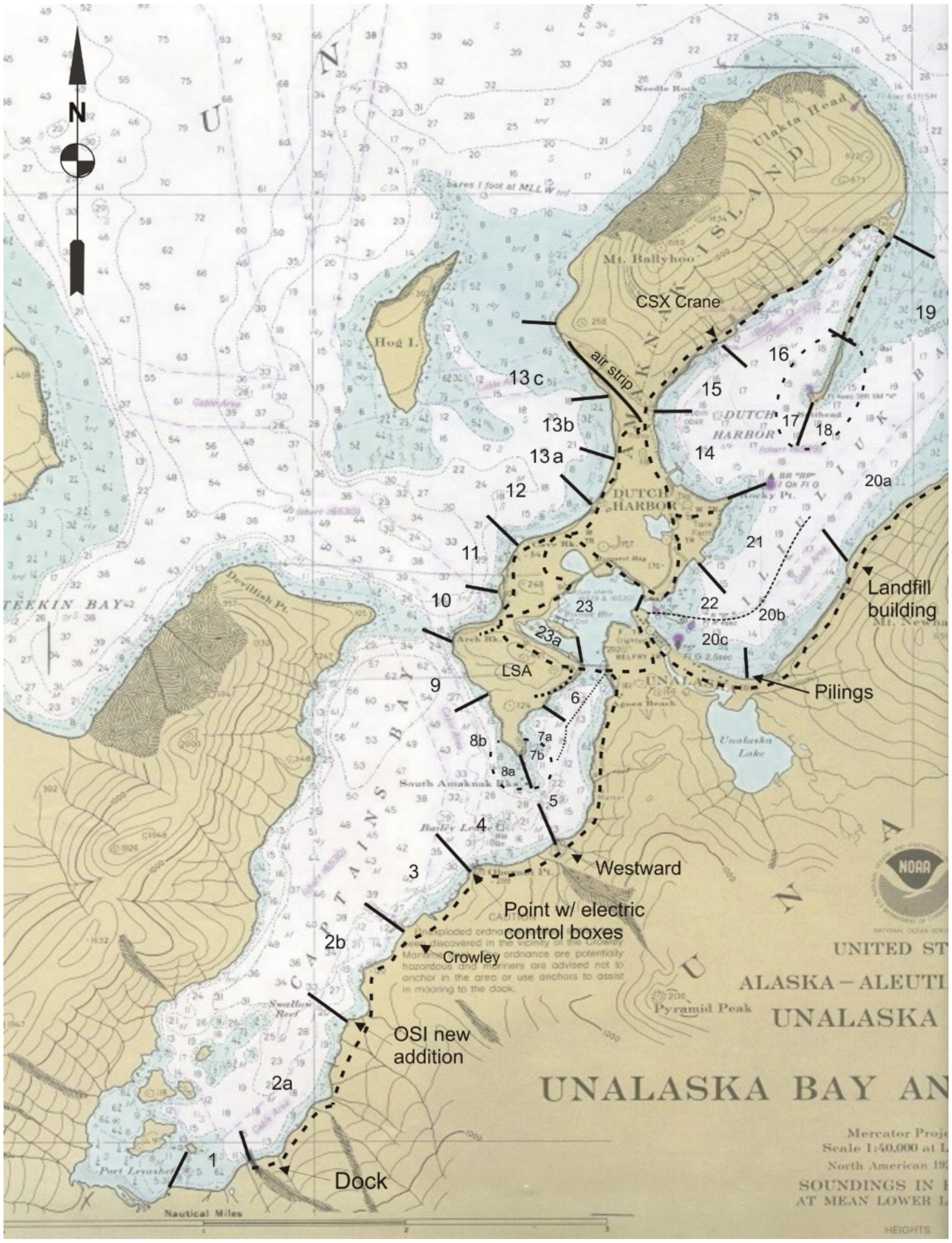

Figure 14. Survey sectors for the USACE surveys for a previous harbor project. The proposed dredging is adjacent to sector 19. The dredging would take place farther offshore in habitat that is not utilized by Steller's eiders.

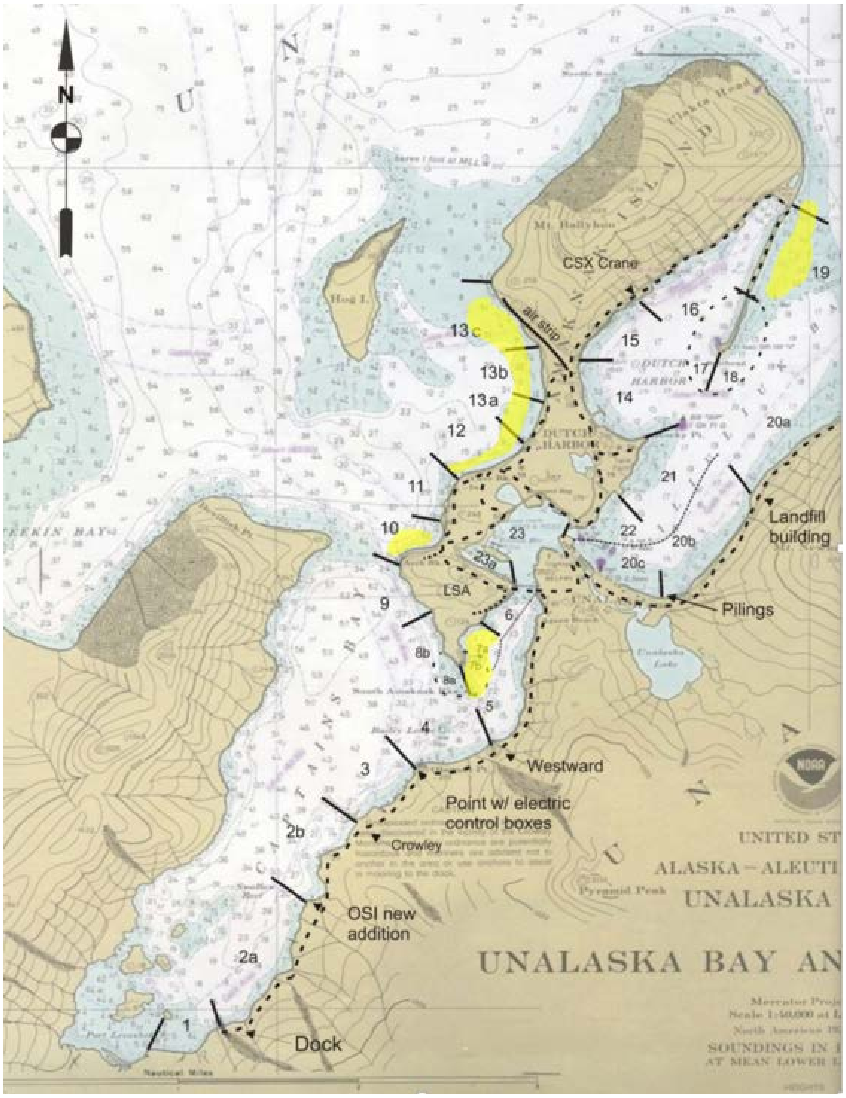

Figure 15. Highlighted areas show sectors, including sector 19, that consistently were used by large numbers of Steller's eiders. The proposed dredging project is located farther offshore in sector 19 and does not overlap an area used by Steller's eiders.

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.

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 16 and in table 4. 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 4.

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.

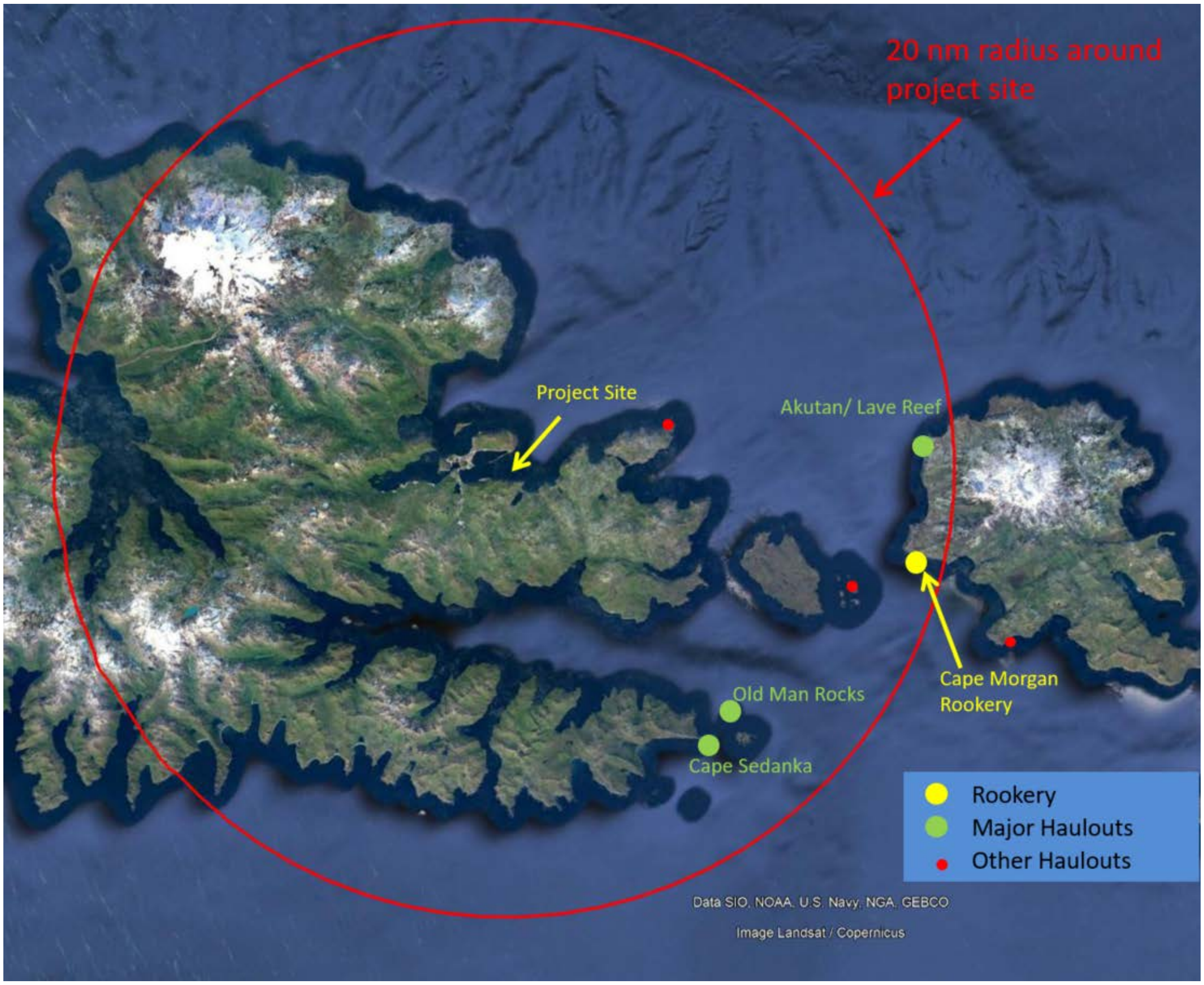

Figure 16. Steller sea lion rookeries, major haulouts, and other haulouts in the Dutch Harbor area. A 20-nautical mile zone is drawn around the project site for simplicity, but could also be drawn around the major haulouts or rookeries since the 20-nautical mile zones around both rookeries and major haulouts are designated as critical habitat.

Table 4. 2014 Summer sea 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 USACE winter surveys in Dutch Harbor, but they were not abundant. Single animals were observed on occasion in sector 19. 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 17. More recent surveys have not detected large aggregations in these areas or elsewhere in Dutch Harbor.

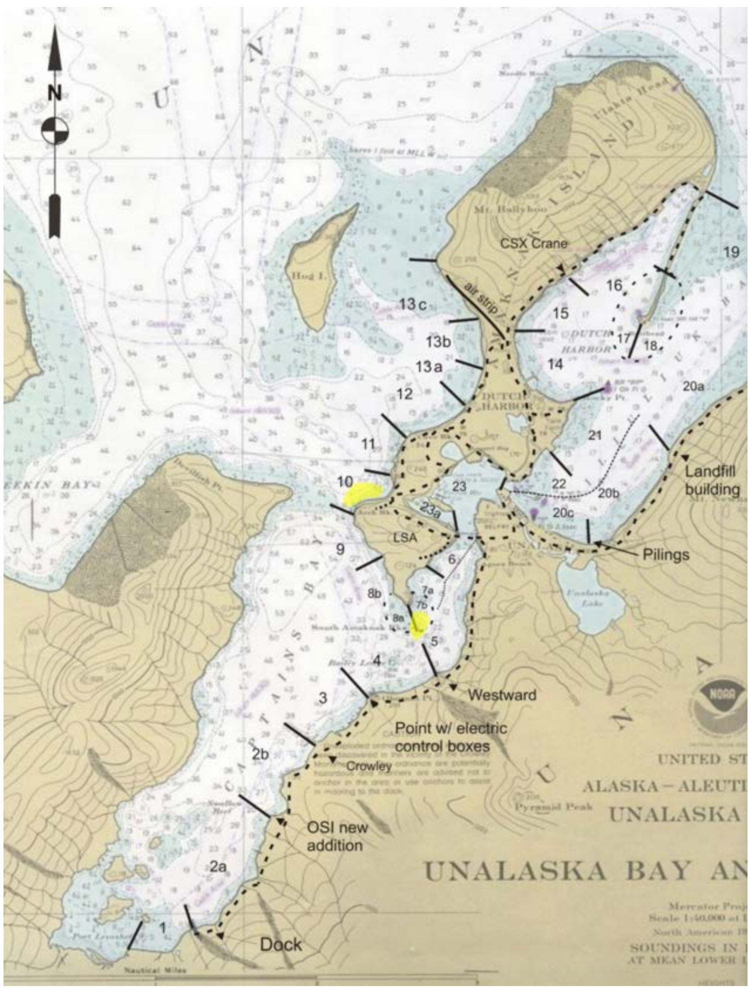

Figure 17. Common Steller sea lion aggregation areas during winters from 2000-2006.

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 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).

Sea otters are commonly observed year round along the spit (Sector 19) where large kelp beds are present. It is typical to see approximately three 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 (i.e. sectors 14-17). Otters were only occasionally observed in Captains Bay and were rare south of the airport (sectors 10-13c). Beginning in winter 2014-2015, a raft of sea otters was consistently observed at the tip of Expedition Peninsula near the boundary of sectors 23 and 23a from late winter to early spring. These otters moved out of the area by late spring or early summer. This is notable because this was not a typical area to observe otters between 2000 and 2012. A December 2016 winter survey by USACE biologists documented a dramatic change from the typical observations in the previous 15 years. Approximately 140 sea otters were observed in the 7a/7b sectors. Of these, about 20 were hauled out on the floating breakwater in the new boat harbor and 25 were hauled out on the armor rocks on the outside of the rubble mound breakwater. Additionally, there were at least 20 additional sea otters throughout the survey area including elsewhere in Captains Bay and south of the airport (sectors 10-13c). Similar observations were made on subsequent winter surveys in February and March 2017. It is possible that this is part of change in abundance and habitat use patterns from a timeframe before the USACE surveys began in 2000. A local resident who routinely works along the waterfront in Unalaska stated that he had not seen so many otters, especially in Captains Bay, since he moved to the area in the mid-1980s (Glenn Olson, personal communication, December 2016).

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.

<u>Status</u>

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 feedings areas (Aleutian Islands, Bering, Chukchi, and Beaufort Seas) that overlap with the action area of the UMC dock replacement project, 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 5). Critical habitat has not been designated for the western North Pacific or Mexico DPSs of humpback whales.

Table 5. Probability of encountering humpback whales from each DPS in the North Pacific Ocean (columns) in various feeding areas (rows). Adapted from Wade *et al.* (2016).

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.			

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%), Mexico DPS (11.3%), and western North Pacific DPS (4.4%) (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.

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).

<u>Critical Habitat</u>
Critical habitat has not been designated for the humpback whale.

Several other species of whales including finback (*Balaenoptera physalus*), Minke (*Balaenoptera acutorostrata*), 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, but are very unlikely to be encountered near the project site.

3.2.3 Special Aquatic Sites

"Special Aquatic Sites" are a subset of waters of the United States that are large or small areas 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 EPA's Section 404 (b) (1) guidelines. This results in increased protection under the Section 404 permit process including a more stringent alternative analysis and emphasis on avoidance and mitigation.

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 and is therefore not considered a special aquatic site.

3.2.4 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.

USACE has been in coordination with NMFS since the planning phase of this project. Nearshore habitat within the area encompassing the bar and potential nearby dredged material disposal sites consist of areas of rapidly increasing depth, with rocky reef, cobble, and soft, sedimentary bottom features that are interspersed with stands of kelp. NMFS aided USACE in designing targeted benthic fish and invertebrate surveys that have helped to characterize seasonal biological utilization of the Iliuliuk bar and five proposed dredged material disposal sites.

Once USACE's survey data are analyzed and developed into a final product, USACE shall coordinate with NMFS and ADFG to refine its proposed project by selecting a single dredged material disposal site. The preferred dredged material disposal site will exhibit the lowest habitat complexity and biological utilization to minimize overall impacts as a result of the project.

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.[2] Table 6 provides population data for the United States, Alaska, and Unalaska over the last 20 years for which data is available.

Table 6. The City of Unalaska Geographical Area – Total Population Data, Source: 2000 Census, 2010 Census, 2016 Population Estimate; Census Bureau

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

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 7 displays racial demographics for the Nation, State, and Unalaska.

Table 7. Population by Race, Source: 2011-2015 American Community Survey 5-Year Estimates, Census Bureau

	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%

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

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 8 lists occupational data for the study area.

Table 8. Civilian Labor Force by Occupation, Source: 2011-2015 American Community Survey 5-Year Estimates, Census Bureau

	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%

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 9 shows the number of households in Unalaska, Alaska, and the United States and the percentage of each by their respective incomes.

Table 9. Family Income, Source: 2011-2015 American Community Survey 5-Year Estimates, Census Bureau

	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%

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 18 - 20). Those are the focus of this economic analysis since only those docks handle vessels large enough to benefit from a deeper bar crossing.

Figure 18. Deep Draft Docks in Unalaska-Dutch Harbor

Figure 19. 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 20. Unalaska Marine Center (UMC) and USCG Dock

The Unalaska Marine Center (UMC) and the U.S. Coast Guard (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 extending 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.

The city has recently completed construction of a capital improvement project to improve the deep-draft dock facilities at the UMC. The project replaced sections of dock between the UMC and the USCG station. They also extended the rails used by the container cranes to cover this area. This will provide an additional 220 feet to the 1,000-foot capacity used by the pilots. Based on the city's FY 2017-FY 2021 Capital and Major Maintenance Plan (CMMP), engineering and design began in 2014 and was completed in FY 2017. Construction was budgeted for completion in FY 2018. According to the city, construction was completed in December 2017.

In addition, a proposed dredging project will create a constant 45-foot depth across the entire dock. Based on the city's CMMP, funds have already been spent for preliminary designs of the work, and funding requests have been budgeted for FY 2020 construction. By comparison, the dredging costs are approximately 5 percent of the costs of the completed dock expansion project. This dredging project has a high likelihood of being completed by 2020.

The Delta Western Fuel dock is the final deep draft dock that is considered 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 with a 30-foot draft. There are currently no plans to expand or deepen the dock.

3.3.4 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 are sources of food for al1 members of the community of Unalaska. Activities include recreational sport fishing and other activities regulated by the Alaska Department of Fish and Game, recreational wildlife viewing, bicycling, hiking, boating, and fishing.

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.

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 (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.

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).

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 10). 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 10. Pounds of subsistence take by resource from ADF&G 1994 representative survey.

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

3.4 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.

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.

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, eleven bombers and six fighter planes from the Japanese aircraft carrier *Ryujo* flew over Amaknak Island, dropping 14 bombs on Fort Mears, destroying five buildings. On June 4, 17 bombers and nine 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).

3.5 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 21 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.

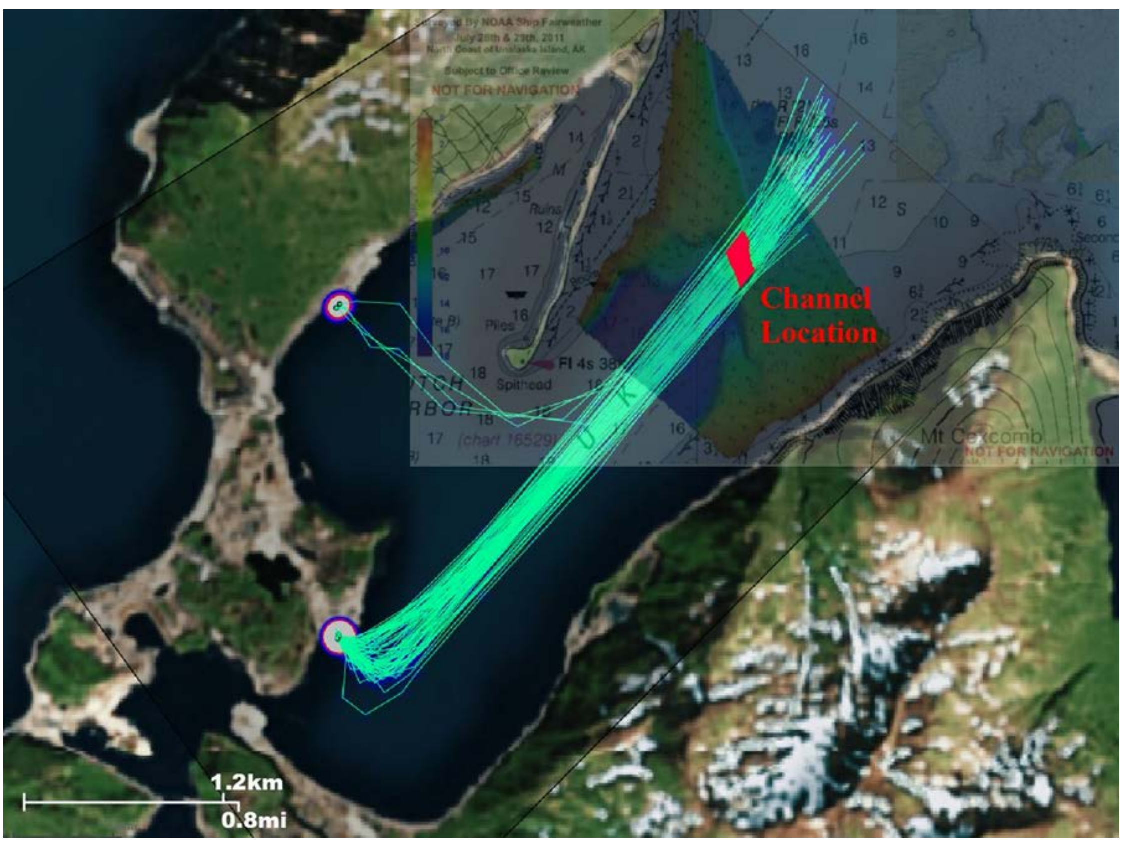

Figure 21. Ship Tracks for Lightly Loaded Vessels

Under calm conditions lacking any waves, vessels with a draft up to 38 feet may safely cross the bar to and from Dutch Harbor without delay during approximately 92 percent of the annual tidal stages. 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 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[3].

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 22) are sometimes unable to seek refuge, repair, and evacuations that they would otherwise seek in Dutch Harbor. Such instances are poorly documented, however. 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.

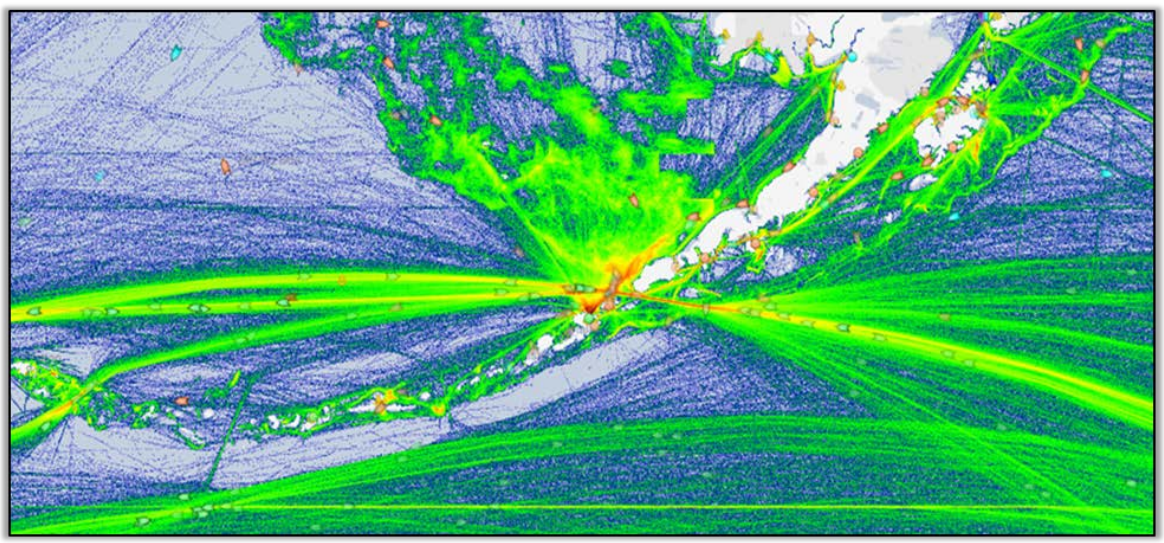

Figure 22. Vessel Traffic Transiting the Great Circle Route and in the Bering Sea 2016 (marinetraffic.com, accessed 1/17/2017)

---

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

Marine geophysical data collected following the Alternatives Milestone 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, there only are three major terminals serving deep draft ships (Figure 18). 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.

3.6 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 23). 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. If dredging depths are less than -58 feet MLLW, some of these objects may no longer be within the anticipated area of dredging.

Raw geophysical survey data from this study has been provided to Naval Facilities Engineering Command (NAVFAC), who has agreed to analyze the data using unique algorithms that potentially can provide some clarification on whether or not certain ferrous targets are MEC. Results of the NAVFAC analyses will likely be available for use during Pre-Engineering and Design Phase (PED). Use of a remotely operated underwater vehicle (ROV) to visually observe and further characterize identified seafloor targets of concern may will be required during PED to further reduce this uncertainty.

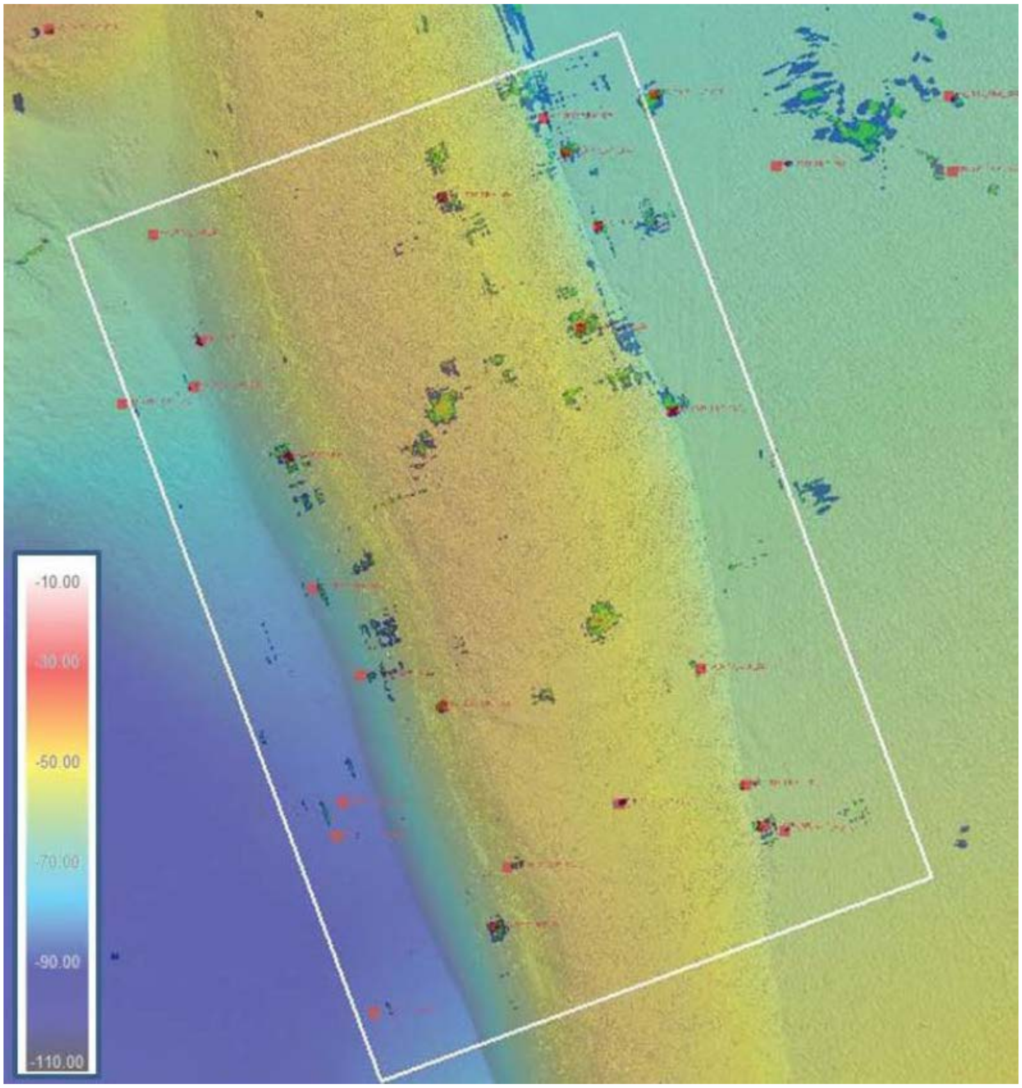

Figure 23. Geophysical Survey Data. Surface objects with ferrous returns are indicated in red. Six of these occur within the potential area of deepening.

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 0.80 feet due to isostatic rebound being greater than sea level rise, and a high end estimate of a rise of 1.17 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 of 0.80 foot 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 0.8 foot to mitigate the effects of this 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.

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.

4.2.2 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 graph below shows the last 3 years of historical volumes and forecasted volumes of bulk and containerized cargo over the study period.

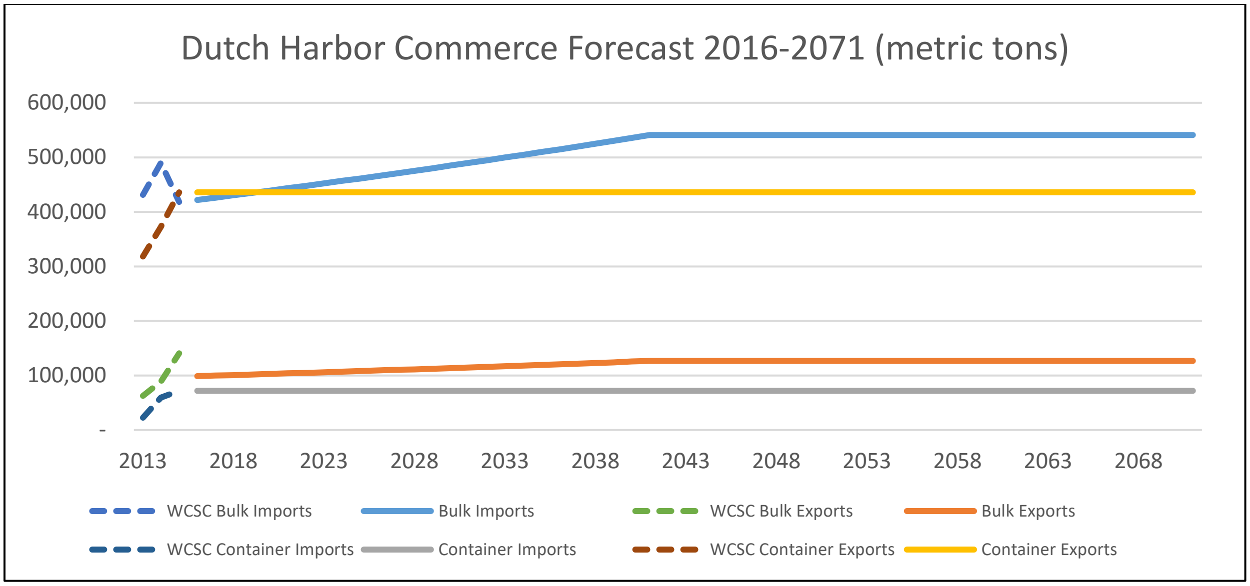

Figure 24. Historical Commerce and Forecasted Commerce Levels (Metric Tons)

4.2.3 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 following table displays the total number of vessel calls (not transits) in 2015 by vessel class that were developed for the base fleet.

Table 11. 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	78
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	186
- Feedermax	617-729	93.5-99.7	27,130-39,266	34.4-39.4	37
- Panamax	856-965	105.8	50,201-68,411	41.3-44.7	22
- Baby Post Panamax	852-906	122.4-131.2	58,197-66,696	41.0-45.9	166
- Post-Panamax	909	131.9	67,987	46.0	34
Total					535

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 underkeel 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 MSC to form the 2M ALLIANCE, 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 Aleutian Islands 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. Under calm conditions lacking any waves, vessels with a draft up to 38 feet may safely cross the bar to and from Dutch Harbor without delay during approximately 92 percent of the annual tidal stages. Vessels with a draft exceeding 38 feet are likely to experience additional 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 are required to wait either at dock or the pilot buoy.

4.3 Planned Development

The city has recently completed 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. According to the city, construction of the dock improvements was completed in December 2017. In addition, a proposed dredging project will create a constant 45-foot depth across the entire dock. This dredging project has a high likelihood of being completed by 2020, hence a depth of 45 feet at the UMC dock was assumed in our analyses. There is no future development planned at the APL dock, which will remain at a depth of 45 feet.

4.4 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. As a response to this, the city plans to deepen the UMC Dock from 39 feet to 45 feet. An increasing proportion of the future fleet of container vessels will not be able to access Dutch Harbor without deepening the bar.

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.

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.

4.5 Biological Environment

The biological environment surrounding the United States' most important commercial fisheries harbor is remarkably dynamic. 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.

4.6 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.

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 12) were initially identified during the charette.

Table 12. Potential Management Measures

Divert to alternate port	Canal through island
Vessel draft limitations	Deep draft dock outside bar
Improved airport/air freight	Anchorage areas outside bar
Change to barges from ships	Underwater reef
Traffic Management System	Breakwater
Improvement to alternate emergency vessel site	Lightering station
New harbor location	Cargo station
Deepening	Shore protection
Off-shore rig	Draw bridge to allow access from south
Pipeline for fuel	

These measures were screened to eliminate those not practical to meet the identified goals or not implementable as part of a USACE project. Screening resulted in the identification of five measures to be carried forward for consideration to be incorporated into alternative plans. The five screened measures are:

1. Deepening the bar in 2-foot increments beginning at -42 feet MLLW
2. Constructing a new deep draft dock facility
3. Constructing a new port facility
4. Implementing a traffic management system (non-structural)
5. Implementing vessel draft restrictions (non-structural)

5.4 Preliminary Alternative Plans

5.4.1 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.

5.4.2 Alternatives Eliminated from Detailed Analysis

Upgrade Captains Bay. 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 UXO 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. 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.

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. 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.

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.

5.4.3 Alternatives Carried Forward

The No Action Alternative and deepening the bar in 2-foot increments beginning at -42 feet MLLW were carried forward for further consideration.

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 Deepening the bar in 2-foot increments beginning at -42 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. Therefore analysis began at 46.0 feet. 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 below.

Table 13 shows the estimated dredging quantities for the depths analyzed.

Table 13. Potential Dredging Quantities

Dredge Depth		Dredge Surface Area		Dredge Quantity	
Feet	*Meters*	*Square Yards*	*Square Meters*	*Cubic Yards*	*Cubic Meters*
-46	-14.0	6,400	5,400	12,000	9,200
-48	-14.6	16,600	13,900	27,500	21,000
-50	-15.2	24,200	20,200	47,200	36,100
-52	-15.8	28,300	23,700	61,600	47,100
-54	-16.5	34,900	29,200	95,200	72,800
-56	-17.1	38,600	32,300	122,000	93,300
-58	-17.7	40,700	34,000	153,600	117,400
-66	-20.1	87,200	72,900	333,200	254,800

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 25). Pertinent information on the design vessel is shown in table 14.

Figure 25. APL Holland

Table 14. Design Vessel Dimensions

	Design Vessel - APL Holland	
	Feet	*Meters*
Length Overall	909.6	277.3
Beam	131.4	40.0
Design Draft	45.9	14.0
Vessel Draft	44.0	13.4

6.2 Without-Project Conditions

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 15 shows how the numbers of calls change for certain vessel classes over the period of study.

Table 15. 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	142	139	139
Feedermax	34.4-39.4	9	5	5
Panamax	41.3-44.7	11	7	7
Baby Post Panamax	41.0-45.9	162	135	135
Post-Panamax	46.0	1	10	10
Barge	24.3	9	5	11
Total		343	311	319

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 Feedermax, Panamax, and Baby Post-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).[4] 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 16. These are outputs of the HarborSym model for the without project condition.

Table 16. Average Vessel Cost per Vessel Class by Year in Without Project Condition

Vessel Class	2022	2032	2042
Aframax	$7,714	$7,645	$7,602
Tanker-MR2	$9,772	$8,682	$8,637
Tanker-Panamax	$4,830	$5,653	$5,008
Regional Feeder	$12,364	$12,258	$12,298
Feedermax	$8,003	$4,915	$4,998

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

Panamax	$21,504	$9,208	$9,046
Baby Post Panamax	$32,163	$31,951	$31,924
Post-Panamax	$61,874	$54,704	$54,670
Barge	$732	$753	$756

6.3 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 are being evaluated in this analysis 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 400 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 in accordance with their planned expansion project.

6.4 Alternative Plan Costs

6.4.1 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 2018 dollars.

6.4.2 Operations & Maintenance Costs

Assuming the deepest channel depth of 58 feet considered in this study, initial operations and maintenance dredging estimates are to remove 5 feet of sandy material (68,000 CY) every 15 years. This is an overly conservative estimate that actually exceeds initial construction dredging estimates for the recommended plan. It is anticipated that yet to be completed sediment transport analyses will indicate that maintenance dredging would be required less frequently and would remove less material. If true, this reduction in operation and maintenance costs will reduce the overall cost of the project. The overly conservative operation and maintenance estimates are included in our cost estimates at this time. These estimates were calculated using a fixed percentage of construction costs—44.3 percent. This percentage was based on the 68,000 CY assumed for maintenance dredging, as previously mentioned, divided by the 150,000 CY needed for the construction dredging of the 58-foot alternative. This results in estimated O&M costs that vary by alternative. Table 17 displays the ROM costs for each channel alternative.

Table 17. ROM Costs for all channel alternative (FY2018 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	$25,427,293
LERRS	$24,000	$24,000	$24,000	$24,000	$24,000	$24,000
OMRR&R	$8,942,651	$9,598,495	$10,239,628	$11,521,895	$12,232,075	$12,971,318
PED	$3,061,716	$3,061,716	$3,061,716	$3,061,716	$3,061,716	$3,061,716

6.4.3 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 FY18 Federal Discount Rate of 2.75 percent along with a period of analysis of 50 years (table 18).

Table 18. Average Annual Cost Summary Information per Alternative

Alternative	AAEQ Total Investment	AAEQ OMRR&R	Total AAEQ	Incremental AAEQ Costs
46ft Channel	$519,405	$331,244	$850,649	$850,649
48ft Channel	$668,404	$355,537	$1,023,941	$173,292
50ft Channel	$775,366	$379,285	$1,154,651	$130,710
52ft Channel	$989,291	$426,782	$1,416,073	$261,422
56ft Channel	$1,073,898	$453,087	$1,526,985	$110,912
58ft Channel	$1,141,416	$480,470	$1,621,886	$94,901

6.5 With-Project Benefits

Total annual project benefits were determined by calculating the average annual reduction in transportation costs for Unalaska-Dutch Harbor at FY18 price levels. Table 19 shows the average annual benefits generated by each alternative. The annualized transportation costs savings were calculated using the total reduction in vessel operating costs for each alternative evaluated, discounted to FY18 price levels using the Federal discount rate of 2.750 percent, over a 50-year period of analysis. See the Economics Appendix for more details.

Table 19. Annual Benefits by Alternative

AAEQ Transportation Cost Reduction Benefit by Alternative ($)	
Alternative	**AAEQ Transportation Cost Reduction Benefit**
46ft Channel	$2,156,914
48ft Channel	$2,801,315
50ft Channel	$2,736,616
52ft Channel	$2,598,457
56ft Channel	$2,594,332
58ft Channel	$2,594,332

6.6 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 20 shows the net benefits and BCR at each project alternative along with net benefits. The project that maximizes net benefits is the 48-foot alternative.

Table 20. Net Benefits and Benefit/Cost Ratio

Alternative	Total AAEQ Costs	Total AAEQ Benefits	Total Net Benefits	Benefit/Cost Ratio
46-foot Channel	$850,649	$2,156,914	$1,306,266	2.5
48-foot Channel	$1,023,941	$2,801,315	$1,777,374	2.7
50-foot Channel	$1,154,651	$2,736,616	$1,581,964	2.4
52-foot Channel	$1,416,073	$2,598,457	$1,182,384	1.8
56-foot Channel	$1,526,985	$2,594,332	$1,067,347	1.7

58-foot Channel	$1,621,886	$2,594,332	$972,447	1.6

6.7 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.

National Economic Development

The results of the NED analysis were discussed in the previous section with the 48-foot alternative maximizing net benefits.

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.

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.

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. The health and safety of those involved with deep-draft navigation in Dutch Harbor will benefit by increasing the margins of safety during harbor transits.

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 Tentatively Selected Plan for Study is the 48-foot channel alternative, based on its preference in the NED account. The table below shows a summary of the four accounts for all alternatives, with the Tentatively Selected Plan highlighted in yellow.

Table 19. 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
46-foot	$1,306,266 (2.5)	$850,649	Negative	Increased employment and income for the region and state	Beneficial
48-foot	$1,777,374 (2.7)	$1,023,941	Negative	Increased employment and income for the region and state	Beneficial
50-foot	$1,581,964 (2.4)	$1,154,651	Negative	Increased employment and income for the region and state	Beneficial
54-foot	$1,182,384 (1.8)	$1,416,073	Negative	Increased employment and income for the region and state	Beneficial
56-foot	$1,067,347 (1.7)	$1,526,985	Negative	Increased employment and income for the region and state	Beneficial
58-foot	$972,447 (1.6)	$1,621,886	Negative	Increased employment and income for the region and state	Beneficial

7 TENTATIVELY SELECTED PLAN*

7.1 Description of Tentatively Selected Plan

Based on the preliminary National Economic Development (NED) analysis, the Tentatively Selected Plan deepens the existing bar to -48 MLLW providing one-way access for vessels with a draft up to 44 feet during calm conditions with tides above 0 feet MLLW. Deepening will allow currently calling light loaded Post-Panamax vessels to travel over the bar with drafts loaded up to 44 feet. Current practice is for vessels to light load from point of origin to maintain an underkeel clearance of 4 feet to clear the bar. Figure 26 describes the channel depth parameters used in channel design. Feet allocated to each design parameter is listed on the right column.

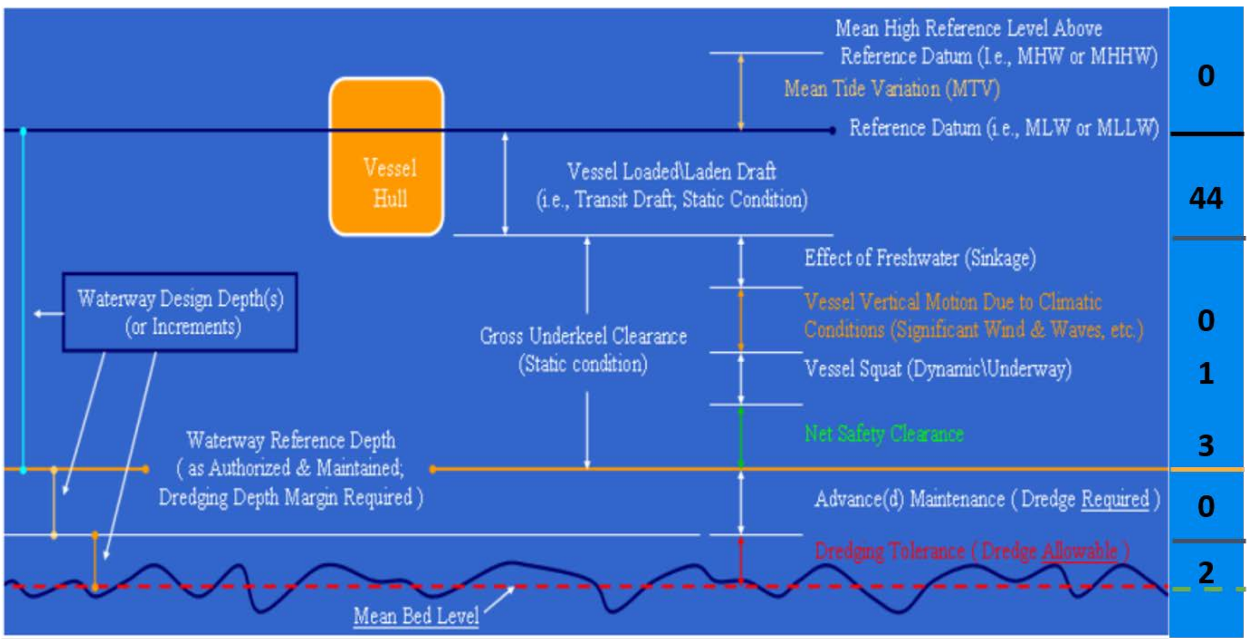

Figure 26. Channel Depth Design Parameters

An underkeel clearance of 4 feet has been assumed in the design of the deepened channel. Coordination with Alaska Marine Pilots indicated that this was the clearance required for safety under existing practices. Additional coordination regarding appropriate underkeel clearance is planned during ship simulation to occur in February 2018. As a result of this coordination, the underkeel clearance assumed in the design could change, impacting the design depth of the channel through the bar.

Initial estimates of deepening the channel to -48 feet MLLW would involve dredging approximately 27,540 cubic yards (CY) of sediment at an estimated cost of $15.8 million. This plan maximizes total net benefits and has a Benefit-to-Cost Ratio (BCR) of 2.7. These preliminary NED calculations will be further refined between the Tentatively Selected Plan and Agency Decision milestones.

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 21). The channel design is a straight channel 600 feet wide and approximately 400 feet long. Final design width and orientation of the channel are to be optimized based upon ship simulation testing to be conducted at the USACE Engineering Research and Design Center in late February 2018. 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.

Dredging equipment and procedures cannot provide a smoothly excavated bottom at a precisely defined elevation. Two feet of allowable over depth dredging was added to the target 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 -50 feet MLLW. Cross sections of the channel showing the dredged area and dredging tolerance are shown in Figure 26, with locations of where the cross sections are taken in Figure 27.

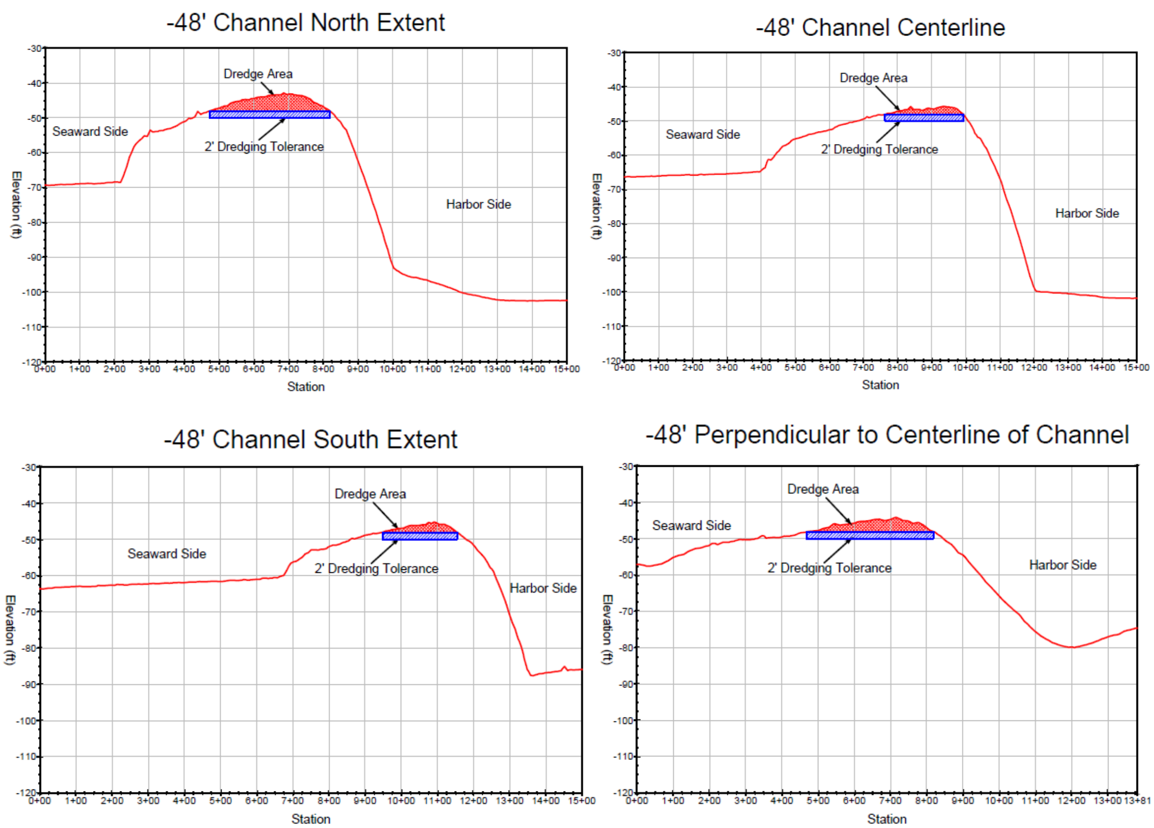

Figure 27. Profile View of Dredge Channel -48 feet MLLW Depth

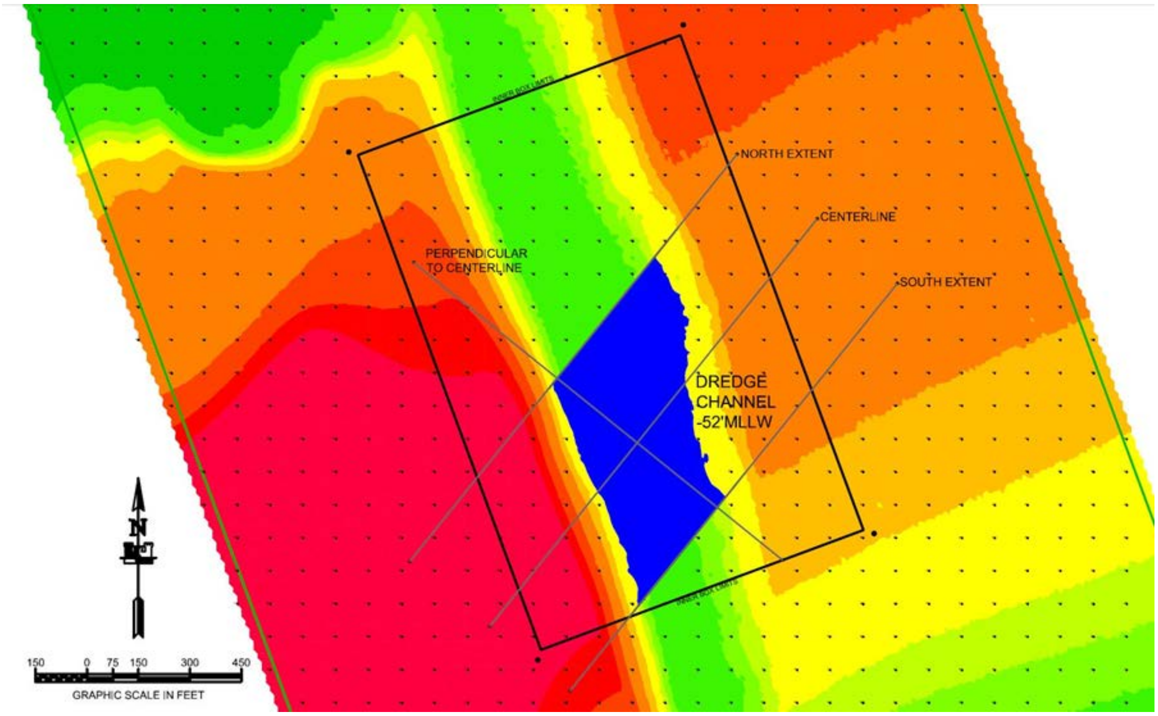

Figure 28. Plan View of Dredge Channel at -52 feet MLLW Depth

7.1.1 Plan Components and Construction of Tentatively Selected 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 28). The geotechnical investigation consisted of a comprehensive geophysical survey across the study area, with actual sampling of the moraine to take place during Preconstruction Engineering and Design (PED). 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. 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.

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.

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.

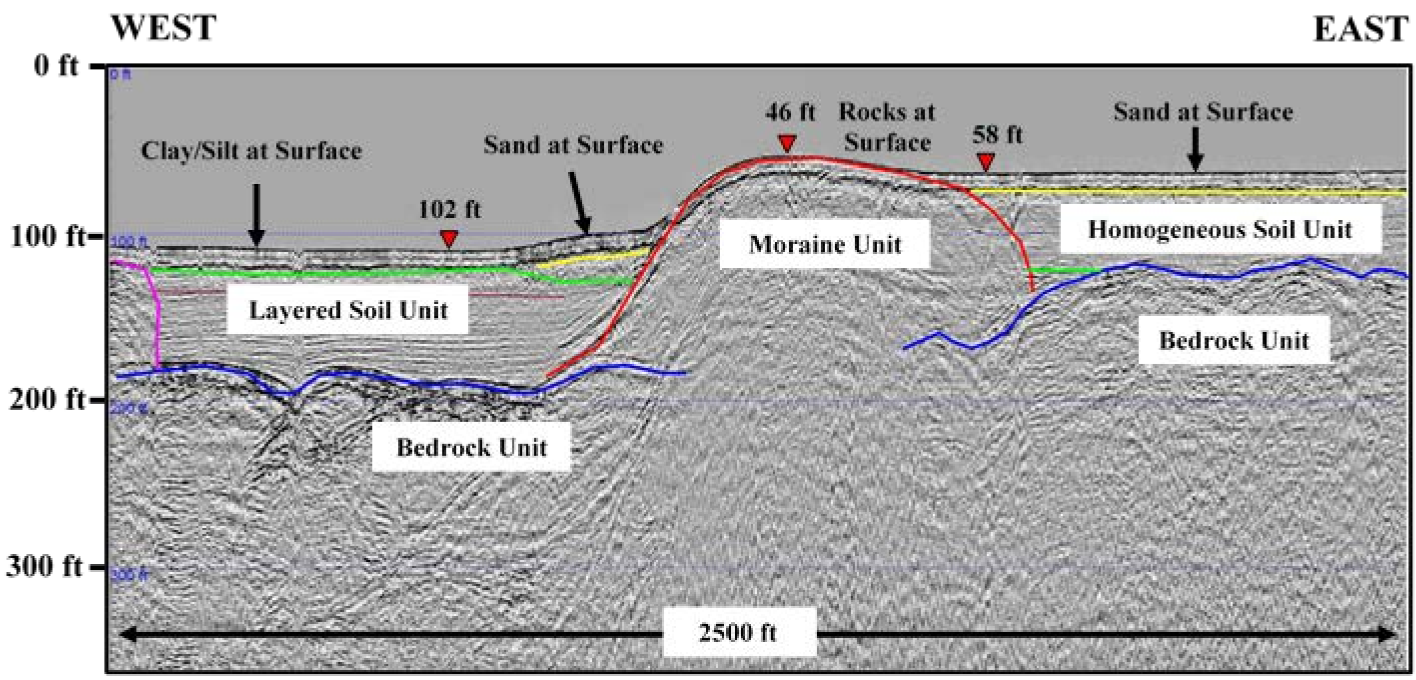

Figure 29. Stratigraphic Cross Section Drawn Perpendicularly Through Shoal

7.1.2 Operations & Maintenance

Initial estimates for maintenance dredging of the deepened channel assume that 5 feet of sandy material (68,000 CY) will be removed from the channel every 15 years. This estimate is based upon the deepest channel depth of 58 feet considered in this study. This is an overly conservative estimate that actually exceeds initial construction dredging estimates for the Tentatively Selected

Plan. It is anticipated that yet to be completed sediment transport analyses will indicate that maintenance dredging would be required less frequently and would remove less material. If true, this reduction in operation and maintenance costs will reduce the overall cost of the project. The overly conservative operation and maintenance estimates are included in our cost estimates at this time. Operation and maintenance requirements will be further refined prior to the Agency Decision Milestone (ADM).

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 placed 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 an incidental harassment authorization (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.

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 surveys 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.

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. Data requirements were identified and addressed with comprehensive environmental surveys and artful collaboration with regulatory agencies, field related subject matter experts, and social and tribal experts. Collaboration between stakeholders has transcended transparency as a united-team, singular-mission ethos has prevailed.

7.2 Real Estate Considerations

To be completed

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.

Ship simulation modeling to be performed in February 2018 at the USACE Engineering Research Design Center will be used to optimize the width and orientation of the design channel. Any changes could have minimal impacts upon costs and resultant changes in the BCR.

An underkeel clearance of 4 feet has been assumed in the design of the deepened channel. Coordination with Alaska Marine Pilots indicated that this was the clearance required for safety under existing practices. Additional coordination regarding appropriate underkeel clearance was planned during ship simulation that occurred in February 2018. As a result of this coordination, the underkeel clearance assumed in the design could change, impacting the design depth of the channel through the bar.

Maintenance dredging estimates included thus far are considered very conservative. It is anticipated that sediment transport analyses will indicate that maintenance dredging would be required less frequently and would remove less material. If true, this reduction in operation and maintenance costs will reduce the overall cost of the project.

An area of project specific risk includes underestimation of project costs in the areas of erosion control measures. These measures were estimated to mitigate possible wave-induced erosion at a beach near the project location. No detailed modeling has been done on the severity and probability of these waves in the project area to date, so conservative estimates for stone revetments were added as potential costs. These costs totaled $12,882,809 for each alternative. The impact of this cost increase on each alternative is shown in the table 21.

Future SBEACH modeling will investigate how waves entering Dutch Harbor will change with the proposed deepening at the bar. If it is determined that erosion could occur at front beach, erosion control methods will be further investigated. The likelihood of needing to do so is considered minimal.

Table 21. Benefit and Cost Analysis Including Erosion Control Measures (FY18 Dollars)

Alt	Net Benefits	Benefit-Cost Ratio
46-foot Channel	$829,074	1.6
48-foot Channel	$1,300,183	1.9
50-foot Channel	$1,104,773	1.7
54-foot Channel	$705,193	1.4
56-foot Channel	$590,152	1.3
58-foot Channel	$495,255	1.2

7.4 Cost Sharing

The following table provides preliminary cost sharing estimated based upon existing ROM cost estimates. These total costs listed in table 22 include escalation, so they are higher than the ROM cost totals previously stated in Section 6.4 that were used in the BCR calculation. The ROM costs in Section 6.4 also include Aids to Navigation (ATONS) and construction of local service facilities (LSF) in their totals. Per USACE guidance, these are not included in the cost apportionment calculation. These totals will also be updated between TSP and ADM.

Table 22. Estimated Cost Sharing for TSP

Description	Total	Federal	Non-Federal
Mobilization/Demobilization (deeper than -20FT MLLW and up to -50FT MLLW)	**$6,628,725**	**$4,971,544**	**$1,657,181**
General Navigation Features (deeper than -20FT MLLW and up to -50FT MLLW)	**$7,052,309**	**$5,289,232**	**$1,763,077**
LERR	**$24,000**	**$0**	**$24,000**
Project Cost Apportionment	**$13,705,034**	**$10,260,776**	**$3,444,258**
Aids to Navigation	**$29,102**	**$29,102**	**$0**
Local Service Facilities	**$2,041,650**	**$0**	**$2,041,650**
10% over time adjustment (less LERR)*		**($1,344,103)**	**$1,344,103**
Final Allocation of Costs	**$15,775,786**	**$8,945,775**	**$6,830,011**
***10% over time adjustment ($6,628,725 mob/demob + $7,052,309 GNF = $13,681,034 x 10% = $1,368,103 - $24,000 = $1,344,103)			

8 ENVIRONMENTAL CONSEQUENCES*

8.1 Water Quality

No-Action Alternative. While there are potential sources of water 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 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 the same impact on water quality. 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.

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 not have a significant impact on overall 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.

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 not be significant.

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 3.1.5.2. 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. This is another indication that the area mixes rapidly and the presence of a sediment plume will likely last for a very short time.

8.2 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 the same impact 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 (8.1.1).

8.3 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 only be around 5 months. Air quality impacts are not anticipated from this project.

8.4 Noise

No-Action Alternative. While there are potential 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 impacts on noise. 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 represent 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). Underwater blasting for this project is not expected to result in significant impacts to people or animals.

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 issuance of an Incidental Harassment Authorization by both agencies to fully permit underwater confined blasting for this project. Potential impacts from underwater confined blasting would be limited to behavioral disturbance; mortality or permanent impacts to hearing would not be allowed. Accordingly, impacts to marine mammals from this project would not be significant. 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.

8.5 Biological Resources

8.5.1 Marine Habitat

8.5.1.1 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. Seabird density in the dredging area is very low at this time of the year and vessel activity around the blast area would minimize the number of birds in the immediate area.

8.5.1.2 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.

8.5.1.3 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 selected site since they were similar in both substrate composition and low fish and invertebrate catch rates. Dredged material disposal at this site would cover the existing 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. Flat fish are minimally affected since they do not have a swim bladder, but many other fish, including salmon and herring could be killed. Construction of this project would ideally occur in spring to avoid abundant periods of salmon and herring, but this spring timing window may not be possible because of numerous outside forces that cause project delays. If blasting needed to occur during the summer months, the effects to large schools of herring could be mitigated by aerial surveys before the blasts to reduce the risk of impacts to herring. Salmon and other fish, which are not able to be effectively surveyed from the air in this area, could be surveyed with sonar prior to the blast to minimize the risk of impacting large numbers of fish.

8.5.1.4 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.

Action Alternatives. All of the action alternatives (different dredging depths) would have similar impacts on marine mammals. Potential impacts to habitat include temporary displacement 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 is the greatest potential source of impacts to marine mammals. Confined underwater blasting impacts marine mammals primarily due to the rapid changes in water pressure that accompany the shock wave from the blast. Blasting would not be allowed in a near field zone where permanent impacts (e.g. hearing loss) or lethal impacts would be anticipated. A much larger zone, possibly up to 7 kilometers outside of this lethal/permanent zone, would be where behavioral effects (disturbance) would be anticipated. These effects are not anticipated to be significant and 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 in 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. Coordination subsequent to the issuance of an IHA will be undertaken to complete the Endangered Species Act consultation process.

8.1.5.5 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.

8.5.2 Threatened & Endangered Species

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 adversely affected by this alternative.

Action Alternatives. All of the action alternatives (different dredging depths) would have similar impacts on threatened and endangered species. Potential impacts to habitat include temporary displacement during construction and alteration of habitat.

Steller's eiders would not be impacted since they only are present in Dutch Harbor between November and March, so they would be out of the area prior to spring construction. The dredged area would not overlap with habitat used by Steller's eiders, so there would be no impact to their habitat when they return the following fall. This disposal area is well beyond their dive depth of approximately 35 feet, so there would be no impact to Steller's eiders or their habitat in the dredged material disposal areas.

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

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 without additional details as the design details are developed.

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. 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. 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. Long delays between the charges being ready and actually detonated are undesirable because longer water exposure times increase the risk of misfires. With an IHA 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 IHA, formal consultation under the Endangered Species Act is required to assess the impacts of implementing the IHA on threatened and endangered Species since the IHA is actually issued under the Marine Mammal Protection Act.

The consequence to threatened and endangered marine mammals is that they will be harassed by non-lethal (i.e. behavioral) disturbance during multiple blasting events over an approximately 90-day period of blasting. This harassment will be authorized by IHAs from both NMFS and USFWS as well as formal consultation under the Endangered Species Act prior to completion of the PED phase. There is an established permit process for confined underwater blasting and there will be no significant impacts to threatened or endangered species as long as the project proceeds under the terms of the IHAs and Endangered Species Act consultations.

8.5.3 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.

8.5.4 Essential Fish Habitat

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.

Action Alternatives. All alternatives (different dredging depths) would have similar impacts on EFH. Confined underwater blasting and the subsequent excavation and deposition of those blasted materials will affect EFH by three particular methods: first, it will temporarily reduce habitat complexity at the Iliuliuk Bar site; second, it will increase habitat complexity at the preferred sandy-substrate disposal site; third, it will blanket adjacent areas with finer sediments, temporarily reducing foraging, sheltering, or spawning habitat.

The biologically encrusted hard bottomed surface at the Iliuliuk Bar will necessarily be disrupted by confined underwater blasting. Subsequent removal of the sediments, in an attempt to reach dredging project depths will expose previously buried substrate features. Because the newly exposed substrate characteristics are expected to physically resemble the previously existing substrate, the loss of habitat complexity is expected to be temporal in nature. These newly exposed materials are expected to be colonized by microorganisms, algae, invertebrates, and eventually fishes in relatively rapid fashion.

By adding three-dimensionality to a previously two-dimensional site, the disposal of biologically encrusted hard bottomed materials at the preferred sandy bottomed disposal area should increase overall habitat complexity. Already inoculated with encrusting microorganisms and invertebrates, habitat quality should increase rapidly in the disposal area and subsequently facilitate utilization by other, larger organisms. Conversely, some fishes may be immediately attracted to the site by invertebrates exposed by the dredging and disposal actions themselves.

Finer sediments are expected fall out of suspension during the confined underwater blasting and subsequent material positioning activities. These sediments are expected to settle over portions of habitat immediately adjacent to the project action. If deep enough, fine sediment depositions have the capacity to smother eggs, reduce habitat complexity, reduce invertebrate populations, impact algae growth, and force fishes from preferred habitats.

Impacts to EFH associated with USACE's proposed navigational improvement project will be disruptive to EFH at the Iliuliuk Bar and the dredged material disposal site. USACE contends that these impacts will be temporary in nature, but may ultimately increase habitat complexity and utilization at the dredged material disposal site. There would be no significant impacts to EFH from the dredging alternatives.

8.6 Cultural Resources

No-Action Alternative. The no-action alternative would have no impact on known cultural resources.

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 23). 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 APE (Figure 7).

Table 23. 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 29). The net was intended to prevent

Japanese submarines from entering into Illiuliak 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).

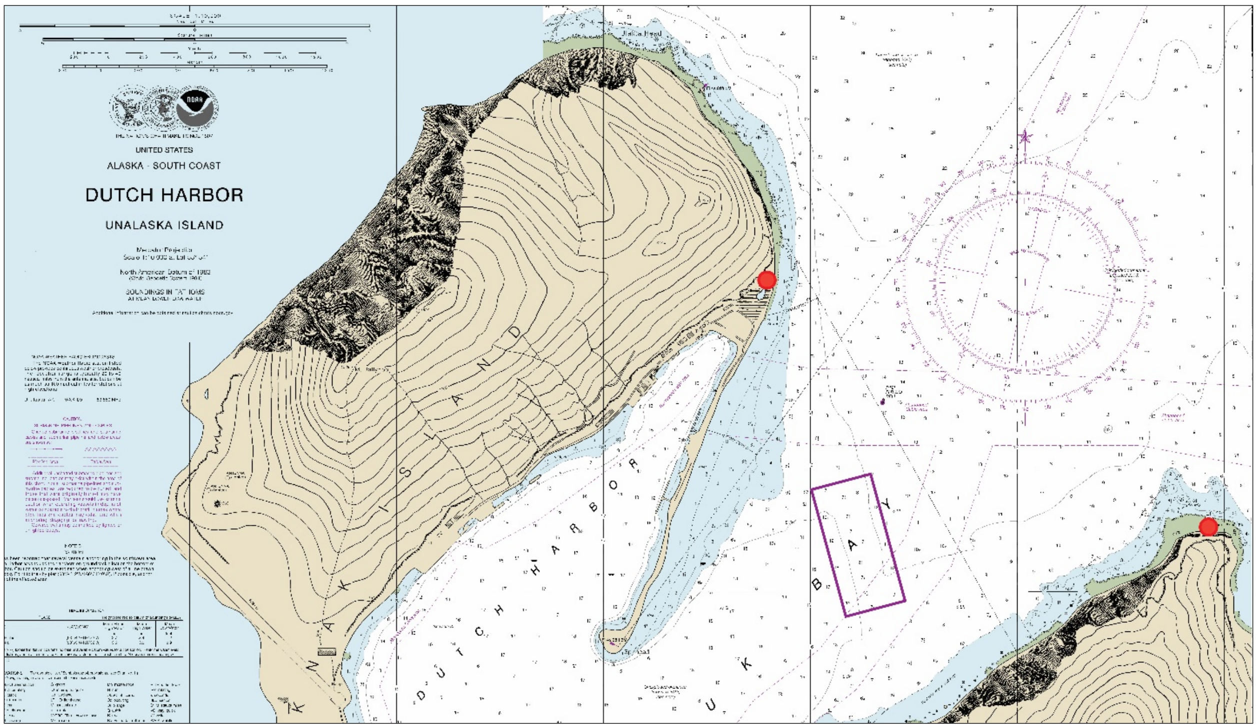

Figure 30. Map showing end points of World War II anti-submarine net (red dots) and approximate dredging area purple.

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 Ulatka Head (NOAA 2017). An additional search of the Bureau of Ocean Energy Management (BOEM) database (Table 24) shows 21 shipwrecks within a 35-mile radius of Dutch Harbor. No shipwrecks are known to occur in the APE.

Table 24. 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. Any changes to the proposed plan will require further consultation with the SHPO.

8.7 Environmental Justice and Protection of Children

No-Action Alternative. The no-action alternative would have no effect on the environment and people would not be subjected to any impacts. Children would not be adversely affected by this alternative.

Action Alternatives. None of the alternatives (i.e. different channel depths) considered in detail would cause more than transitory effect or minor inconvenience to people, including low-income or minority people gathering fish or marine mammals. The proposed action would not affect the potential of any population to be exposed to contaminants. The proposed action would not increase exposure to safety hazards, traffic in residential areas, noise, or lights to any population, including minority or low-income people.

Dredging and disposal would not occur near schools, playgrounds, or large daycare centers. There are no residences near the project site. All the alternatives are consistent with Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks, and none would increase danger to children.

8.8 Unavoidable Adverse Impacts

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.

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 demersal fishes 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 an unquantifiable 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, USACE anticipates unavoidable adverse impacts to marine mammals as a result of the necessity to utilize confined underwater blasting to prepare material at the Iliuliuk Bar site for dredging. Currently, these unavoidable adverse impacts to marine mammals are difficult to quantify because details of the blasting effort have yet to be developed, and comprehensive marine mammal presence/absence data for Iliuliuk Bay has yet to be collected. This information is to be assembled during PED and will allow development of the most appropriate mitigation strategies. USACE developed this plan early in its planning process and engaged NMFS Protected Resources Division, Anchorage, and is in the preliminary stages of planning field data collection efforts and the acquisition of an IHA.

8.9 Cumulative & Long-term Impacts

No Action Alternative. Cumulative and long-term 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 so in the absence of increased large, deeper-drafting vessel traffic. Arguably, the most important aspect of maintaining ecological integrity in this particular setting is limiting or totally preventing the inadvertent release of petroleum products and other persistent aquatic environmental contaminants. Currently, some vessels forego dockside fueling in order to maintain a draft that facilitates safe passage over the bar. Once past the bar, these vessels lighter fuel from smaller attendant vessels. This action is widely recognized as a potential pathway for the environmental release of petroleum products and is expected to continue in the long term.

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.

Action Alternative. Cumulative and long-term impacts upon the natural environment as a result of navigational improvements at Dutch Harbor are not expected at this time to include impacts associated with increased deeper-drafting ship traffic, more frequent fuel resupply efforts, or large-scale land-based infrastructure expansion and modernization initiatives.

Conversely, cumulative and long-term 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.

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.

If future commerce levels are sustained at current rates, what is presently unclear is how marine mammals and other wildlife might respond to a deeper channel entrance at Iliuliuk Bay. There may be no notable difference in the existing behavior of marine mammals or other wildlife in Iliuliuk Bay that currently regularly displace to avoid collision or disruptive bow waves or wake from incoming and outgoing vessels. Similarly, these animals may learn to avoid the dredged channel area's location as it will incur the heaviest traffic rates. Taken cumulatively, marine mammals and other wildlife may not forego foraging and loitering in the waters of Iliuliuk Bay due to a predictable and sustained frequency of disruptions.

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. Long-term and cumulative impacts recognize this threat as decreasing in likelihood as some of the more risk-prone activities such as fuel lightering are curtailed out of lack of necessity. Regardless of this reduction in risk, spill response plans for Iliuliuk Bay and its surrounding waters should be updated to reflect the changes in real-time operations.

8.10 Summary of Mitigation Measures

Mitigation for this project would 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 near zone (lethal or permanent impacts) and 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 are being assessed as part of the study. Additional public feedback will be solicited during concurrent review of the Draft Integrated Feasibility Report to be initiated in March 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.

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
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 acquisition of an Incidental Harassment Authorization (IHA) from NMFS
Marine Mammal Protection Act	PC	Pending acquisition of an IHA
Magnuson-Stevens Fishery Conservation and Management Act	PC	Pending EFH effects determination
Fish and Wildlife Coordination Act	PC	Pending concurrence. 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	PC	
National Historic Preservation Act	PC	Upon completion of Section 106 coordination
National Environmental Policy Act	PC	Upon FONSI signature
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 Tentatively Selected Plan and expressed their support during the TSP milestone meeting conducted on January 18, 2018.

10 CONCLUSIONS & RECOMMENDATIONS

10.1 Conclusions

To be completed

10.2 Recommendations

To be completed

11 REFERENCES

Alaska Department of Fish and Game (ADF&G). 1994. Harvest Data and Reports, Unalaska. Online document, http://www.adfg.alaska.gov/sb/CSIS/index.cfm?ADFG=commInfo .summary, accessed January 22, 2018.

Alaska Department of Fish and Game (ADF&G). 2001. Subsistence Fishing: Bering Sea/Aleutian Island Area. Online document, http://www.adfg.alaska.gov/index.cfm?adfg= ByAreaSubsistenceBeringAleutians.main, accessed January 22, 2018.

Alaska Department of Fish and Game (ADF&G). 2008. The Subsistence Harvest of Harbor Seals and Sea Lions by Alaska Natives in 2008. Technical Paper No. 347.

Alaska Department of Fish and Game (ADF&G). 2012. Alaska Subsistence Salmon Fisheries Report. Online document, http://www.adfg.alaska.gov/index.cfm?adfg=fishing Subsistence.main, accessed January 22, 2018.

Alaska Department of Fish and Game (ADF&G). 2017. Alaska Subsistence and Personal Use Salmon Fisheries 2014 Annual Report, Technical Paper No. 427.

Alaska Heritage Resources Survey (AHRS). 2017. AHRS Database. Alaska Office of History and Archaeology.

Allen, B.M and R.P. Angliss. 2010. Alaska marine mammal stock assessments, 2009. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-206, 276 p.

Au, W. W. L., A. A. Pack, M. 0. Lammers, L. M. Herman, M. H. Deakos, and K. Andrews. 2006. Acoustic properties of humpback whale songs. Journal of the Acoustical Society of America 120:1103-1110.

Au, W.W. L. 2000. Hearing in whales and dolphins: An overview. Pages 1-42 *in* W.W. L. Au, A. N. Popper, and R.R. Fay, editors. Hearing by Whales and Dolphins. Springer-Verlag, New York.

Bettridge, S., Baker, C.S., Barlow, J., Clapham, P.J., Ford, M., Gouveia, D., Mattila, D.K., Pace III, R.M., Rosel, P.E., Silber, G.K. and Wade, P.R., 2015. Status Review of the Humpback Whale (Megaptera novaeangliae) under the Endangered Species Act. NOAA Technical Memorandum NMFS. NOAA-TM-NMFSSWFSC-540. California: US Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center.

Black, Lydia. 2004. *Russian in Alaska, 1732-1867*. University of Alaska Press.

Bureau of Ocean Energy Management (BOEM). 2011. Alaskan Shipwrecks Table. Online document, https://www.boem.gov/Alaska-Coast-Shipwrecks/, accessed January 17, 2018.

Clark, C., W. T. Ellison, B. Southall, L. Hatch, S. M. Van Parijs, A. S. Frankel, D. Ponirakis, and G. C. Gagnon. 2009. Acoustic masking of baleen whale communications: potential impacts from anthropogenic sources. Page 56 Eighteenth Biennial Conference on the Biology of Marine Mammals, Quebec City, Canada.

Community Database Online. 2010. Community Information. Online document, https://www.commerce.alaska.gov/dcra/DCRAExternal/community/Details/bc972abc-3475-4cab-bf2f-df84f7741efe, accessed January 22, 2018.

Corbett, Debra, and Michael Yarborough. 2016. The Aleutian Tradition: The Last 4,000 Years. In *The Oxford Handbook of the Prehistoric Arctic*. T. M. Friesen and O. K. Mason, eds. Pp. 607-629. Oxford University Press.

Davis, Richard, Knecht, Richard, and Jason Rogers. 2016. First Maritime Cultures of the Aleutians. In *The Oxford Handbook of the Prehistoric Arctic*. T. M. Friesen and O. K. Mason, eds. Pp. 279-302. Oxford University Press.

Denfeld, Colt. 1987. The Defense of Dutch Harbor, Alaska: From Military Construction to Base Cleanup. Defense Environmental Restoration Program, U.S. Army Corps of Engineers, Alaska District.

Doroff, A.M., J.A. Estes, M.T. Tinker, D.M. Burn, and T.J. Evans. 2003. "Sea otter population declines in the Aleutian archipelago." *J. Mammal*: 84(1):55-64.

Drewes, H., G.D. Fraser, G.L. Snyder, H.F. Barnett Jr. 1961. Geology of Unalaska Island and Adjacent Insular Shelf, Aleutian Islands, Alaska. Investigations of Alaskan Volcanoes, Geological Bulletin 1028-S.

Edds-Walton 1997. Acoustic communication signals of Mysticete whales. Bioacoustics 8:47-60.

Erbe, C. 2002. Hearing abilities of baleen whales. Atlantic report CR 2002-065. Contract Number: W7707-01-0828. Defence R&D Canada.

Faulkner, Sandra, Spude, Robert, and Erwin Thompson. 1987. Dutch Harbor: Naval Operating Base Dutch Harbor and Fort Mears, Unalaska Island, Alaska: Historic American Buildings Survey Recording Project Report. Unalaska Pride.

Federal Register. 2009. U.S. Fish and Wildlife Service, U.S. Department of the Interior. 50 CFR Part 17, 10 Vol. 74, No. 194. FWS-R7-ES-2008-0105. Endangered and threatened wildlife and plants; Designation of critical habitat for the southwest Alaska distinct population segment of the Northern sea otter. Final Rule. October.

Fleming, A. and Jackson, J., 2011. Global review of humpback whales (Megaptera novaeangliae). US Department of Commerce NOAA, National Marine Fisheries Service, Southwest Fisheries Science Center, editor. NOAA Technical Memorandum NMFS.

Frazer, L. N., and E. Mercado III. 2000. A sonar model for humpback whale song. IEEE Journal of Oceanic Engineering 25**:**160-182.

Fritz, L., M. Lynn, E. Kunisch, and K. Sweeney. 2008. "Aerial, ship, and land-based surveys of Steller sea lions (*Eumetopias jubatus*) in the western stock in Alaska, June and July 2005-2007." U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-183, 70 pp.

Fritz, Lowell W., et al. "Aerial and ship-based surveys of Steller sea lions (Eumetopias jubatus) conducted in Alaska in June-July 2013 through 2015, and an update on the status and trend of the western distinct population segment in Alaska." (2016).

Garshelis, D.L., A.M. Johnson, and J.A. Garshelis. 1984. "Social organization of sea otters in Prince William Sound, Alaska." *Can. J. of Zoo*. 62:2648-2658.

Glenn Olson. 2016. Personal communication in Dutch Harbor, AK. Mr. Olson has been a resident of Dutch Harbor since the 1980s and spends much the year outside at coastal construction sites.

Green, G.A. and J.J. Brueggeman. 1991. "Sea otter diets from a declining population in Alaska." *Mar. Mamm. Sci*. 7:395-401.

Houser, D.S., D.A. Helweg and P.W.B. Moore. 2001. A Bandpass filter-bank model of auditory sensitivity in the humpback whale. Aquatic Mammals 27(2): 82-91.

Jensen, A.S. and G.K. Silber. 2003. Large Whale Ship Strike Database. U.S. Department of Commerce, NOAA Technical Memorandum. NMFS-OPR- , 37 pp.

Kennedy, A. S., A. N. Zerbini, B. K. Rone, and P. J. Clapham. 2014. Individual variation in movements of satellite-tracked humpback whales *Megaptera novaeangliae* in the eastern Aleutian Islands and Bering Sea. Endangered Species Research 23:187-195.

Kenyon, K.W. 1969. "The sea otter in the eastern Pacific Ocean." *N. Am. Fauna* 68 :1-352..

Ketten, D.R. 1997. Structure and function in whale ears. Bioacoustics 8:103-137.

Lantis, Margaret. 1970. The Aleut Social System, 1750 to 1810, from Early Historical Sources. In *Ethnohistory in Southwestern Alaska and the Southern Yukon: Method and Content*. M.

Lantis, ed. Studies in Anthropology No. 7. Pp. 139-301. University Press of Kentucky.
National Oceanic Atmospheric Administration (NOAA). 2017. Wrecks and Obstructions Database. Online document, https://wrecks.nauticalcharts.noaa.gov/viewer/, accessed December 08, 2017.

Lensink, C.J. 1962. "The history and status of sea otters in Alaska." Ph.D. Diss., 188 p. Purdue Univ., West La Fayette, IN.

Marine Mammal Commission. 2000. Annual report to Congress 1999. Bethesda, MD. 243 p.

marinetraffic.com. Accessed 1/19/2017. Density Maps. 2016.

Metzner, K.A. 1993. "Ecological strategies of wintering Steller's Eiders on Izembek Lagoon and Cold Bay, Alaska." M.S. Thesis, University of Missouri, Columbia, Missouri. 193 pp.

National Marine Fisheries Service (NMFS). 2016. Endangered Species Act section 7(a)(2) biological opinion on the Replacement of the UniSea, Inc. G1 Dock and Associated Proposed Issuance of an Incidental Harassment Authorization in Iliuliuk Harbor, Unalaska, Alaska. Consultation Number AKR-2016-9518, Alaska Region, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, Juneau, Alaska.

National Marine Mammal Laboratory (NMM)L. 2016. Humpback whale *(Megaptera novaeangliae).* National Marine Mammal Laboratory, Alaska Fisheries Science Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, http://www.afsc.noaa.gov/nmml/species/species_humpback.php

National Park Service (NPS). 1997. How to Apply the National Register Criteria for Evaluation. National Register Bulletin No. 15.

Petersen, M.R. 1980. “Observations of wing-feather moult and summer feeding ecology of Steller’s Eider at Nelson Lagoon, Alaska.” *Wildfowl* 31: 99–106.

Piatt, J.F., G.S. Drew, and D.B. Irons. 2006. “Atlas of seabird distribution at sea in Alaska.” Unpublished report. USGS Alaska Science Center & USFWS, Anchorage, AK. 33 pp.

Pitcher, K.W. 1981. “Prey of the Steller sea lion in the Gulf of Alaska.” *Fisheries Bulletin Seattle* 79:467-472.

R&M Consultants Inc. 2017. Geophysical Survey Report, Volumes 1 and 2, Channel Navigation Improvements Feasibility Study, Dutch Harbor, Alaska

Reidman, M.L., and J.A. Estes. 1990. “The sea otter: behavior, ecology, and natural history.” United States Fish and Wildlife Service Biological Report 90:1-126.

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

Rotterman, L.M., and T. Simon-Jackson. 1988. “Sea otter.” Pp. 237-275 in J.W. Lentfer (ed.), *Selected Marine Mammals of Alaska: Species Accounts with Research and Management Recommendations.* U.S. Marine Mammal Commission, Washington, D.C.

Schneider, K.B. 1978. “Sex and age segregation of sea otters.” Final Rep. Fed. Aid in Wildl.Restoration, Proj. W-17-4 through W-17-8. Alaska Dep. Fish and Game, Juneau. 45 pp.

Sinha, A.A. C.J. Conway, and K.W. Kenyon. 1966. “Reproduction in the female sea otter.” *J. Wildl. Manage.* 30:1221-1230.

Southall, B. L., A. E. Bowles, W. T. Ellison, J. J. Finneran, R. L. Gentry, C.R. Greene Jr., D. Kastak, D., R. Ketten, J. H. Miller, P. E. Nachtigall, W. J. Richardson, J. A. Thomas, and P. L. Tyack. 2007. Marine mammal noise exposure criteria: Initial scientific recommendations. Aquatic Mammals 33:411-521.

Thompson, Erwin N. 1984. Dutch Harbor Naval Operating Base and Fort Mears, U.S. Army. National Register of Historic Places Inventory – Nomination Form. National Park Service.

Tinker, M.T. and Estes, J.A. 1996. *The population ecology of sea otters at Adak Island, Alaska*. Final Report to the Navy, Contract # N68711-94-LT-4026, U.C. Santa Cruz, CA.

Tryck Nyman Hayes, I. O. (1995). *Unalaska-Dutch Harbor Navigation Improvements.* Anchorage: Tryck Nyman Hayes, Inc.

Troy, D.M., and S.R. Johnson. 1987. “Marine birds.” In: J.C. Truett (ed.) *Environmental characterization and biological utilization of the North Aleutian Shelf nearshore zone*. LGL Ecological Research Associates, Inc. Bryan, Texas.

Turner, Lucien. 2008. *An Aleutian Ethnography*. R. L. Hudson, ed. University of Alaska Press.

United States Army Corps of Engineers (USACE). 1986. Dutch Harbor Defense Environmental Restoration Account. Prepared by Ocean Technology, Ltd.

United States Army Corps of Engineers (USACE). 1988. World War II in Alaska: A Historic and Resource Management Plan. Prepared by Envirosphere Company.

USACE.2003. View of the Past: A Driving Guide to World War II Buildings and Structures on Amaknak Island and Unalaska Island. Prepared by Jacobs Engineering.

USACE. 2004. Navigational Improvements Integrated Interim Feasibility Report and Final Environmental Impact Statement Vol 1. Unalaska, Alaska.

USACE. Unpublished data. Alaska District, Corps of Engineers waterfowl and marine mammal surveys in Dutch Harbor, Alaska, between 2000-2017. U.S. Army Corps of Engineers, Alaska District.

U.S. Fish and Wildlife Service (USFWS). 2000. *Final Rule to list the short-tailed albatross as Endangered*. 65 CFR (147) 46,643–46,654.

U.S. Geological Survey (USGS). 2005. North Pacific Pelagic Seabird Database. Short-tailed Albatross, Ver. 2005.06.07. USGS Alaska Science Center & U.S. Fish and Wildlife Service, Anchorage, Alaska. Online: http://alaska.usgs.gov/science/biology/nppsd/index.php/.

Veltre, Douglas. 2003. Potential Impacts on Subsistence Activities of a Proposed Boat Harbor on Southern Amaknak Island, City of Unalaska, AK. Prepared for U.S. Army Corps of Engineers.

Vu, E.T., D. Risch, C. W. Clark, S. Gaylord, L. T. Hatch, M.A. Thompson, D. N. Wiley, and S. M. Van Parijs. 2012. Humpback whale song occurs extensively on feeding grounds in the western North Atlantic Ocean. Aquatic Biology 14:175-183.

Wade, P., T.J. Quinn II, J. Barlow, C. Scott Baker, A.M. Burdin, J. Calambokidis, P.J. Clapham, E.A. Falcone, J.K.B. Ford, C.M. Gabriele, D.K. Mattila, L. Rojas-Bracho, J.M. Straley, and B. Taylor. 2016. Estimates of abundance and migratory destination for North Pacific humpback whales both summer feeding areas and winter mating and calving areas. International Whaling Commission Report SC/66b/W2.

Wartzok, D. and D.R. Ketten. 1999. Marine mammal sensory systems, pp. 117-175. In: J.E. Reynolds, II and S.A. Rommel (eds.), Biology of marine mammals. Smithsonian Institute Press: Washington D.C.

Zimmerman, T and S. Karpovich. 2008. Humpback Whale. Alaska Department of Fish and Game Fact Sheet. https://www.adfg.alaska.gov/static/education/wns/humpback_whale.pdf