US Army Corps of Engineers
Alaska District

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

Kotzebue Harbor Feasibility Study Navigation Improvements at Cape Blossom Kotzebue, Alaska

January 2019

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Kotzebue Harbor Feasibility Study

Navigation Improvements at Cape Blossom

Kotzebue, Alaska

Prepared by

U.S. Army Corps of Engineers

Alaska District

January 2019

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FINDING OF NO SIGNIFICANT IMPACT

Kotzebue Harbor Feasibility Study

Navigation Improvements at Cape Blossom

Kotzebue, Alaska

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

The Final FR/EA, incorporated herein by reference, evaluated a number of structural alternatives based on economic, engineering, environmental, and cultural resource factors. In accordance with Implementation Guidance for Section 2006 WRDA 2007 (as amended), plan selection was based on Cost Effectiveness/Incremental Cost Analysis (CE/ICA) in the Other Social Effects account, with plan selection also supported by a least cost analysis as there is no National Economic Development Plan.

The recommended plan is Alternative 7 which includes a 707,000 cubic yard (CY) dredged channel from approximately minus 26 ft Mean Lower Low Water (MLLW) extending 4,700 ft to a dock located at minus 12 ft MLLW. A 1,600 ft trestle extends from the uplands to the dock. The recommended plan is the optimized design because it identified the least-cost location for a dock considering dredging cost versus the cost of extending in-water infrastructure to the dock. The recommended plan is supported by the non-Federal sponsors include the Native Village of Kotzebue and the City of Kotzebue,

The existing suite of alternatives were developed in parallel with guidance from NMFS' Protected Resources and Fish Habitat Divisions guidance that permanent structures, emplaced perpendicular to the shoreline, shall make provisions for fish and marine mammal passage.

In addition to a "no action" plan (Alternative 1), six alternatives (Alternatives 2 through 7) were evaluated.[1] Alternative 2, Dredge to Shore, requires the largest quantity of dredging. Alternatives 3 through 6 require the least amount of dredging because the docking or dolphins are located in deep water. There were no non-structural alternatives considered that would have improved navigational conditions at Kotzebue. Alternatives and their formulation are considered in-depth in Section 5 of this integrated FR/EA are presented in the table below:

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

Number	Description
Alt. 1	No Action
Alt. 2	Dredge to Shore
Limited Dredging or Deep Water Alternatives	
Alt. 3	Lightering with detached breakwater and dolphins
Alt. 4	Trestle with gravity-filled support structures to a dock
Alt. 5	Causeway to dock
Alt. 6	Trestle and causeway combination to dock
Optimized Dredged Channel Design	
Alt. 7	Dredged channel with trestle and / or causeway to dock

For each alternative, except Alt. 1, upland and in-water Local Service Facilities (LSF) are needed to realize benefits. The upland LSF are consistent for each alternative, and as a result, do not differentiate between alternatives. In-water LSF can vary and can differentiate between alternatives to some degree because the LSF cost is scaled to size of the feature required for a particular alternative.

Uplands LSF
Bulk fuel storage and related infrastructure
Boat ramp for increased subsistence/recreation and marine safety
Gravel pad area for future upland LSFs that may include:
Lay-down yard for incoming and outgoing cargo
Parking areas
Warehouses, maintenance shops
In-Water LSF
Bridge connecting uplands to trestle / causeway
Trestle and /or causeway to dock
Pass-pass facilities (ship to ship or ship to pier or causeway)
Marine fueling head (8”) and pipeline to the bulk fuel storage facility

For all alternatives, the potential effects to the following resources were evaluated:

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

Ongoing coordination with Federal and State resource agencies shall seek to ensure that all practical means to avoid or minimize adverse environmental effects will be analyzed and incorporated into the recommended plan. Best management practices (BMPs) may be implemented to reduce overall impacts to identified resources, but details of these BMPs are unknown at this time.

No compensatory mitigation measures have been identified for impacts associated with the implementation of the preferred alternative. Unavoidable adverse impacts as a result of project implementation include temporal and spatial disruption of Cape Blossom's nearshore waters from a turbidity, water quality, and underwater noise perspective.

Pursuant to Section 7 of the Endangered Species Act (ESA) of 1973, as amended, USACE expects to concurrently coordinate with NMFS while its application for Incidental Harassment Authorization for actions associated with the implementation of its preferred alternative that may incidentally harass marine mammals that are also listed species under the ESA is reviewed by NMFS' Protected Resources Division.

Pursuant to Section 106 of the National Historic Preservation Act of 1966, as amended, the U.S. Army Corps of Engineers determined that no historic properties would be affected by the recommended plan [36 CFR §800.4(d)(1)]. The Alaska State Historic Preservation Officer (SHPO) concurred with this assessment on April 26, 2017.

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

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

Pursuant to the Marine Mammal Protection Act of 2007, as amended, USACE intends on applying for an Incidental Harassment Authorization (IHA) for actions required during the construction and implementation of its preferred alternative that may reach level B harassment values for disturbance to marine mammals.

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

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

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

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

Date Phillip J. Borders

COL, EN, Corps of Engineers

District Commander

EXECUTIVE SUMMARY

This General Investigations study is being conducted under authority granted by Section 204 of the Flood Control Act of 1948, which authorizes a study of the feasibility for development of navigation improvements in various harbors and rivers in Alaska. This project is also utilizing the authority of Section 2006 of WRDA, 2007, Remote and Subsistence Harbors, as modified by Section 2104 of the Water Resources Reform and Development Act of 2014 (WRRDA 2014) and further modified by Section 1105 of WRDA 2016. This authority states that the Secretary may recommend a project without demonstrating that the improvements are justified solely by National Economic Development (NED) benefits, if the Secretary determines that the improvements meet specific criteria detailed in the authority. This project meets these criteria. The project would improve navigation efficiency to reduce the costs of commodities critical to the viability of communities in the region. This study has been cost-shared, with 50 percent of the study funding provided by the non-Federal sponsors, which are the Native Village of Kotzebue (a Federally-recognized tribe) and the City of Kotzebue per the amended Federal Cost Share Agreement.

The cultural identity of Alaska Native Tribes is highly dependent upon subsistence activities tied to specific locations, and deep historical knowledge of land and subsistence resources. Also critical are the availability and affordability of fuel and other essential goods. Rural economies in Alaska, including that which exists in Kotzebue and communities the region (Northwest Arctic Borough), can be characterized as a mixed, subsistence-cash economy in which the subsistence and cash sectors are interdependent and mutually supportive.

The ability to successfully participate in subsistence activities is highly dependent on the opportunity to earn some form of monetary income and access to the resources needed to engage in subsistence activities. Reductions in costs of basic essential goods required to conduct subsistence activities are essential to community viability. When subsistence communities are forced to disband due to high costs of such essential goods, including fuel, tribal identities and cultural communities are endangered. Regional outmigration from villages to Kotzebue first, then Kotzebue to other parts of Alaska, such as Anchorage, was found to be a statistically significant trend by the University of Alaska’s Institute for Social and Economic Research. As the outmigration trend continues into the future the long-term viability of the communities are more and more threatened. Northwest Arctic Borough communities listed in the Alaska Department of Labor & Workforce Development Distressed communities report include Kivalina, Noatak, Kiana, Ambler, Kobuk, Shungnak, Noorvik, Selawik and Buckland.

This Feasibility Report and Environmental Assessment (FR/EA) documents the studies and coordination conducted to determine whether the Federal Government should participate in navigation improvements at Kotzebue, Alaska that would ultimately provide benefits to the entire region identified as the Northwest Arctic Borough, and determines the feasibility of Federal participation in potential improvements. Navigation-related issues at Kotzebue result in exorbitantly high costs for fuels and cargo due to the need to lighter goods from coastal barges to shallow draft vessels because of the extensive shallow water conditions leading to the current harbor.

The proposed project site is an undeveloped area with no road access located approximately 10 miles south of Kotzebue near Cape Blossom. Previous studies going back to at least 1973 by the United States Army Corps of Engineers and others selected Cape Blossom for this study because of its relatively deep near-shore bathymetry and its close proximity to Kotzebue. Construction of an all-season access road from Kotzebue to the project site is scheduled to start in 2019 by the Alaska Department of Transportation and Public Facilities.

A port facility near Cape Blossom would improve navigation efficiency to Kotzebue by reducing or eliminating the high cost of lightering, and increasing the available shipping season to Kotzebue and other communities in the region that require their fuel and cargo to be transferred to shallow draft river barges after arrival to Kotzebue. The study considered a wide range of measures and alternative plans, and the environmental consequences of those alternatives. The alternatives had a goal of reducing the amount of lightering, which significantly increases the transportation cost associated with delivery of fuels and cargo. None of the alternative plans evaluated resulted in a NED Plan, so selection of the plan was based upon a Cost Effectiveness/Incremental Cost Analysis (CE/ICA) consistent with ecosystem restoration evaluation procedures, as specified in the Remote and Subsistence Harbor Authority. The specific CE/ICA metric utilized for this study is increased vessel opportunity days for safe access and moorage.

In addition to a "no action" plan (Alternative 1), six alternatives (Alternatives 2 through 7) were evaluated. Alternative 2, Dredge to Shore, requires the largest quantity of dredging. Alternatives 3 through 6 require the least amount of dredging because the docking or dolphins are located in deep water. There were no non-structural alternatives considered that would have improved navigational conditions at Kotzebue. The Tentatively Selected Plan is Alternative 7 which includes a dredged navigation channel from approximately minus 26 feet Mean Lower Low Water extending 4,700 feet to a dock located at a current depth of minus 12 feet MLLW. A trestle extends from the uplands to the dock. No NED Plan was identified during this study, as a result the TSP was identified based on the CE/ICA results. The CE/ICA was differentiating between alternatives and resulted in a best buy plan. The TSP is Alternative 7 which is an alternative plan that is optimized by combining various measures to minimize project cost and still meet the identified objectives and avoiding constraints. The recommended plan is supported by the non-Federal sponsors. No mitigation measures have yet to be identified and developed for the preferred alternative. The permanent structures make provisions for fish and marine mammal passage. USACE expects that marine mammal monitors would be required on site during all phases of in-water construction.

PERTINENT DATA

Tentatively Selected Plan

Alternative 7: Dredged Channel with Trestle to Dock

Project Component: Dredge Channel to minus 26 feet MLLW plus 2 feet allowable over depth (see Figure 22. Dredge Channel Plan View)		
Feature	**Units**	**Approximate Quantity**
Initial (New Work) Dredge Quantity	CY	707,000
Maintenance Dredge Quantity (1)	CY	300,000
Dredge Area Removed	Acres	59.5
Length of Dredge Area (Maximum)	Feet	4,700
Width of Dredge Area (Maximum)	Feet	570
Other Waste Removed & Landfilled	Tons	N/A
Total Area Filled by At-Sea Disposal	Acres	68
Number of Separate Areas Filled (See Figure 2)	#	1

NOTE: Dredge quantities will be revised after draft report to some degree to resolve inconsistencies recently recognized between Hydraulics & Hydrology and Cost Engineering; estimates. However the revised quantities would not influence plan selection or change the tentatively selected plan.

Project Component: Trestle with Cellular Supports to Dock (see Figure 21. Alternative 7 - TSP Plan View Concept Drawing)		
Feature	**Units**	**Approximate Quantity**
Length of Trestle (Shoreline to Dock at minus 12 feet MLLW)	Feet	1,600
Width of Trestle	Feet	30
Number of Cellar Support Structures- Trestle	#	17
Diameter of Cellar Support Structure- Trestle	Feet	40
Length of Dock	Feet	400
Width of Dock	Feet	40
Dock Surface Area	Square Feet	16,000
Number of Cellar Support Structures- Dock	#	5
Diameter of Cellar Support Structure- Dock	Feet	40

Project First Cost			
Item	Federal ($)	Non-Federal ($)	Total ($)
Cost Share	$38,927,000	$65,437,000	$104,365,000
LERRS		$0.00	

Economics	
Item	Alternative 7
Net Present Value at TSP	$(51,692,000)
Equivalent Annual Cost	$(1,830,000)
Benefit Cost Ratio	0.4784
CE/ICA	Best Buy

* These numbers are preliminary and will be updated with the final version of this report.

Item	Federal ($)	Non-Federal ($)	Total ($)
Discounted Annual Maintenance and Operations Costs at TSP	$342,000	$0.00	$342,000

LIST OF ACRONYMS AND ABBREVIATIONS

ADCRA	Alaska Division of Community and Regional Affairs
ADEC	Alaska Department of Environmental Conservation
ADFG	Alaska Department of Fish and Game
ADOT&PF	Alaska Department of Transportation and Public Facilities
ANCSA	Alaska Native Claims Settlement Act
AKDOL&WD	Alaska Department of Labor and Workforce Development
ATS	Alaska Townsite Survey
AWC	Anadromous Waters Catalog
AVEC	Alaska Village Electrical Cooperative
BCR	Benefit-Cost Ratio
BMP	Best Management Practices
Borough	Northwest Arctic Borough
C	Celsius
C-MAN	Coastal Marine Automated Network
CAA	Clean Air Act
CE/ICA	Cost Effectiveness/Incremental Cost Analysis
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFEC	Commercial Fisheries Entry Commission
CFR	Code of Federal Regulations
COL	Colonel
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
EQ	Environmental Quality
FAA	Federal Aviation Administration
F	Fahrenheit
FC	Full Compliance
FHWA	Federal Highway Administration
FMP	Fishery Management Plan
FONSI	Finding of No Significant Impact
FR/EA	Feasibility Report and Environmental Assessment
FWCA	Fish and Wildlife Coordination Act

FWP	Future With Project
ft	feet
GMSL	Global Mean Sea Level
GNF	General Navigation Feature
HTRW	Hazardous, Toxic, and Radioactive Wastes
IDC	Interest During Construction
JPL	Jet Propulsion Laboratory
kg	Kilograms
lbs	Pounds
LERR	Lands, Easements, Real Estate, and Rights-Of-Way
LPP	Locally Preferred Plan
LSF	Local Service Facilities
mg	Milligrams
MBTA	Migratory Bird Treaty Act
MHHW	Mean Higher High Water
MHW	Mean High Water
MLLW	Mean Lower Low Water
MLW	Mean Low Water
MMPA	Marine Mammal Protection Act
MSL	Mean Sea Level
MTL	Mean Tide Level
N/A	Not Applicable
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration
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
OMRRR	Operation, Maintenance, Repair, Replacement, and Rehabilitation
OSE	Other Social Effects
PC	Partial Compliance
PED	Preconstruction Engineering and Design
PSMSL	Permanent Service for Mean Sea Level
R	Republican
RED	Regional Economic Development
S&A	Supervision and Administration
SHPO	State Historic Preservation Officer

TSP	Tentatively Selected Plan
U.S.	United States
UDV	Unit Day Value
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code
USCG	United States Coast Guard
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
USS	United States Survey
VLM	Vertical Land Movement

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1 INTRODUCTION

1.1 Authority

This feasibility study is being conducted under authority granted by Section 204 of the Flood Control Act of 1948, which authorizes a study of the feasibility for development of navigation improvements in various harbors and rivers in Alaska. Section 204 states: "*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,"* as amended by the Flood Control Act of 1950. In 1970, the House of Representatives passed a resolution authorizing a review of: "…the report of the Chief of Engineers on Rivers and Harbors in Alaska, published as House Document Numbered 414, 83rd Congress, 2nd Session… Northwestern Alaska, published as House Document Numbered 99, 86th Congress, 1st Session; …, with a view to determining whether any modifications of the recommendations contained therein are advisable at the present time."

1.1.1 Additional Study Authority

The study is also using the authority of Section 2006 of WRDA, 2007, Remote and Subsistence Harbors, as modified by Section 2104 of the Water Resources Reform and Development Act of 2014 (WRRDA 2014) and further modified by Section 1105 of WRDA 2016. The authority specifically states that in conducting a study of harbor and navigation improvements the Secretary may recommend a project without demonstrating that the improvements are justified solely by National Economic Development (NED) benefits, if the Secretary determines that the improvements meet specific criteria detailed in the authority. Following are the criteria outlined in the authority along with a description of how this study satisfies them:

1. The community to be served by the improvements is at least 70 miles from the nearest surface accessible commercial port and has no direct rail or highway link to another community served by a surface accessible port or harbor; or the improvements would be located in the State of Hawaii or Alaska, the Commonwealth of Puerto Rico, Guam, the Commonwealth of the Northern Mariana Islands, the United States Virgin Islands; or American Samoa;
    - *Kotzebue is located in the State of Alaska*

2. The harbor is economically critical such that over 80 percent of the goods transported through the harbor would be consumed within the region served by the harbor and navigation improvement as determined by the Secretary, including consideration of information provided by the non-Federal interest; and

- *Commodities transported in the future with-project condition were analyzed and determined that more than 80 percent of the goods transported to Kotzebue are consumed within the region. The region served by the navigation improvements was determined to be the Northwest Arctic Borough.*

3. The long-term viability of the community in which the project is located, or the long-term viability of a community that is located in the region that is served by the project and that will rely on the project, would be threatened without the harbor and navigation improvement.
   - *To provide economic opportunities for the community, consistent with the authority, the project strives to improve navigation efficiency to reduce the costs of critical commodities critical to the viability of communities in the region.*

   - *The cultural identity of Alaska Native Tribes is highly dependent upon subsistence activities tied to specific locations, and deep historical knowledge of land and subsistence resources. Also critical are the availability and affordability of fuel and other essential goods. Rural economies in Alaska, including that which exists in Kotzebue and communities the region (Northwest Arctic Borough), can be characterized as a mixed, subsistence-cash economy in which the subsistence and cash sectors are interdependent and mutually supportive. The ability to successfully participate in subsistence activities is highly dependent on the opportunity to earn some form of monetary income and access the resources needed to engage in subsistence activities.*

   - *Reductions in costs of such basic essential goods are essential to community viability. When subsistence communities are forced to disband due to high costs of essential goods, including fuel, tribal identities and cultural communities are endangered.*

   - *Regional outmigration from villages to Kotzebue first, then Kotzebue to other parts of Alaska such as Anchorage, was found to be a statistically significant trend by the University of Alaska's Institute for Social and Economic Research. The study tracked individuals through their Social Security Numbers and Alaska Permanent Fund Dividend applications over time to identify this trend. Additionally, the likelihood of village – regional hub – outmigration was correlated to areas with higher fuel prices such as Kotzebue and the Northwest Arctic Borough. As the outmigration trend continues into the future – trends of people being displaced from their homeland - the long-term viability of the community is more and more threatened.*

   - *Northwest Arctic Borough communities listed in the Alaska Department of Labor & Workforce Development Distressed communities report include*

Kivalina, Noatak, Kiana, Ambler, Kobuk, Shungnak, Noorvik, Selawik and Buckland.

Per Section 2006 of WRDA of 2007 as amended by Section 2104 of WRRDA 2014, while determining whether to recommend a project under the criteria above, the Secretary will consider the benefits of the project to the resources listed below. As indicated in the above narratives and throughout the report, navigation improvements at Kotzebue would benefit the following:

- Public health and safety of the local community and communities that are located in the region to be served by the project and that will rely on the project, including access to facilities designed to protect public health and safety;
- Access to natural resources for subsistence purposes;
- Local and regional economic opportunities;
- Welfare of the local population; and
- Social and cultural value to the local community and communities that are located in the region to be served by the project and that will rely on the project.

1.2 Study Non-Federal Sponsor

This study has been cost-shared, with 50 percent of the study funding provided by the non-Federal sponsors, which are the Native Village of Kotzebue (a Federally-recognized tribe) and the City of Kotzebue per the amended Federal Cost Share Agreement (FCSA).

1.3 Scope of Study

This Feasibility Report and Environmental Assessment (FR/EA) documents the studies and coordination conducted to determine whether the Federal Government should participate in navigation improvements at Kotzebue, Alaska. Engineer Regulation (ER) 1105-2-100, "*Planning Guidance Notebook*," defines the contents of feasibility reports for navigation improvements. 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 FR/EA. It also complies with the requirements of the Council on Environmental Quality's regulations for implementing the National Environmental Policy Act of 1969 (43 U.S.C. 4321 et seq.).

Studies of potential navigation improvements considered a wide range of alternatives and the environmental consequences of those alternatives, but focused mainly on actions that would reduce lightering, which increases the transportation cost associated with delivery of fuels and goods (i.e., cargo) to Kotzebue and the region. Commercial navigation is a high priority mission for the U.S. Army Corps of Engineers (USACE) and commercial vessel activity at Kotzebue generates sufficient remote and subsistence benefits to allow the USACE to recommend a project to Congress under Section 2006 of the Water Resources Development Act (WRDA) of 2007.

The City of Kotzebue has stated its intention to cost-share in a Federally-constructed harbor at Kotzebue. This partnership of Federal and non-Federal interests in navigation improvements helps ensure that improvements made would effectively serve both local and national needs.

The Alaska District, USACE was primarily responsible for conducting studies for navigation improvements at Kotzebue. The studies that provide the basis for this report were conducted with the assistance of many individuals and agencies, including the Native Village of Kotzebue, the NANA Regional Corporation, the Kikiktagruk Inupiat Corporation, the City of Kotzebue, the U.S. Fish and Wildlife Service (USFWS), the National Marine Fisheries Service (NMFS), the U.S. Coast Guard (USCG), the Alaska Department of Fish and Game (ADFG), the Alaska Department of Environmental Conservation (ADEC), and many members of the interested public who contributed information and constructive criticism to improve the quality of this report.

1.4 Study Area

The study area for this project is the Northwest Arctic Borough (Borough) of Alaska (Figure 1). The Borough area encompasses approximately 41,000 square miles; it is about the size of the state of Kentucky. The Borough is completely disconnected from the continental road network. The Borough has a total population of approximately 7,800 people distributed among 11 villages (Table 1).

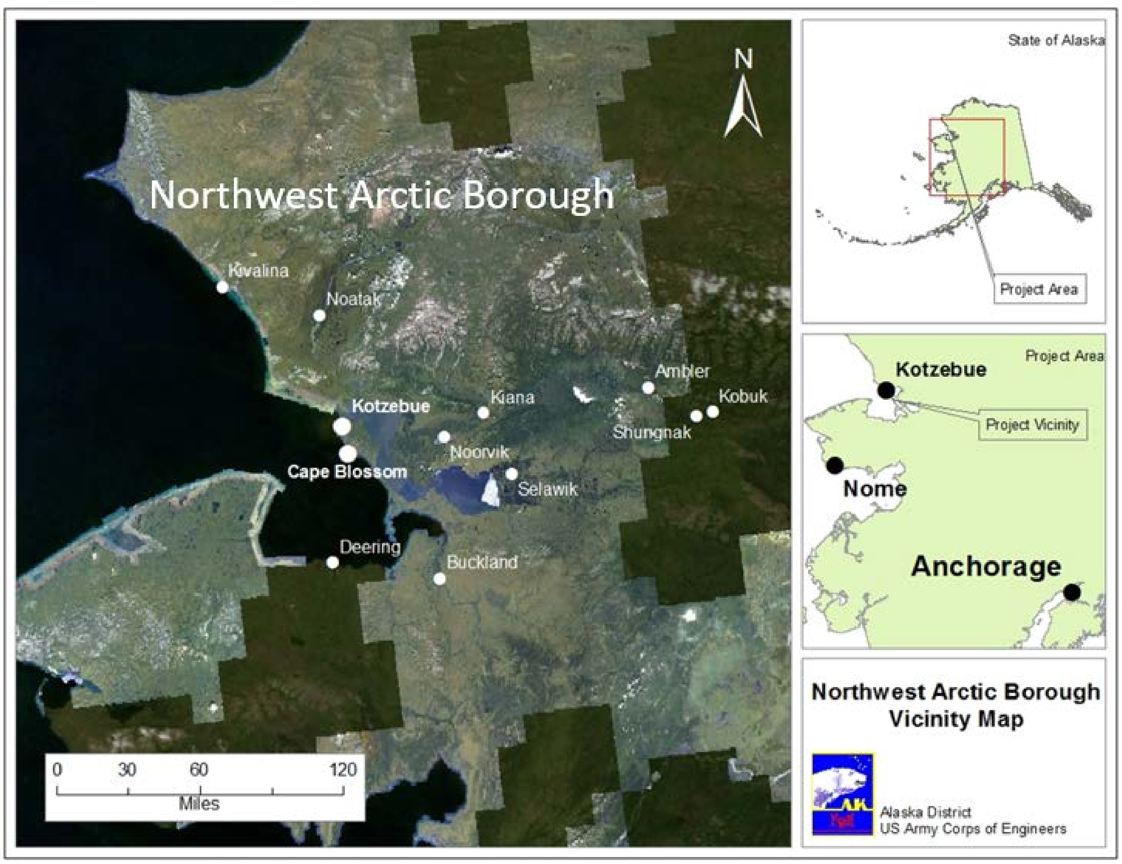


Figure 1. Northwest Arctic Borough Area Map

Table 1. Borough Village Populations

Village	Population	Village	Population
Ambler	284	Kotzebue	3,154
Buckland	510	Noatak	580
Deering	154	Noorvik	669
Kiana	417	Selawik	861
Kivalina	417	Shungnak	291
Kobuk	145		

Reference: Data from ADCCED 2017

The Borough is identified as the study area because of the logistics associated with the transportation of people, fuel and goods to the region. The City of Kotzebue is located at the northern end of the Baldwin Peninsula, approximately 550 miles northwest of Anchorage (Figure 2). It is the largest village and the transportation hub in the Borough by providing transportation, fuel, goods, and services to residents of the 10 outlying villages.

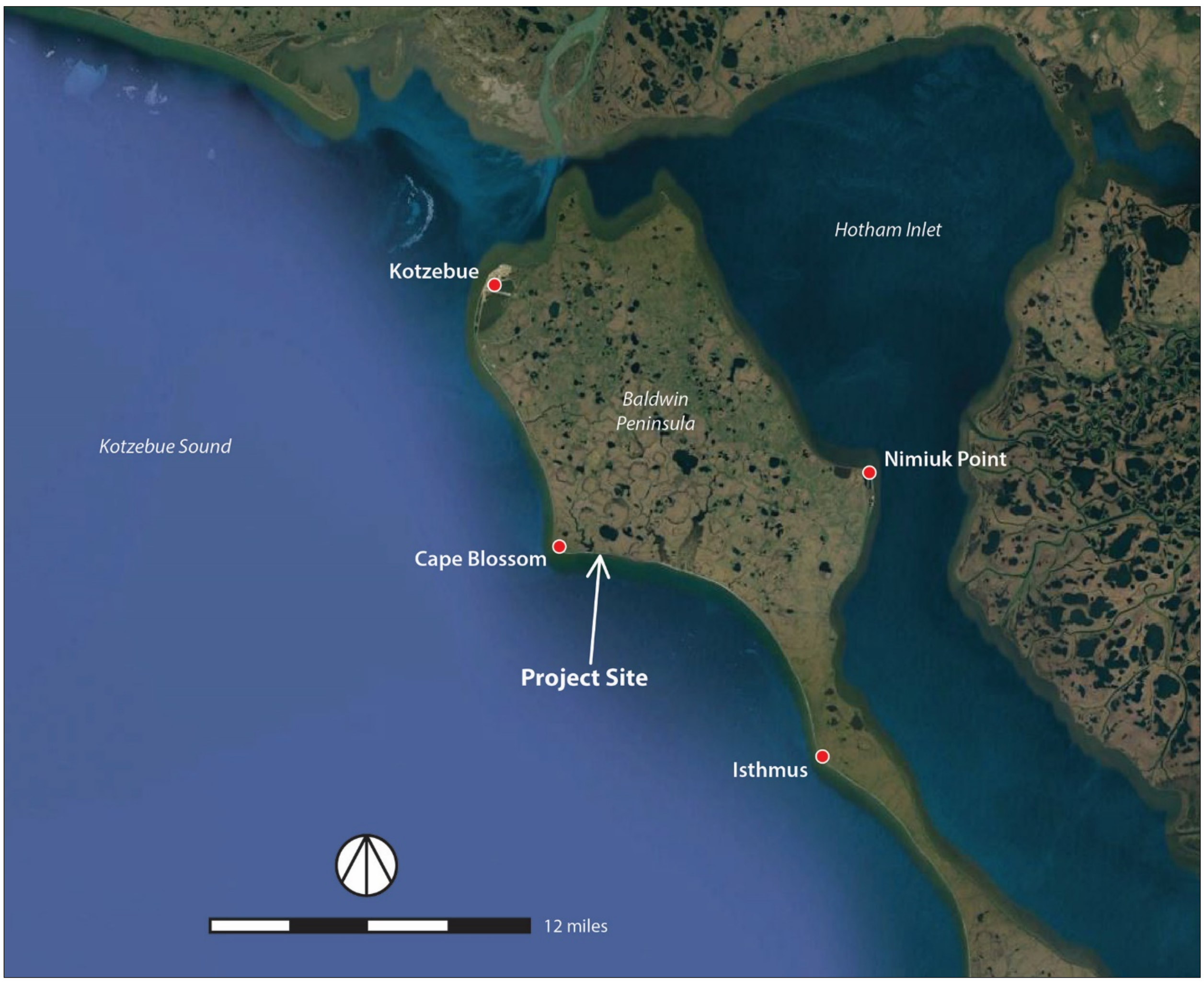


Figure 2. Project Site Location – Cape Blossom (Satellite Image: GoogleEarth 2016).

In order to travel outside of the Borough, residents of the outlying villages typically commute to Kotzebue by boat or small aircraft in the summer, and by air, snowmachine or dogsled in the winter. They then fly out of the Ralph Wien Memorial Airport, a state-owned public-use airport, to continue their travel. The return travel typically reverses these logistics. Although some cargo arrives in Kotzebue by air before distribution in the region, most fuel and goods coming in to the Borough are initially shipped to Kotzebue by barge in the summer before being loaded onto smaller vessels (riverine barges) or small aircraft for transport to the outlying villages. For these logistics reasons, Kotzebue is the transportation hub; it is integral to all of the villages in the region. Essentially 100 percent of the fuel and goods delivered to Kotzebue are consumed within the Borough. As a result, navigation inefficiency issues affecting delivery of fuel and goods to Kotzebue directly affects the price of goods delivered to the region.

1.5 Project Site Location

The proposed project site is approximately 10 miles south of Kotzebue and 1.5 miles east of a geographic feature named Cape Blossom (see Figure 2). This future port location has been recommended since at least 1983, when an early feasibility study concluded that the goal of improving shipping at Kotzebue could be best met by constructing a new deep-water port outside the City limits, specifically east of Cape Blossom (Tetra Tech et al. 1983). This location was recommended, in part, because of its favorable bathymetry, which was deeper near shore than other locations, and its relatively close proximity to Kotzebue. However, there was no road access to the Cape Blossom vicinity at that time. Subsequent planning by the Alaska Department of Transportation and Public Facilities (ADOT&PF) in cooperation with the non-Federal sponsors has resulted in the Kotzebue to Cape Blossom Road (Figure 3) entering the final design phase; the first construction contracts are scheduled to be released in April 2019. According to the project website (http://dot.alaska.gov/nreg/capeblossomroad/), the road project is funded by the Federal Highway Administration (FHWA) and fully complies with the National Environmental Policy Act (NEPA) and other federal, state, and local regulations.

Figure 3. Kotzebue Cape Blossom Road Route.

1.6 Congressional Delegation

This study area is in the Alaska Congressional District, which has the following Congressional delegation:

- Senator Lisa Murkowski (R-AK)
- Senator Dan Sullivan (R-AK)
- Representative Don Young (R-AK)

1.7 Related Reports & Studies

In 1973, a reconnaissance report was prepared by USACE at the request of the Common Council of the City of Kotzebue. The report noted that several alternatives were physically feasible for developing a port at Kotzebue; however, the low benefit-to-cost ratios indicated the alternatives were not feasible despite secondary benefits to the socioeconomic wellbeing of the community (USACE 1973).

In 1981, a second reconnaissance report was prepared by USACE at the request of the City of Kotzebue. This report found that navigation improvements were not economically favorable at Kotzebue. It recommended the city request help from the National Oceanic and Atmospheric Administration (NOAA) to schedule a charting mission of Kotzebue Sound in search of a natural deep-water channel to or in the vicinity of Kotzebue (USACE 1981).

In 1983, Tetra Tech and Wright Forssen Associates produced a report for the City of Kotzebue containing recommendations and estimated costs for development of a deep-water port at Cape Blossom (Tetra Tech et al. 1983).

In 2002, a Federal interest in the construction of navigation improvements at Cape Blossom was documented in a Section 905(b) (WRDA 86) Analysis for Navigation Improvements for Kotzebue, Alaska (USACE 2002).

In 2004, the USACE completed an economic analysis of various alternatives for a port at Cape Blossom. A National Economic Development (NED) plan was not identified at that time. One of the recommendations in this report included obtaining better bathymetry data so that engineering designs and associated costs could be better defined. In addition, this report noted that a successful port project would require road access from Kotzebue to Cape Blossom (USACE 2004).

Since 2011 multiple engineering and environmental assessment documents associated with the planned Kotzebue to Cape Blossom Road have been prepared and made available on the ADOT&PF website: http://dot.alaska.gov/nreg/capeblossomroad/documents.shtml. The project timeline presented in this website, as well as the "*2018-2021 Alaska Statewide Transportation Improvement Program*" approved May 31, 2018, shows that the first phase of road construction for the Kotzebue to Cape Blossom Road is scheduled for the spring of 2019.

NOAA created the first edition of Nautical Chart No. 16161, "*Kotzebue Harbor and Approaches*," in April 2012. It most recent correct date is April 25, 2018. This map shows the bathymetry of Kotzebue Sound leading up to Kotzebue including the existing natural channel, the approximate route of a fiber optic cable buried in the channel sea floor in 2016, and Cape Blossom area (Figure 4).

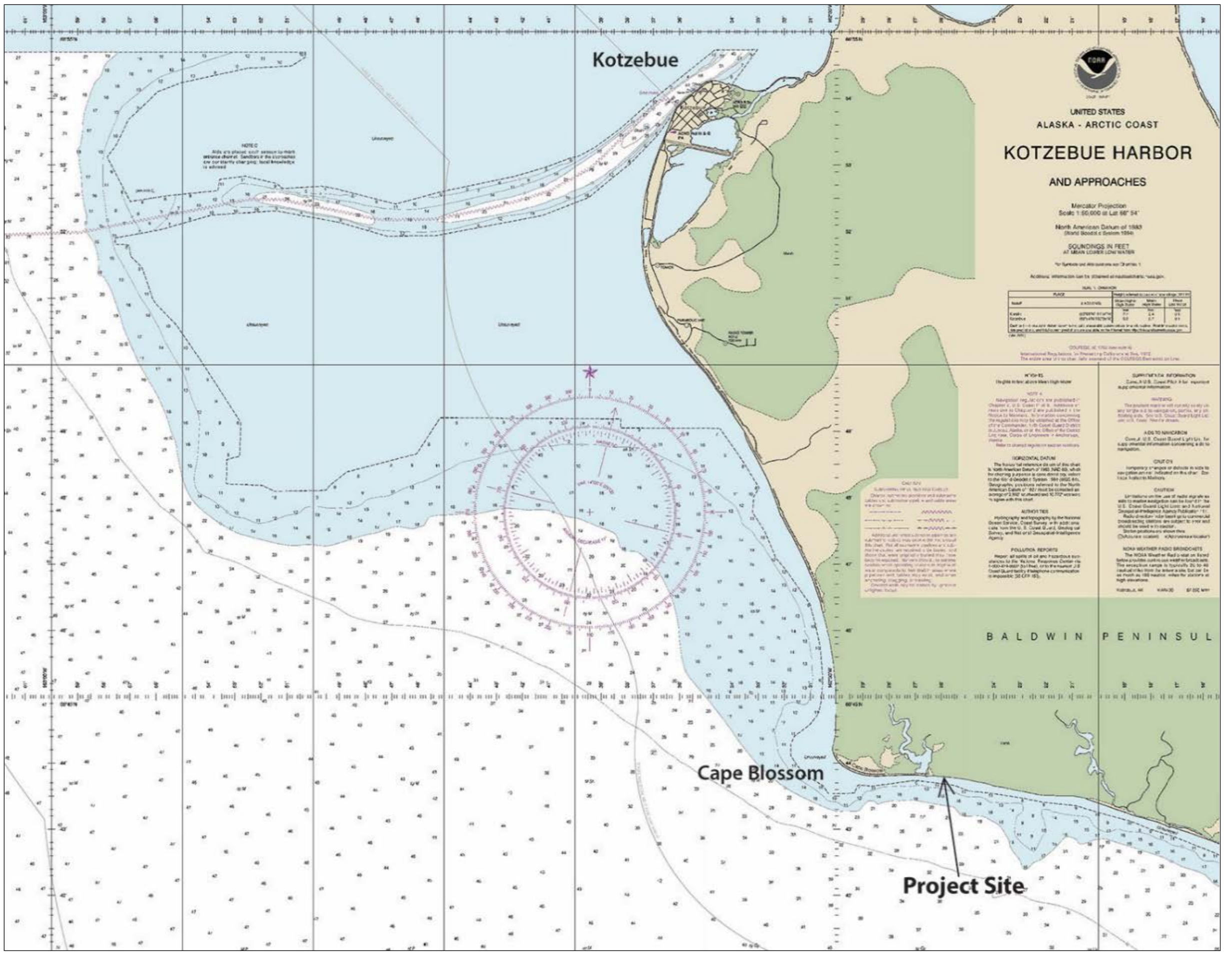


Figure 4. Existing Bathymetry for Kotzebue Area (*from* NOAA 2018).

In December 2013, the FHWA published their EA and subsequent Finding of No Significant Impact (FONSI) for the Kotzebue to Cape Blossom Road, Federal Project No. NCPD-0002(204), State Project No. 76884. The USACE concurs with the analysis presented in the FHWA's assessment (FHWA 2013) and shall incorporate its findings by reference where applicable, in accordance with 40 CFR § 1502.21.

2 PLANNING CRITERIA, PURPOSE & NEED FOR PROPOSED ACTION

2.1 Problem Statement

There are two navigation efficiency problems that this project can improve by having a port facility near Cape Blossom. These problems greatly increase the transportation cost applied to the price of fuel and goods initially delivered to Kotzebue and subsequently to those delivered to the outlying villages in the area. The primary navigation efficiency problem is related to the ability of coastal barges to reach Kotzebue (see Figure 4). Insufficient depth in two segments of the natural channel to Kotzebue requires deep-draft vessels to either to anchor 12 to 15 miles off shore near the channel entrance and conduct ship-to-ship transfer of cargo to shallow-draft vessels that can navigate the channel, or to arrive at less than capacity in order to navigate the channel themselves.

Dredging to improve navigation through the natural channel to Kotzebue was evaluated by previous studies (USACE 1973, 1981, 2002, 2004), but this potential solution was not considered cost effective due to the high frequency and associated cost of maintenance dredging. In addition, a fiber-optic cable was buried in the existing natural channel in 2016; due to its undefined burial depth it would, with certainty, have to be relocated if the channel was dredged deeper. With these considerations, a port near Cape Blossom was ultimately selected for further study.

A secondary navigation efficiency problem is associated with transporting cargo from Kotzebue to the outlying villages of Noorvik, Kiana, Ambler, Shungnak, which are located on the Kobuk River, and to the village Selawik, which is located on the east side of Selawik Lake (Figure 5). At present, marine access to Kotzebue is not possible when the normal maximum depth of navigation on the Kobuk and Selawik Rivers exists. Cargo cannot be brought to Kotzebue and transshipped to river barges for delivery during the most efficient travel period on the rivers. This is because the river ice breaks up and flows down river to Hotham Inlet before the channel between the Kotzebue and Kotzebue Sound Bay is open. During some years, villages within the region do not receive river freight because the river stages are too low when cargo is available to sail. Since the Cape Blossom area loses sea ice before the channel to Kotzebue clears, up-river freight/fuel brought in at Cape Blossom could be available for transshipment 10 to 15 days before the channel clears. Barges that overwinter at Kotzebue can launch as soon as the lower part of Hotham Inlet is ice-free; early deliveries at Cape Blossom have the potential to access villages during the maximum river stage (generally the first two – three weeks after ice-out.)

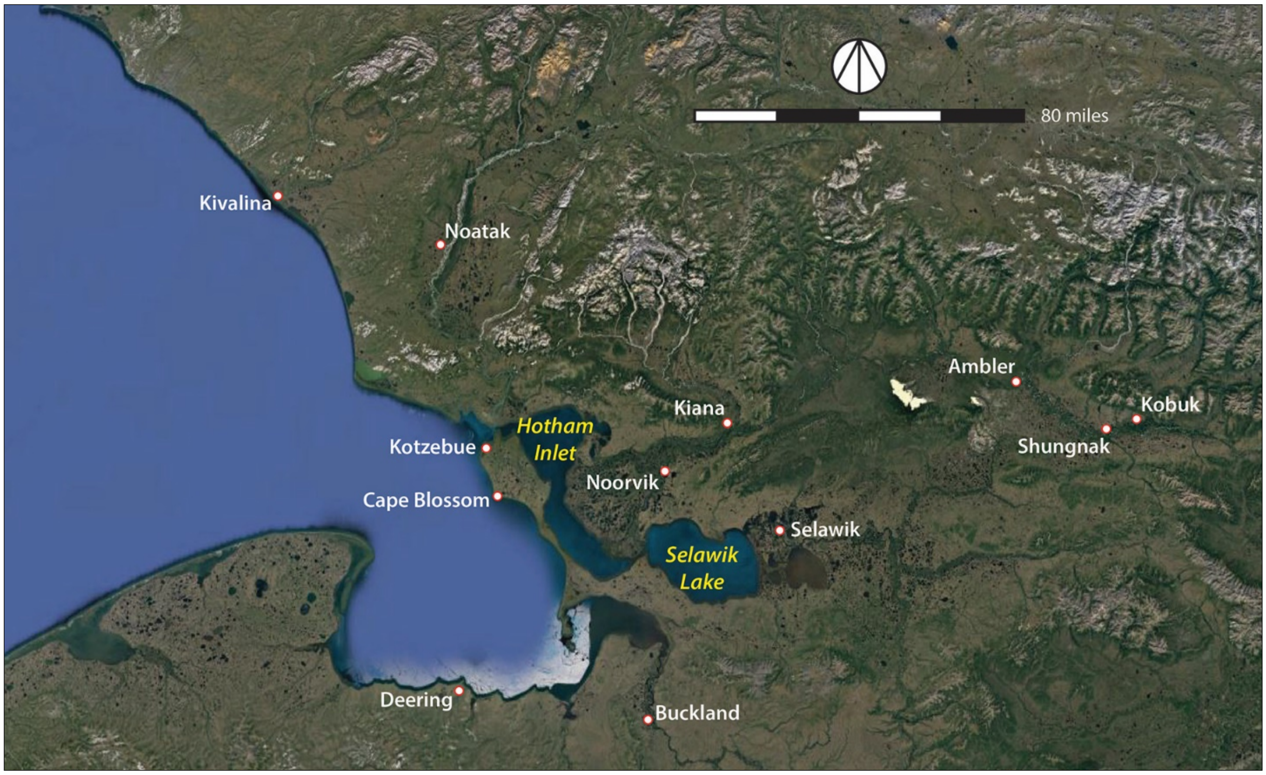


Figure 5. Kotzebue Regional Communities Map (Satellite Image: GoogleEarth 2016).

These navigation problems lead to an increase in the prices of local goods and services throughout the region, decreasing the effective income of residents and lowering their quality of life.

2.2 Purpose & Need*

The purpose of this study is to identify a feasible solution that provides safe, reliable, and efficient navigation and mooring for ocean-going barges serving the hub community of Kotzebue, Alaska, and provides for the safe and efficient transfer of goods to riverine barges that serve the outlying villages on the Kobuk River. The project is needed to alleviate existing vessel restrictions that are imposed by insufficient channel depths and to provide safe refuge at Kotzebue. Ship transportation in to Kotzebue is presently limited by depth, with existing depths inadequate to safely accommodate vessels with drafts exceeding minus 5 feet (ft) mean lower low water (MLLW), and, to some degree, ice conditions.

2.3 Opportunities

This study is focused on the feasibility of developing a port near Cape Blossom. A safe, efficient and reliable port at Cape Blossom would reduce transportation risks and costs to Kotzebue, and in turn reduce costs of cargo in the region. In addition, a port at Cape Blossom would be more reliable and have a longer shipping season than the existing port at Kotzebue because of the favorable bathymetry (deeper closer to shore) and additional ice-free days. Earlier ice-out conditions would allow cargo to be staged in Kotzebue so that the riverine barges that typically over winter near Kotzebue in Hotham Inlet could be loaded as soon as ice conditions allow travel up the Kobuk River and through Selawik Lake to associated villages. This opportunity could improve community viability in the region with riverine barge travel more reliable by extending the river shipping season, and, more importantly, increase navigation efficiency by allowing more fully loaded barges to access the river earlier in the season during higher water levels.

The opportunities are summarized below:

- Increase the efficiency of maritime transportation
- Increase maritime safety
- Increase the effective maritime and riverine shipping seasons
- Lower the cost of goods, services, and fuel to Kotzebue and the outlying villages
- Increase the duration of the construction season
- Improve community viability in the region
- Sustain Alaska Native cultures and subsistence ways of life

2.4 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. In regard to navigation projects, NED minimizes expected property damage and transportation inefficiencies. Minimizing inefficiencies, increases the net value of goods and services provided to the economy of the nation as a whole. Other national objectives may be defined by law.

2.5 Study Objectives

The overarching objective of this study is to improve navigation efficiency at Kotzebue and to realize any associated opportunities that may arise from doing so in order to increase the quality of life for the residents of the Northwest Arctic Borough. Study objectives identified in the initial, and refined in the subsequent, steps and iterations of the planning process are as follows:

- Decrease endemic navigational inefficiencies associated with delivery of fuel and goods
- Increase the number of days of barge access to Kotzebue and the region
- Increase safe subsistence opportunities that may be associated with facility development

2.6 Study Constraints

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

- Negative impacts to navigation
- Negative impacts to fisheries and wildlife
- Adequate passage for fishes and marine mammals must be maintained

- Negative impacts to the environment
- Negative impacts to historic sites, cultural resources, and critical infrastructure
- Negative impacts to subsistence activities
- Beach access must be maintained for all-terrain vehicle (ATV) use per input by local community members
- The new port location and associated general navigation features need to be in alignment with the Kotzebue to Cape Blossom Road

2.7 National Evaluation Criteria

Alternative plans should be formulated to address study objectives and adhere to study constraints. Each alternative plan shall be formulated with 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 and benefits were calculated using Federal Fiscal Year (FY) 2018 nominal price levels and then converted to present value using the alternatives construction schedule and nominal FY 2018 federal discount rate of 2.750 percent. The 2018 cost for the TSP alternative will be updated and put into revised present value terms for the final version of this report.

Each alternative for this study had an estimated cost prepared by Cost Engineering utilizing MCASES. This study also had a “Total Project Cost Summary” prepared for each alternative. The total economic (NED) cost used in the NED analysis differs from the Total Project Cost. The Total Project Cost includes the authorized general navigation features and local sponsor facilities costs. The NED cost, in comparison, includes general navigation features, local service facilities, and operations, maintenance, repairs, replacements, and rehabilitations expenses, as well as other tangible opportunity costs (discounted over a period to be represented in average annual costs). Further discussion of the NED analysis and methodology can be found in Appendix D (Economics) and the associated Economics Addendums.

2.8 Study Specific Evaluation Criteria

According to the USACE's Implementation Guidance (Section 1105 of WRDA 2016), if there is no NED plan and/or the selection of a plan other than the NED plan is based in part or whole on non-monetary units, then the recommendation will be supported by a Cost Effectiveness/Incremental Cost Analysis (CE/ICA). The metric for this study and the results of the CE/ICA analysis is presented in Appendix D and below in Section 6.2.1.

3 BASELINE CONDITIONS / AFFECTED ENVIRONMENT*

3.1 Physical Environment

3.1.1 Climate (Temperature & Precipitation)

According to the updated Köppen-Gieger world climate classification map, the Baldwin Peninsula is characterized as a snow climate, fully humid, with a cool summer and cold winter (Kottek et al. 2006). Summers are short and mild, while winters are long and can be exceedingly cold. In Kotzebue, July is typically the region's warmest month, while January is its coldest (Table 2). Rainfall is variable, but averages approximately 10 inches per year; average annual snowfall is 39 inches.

Table 2. Temperature and Precipitation

	Jan	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*
Mean Min Temperature [F]	-9.5	-7.8	-6.7	5.4	26.0	39.9	49.7	47.3	37.9	20.1	4.0	-4.1
Mean Temperature [F]	-2.8	-0.8	1.1	13.3	31.9	45.7	54.6	51.7	42.3	24.3	9.1	2.3
Mean Max Temperature [F]	3.9	6.3	8.8	21.2	37.8	51.5	59.5	56.1	46.7	28.5	14.2	8.7
Mean Precipitation [Inch]	0.6	0.7	0.4	0.54	0.4	0.6	1.5	2.2	1.6	1.0	0.8	0.8
Snowfall [Inch]	9.1	9.6	5.9	5.1	1.2	0.0	0.0	0.0	0.8	6.1	10.5	11.5

Reference: Kottek et al. 2006

3.1.2 Wind

Wind measurements for the proposed project site are not available. However, wind information from hindcast points near the project site are available through the Wave Information Study presented in Appendix C (Hydraulics & Hydrology). Wind data at Kotzebue are available for the Kotzebue/Ralph Wien Airport for the years 1970 through 2018. A wind rose for the period of record indicates that the predominant wind direction is from the east-southeast and the average speed is 12.3 miles per hour (Figure 6). Analysis of the monthly wind roses indicates that the east-southeast wind is the dominant direction from September to April. During the months of May through August, the dominant wind direction is from the west-northwest.

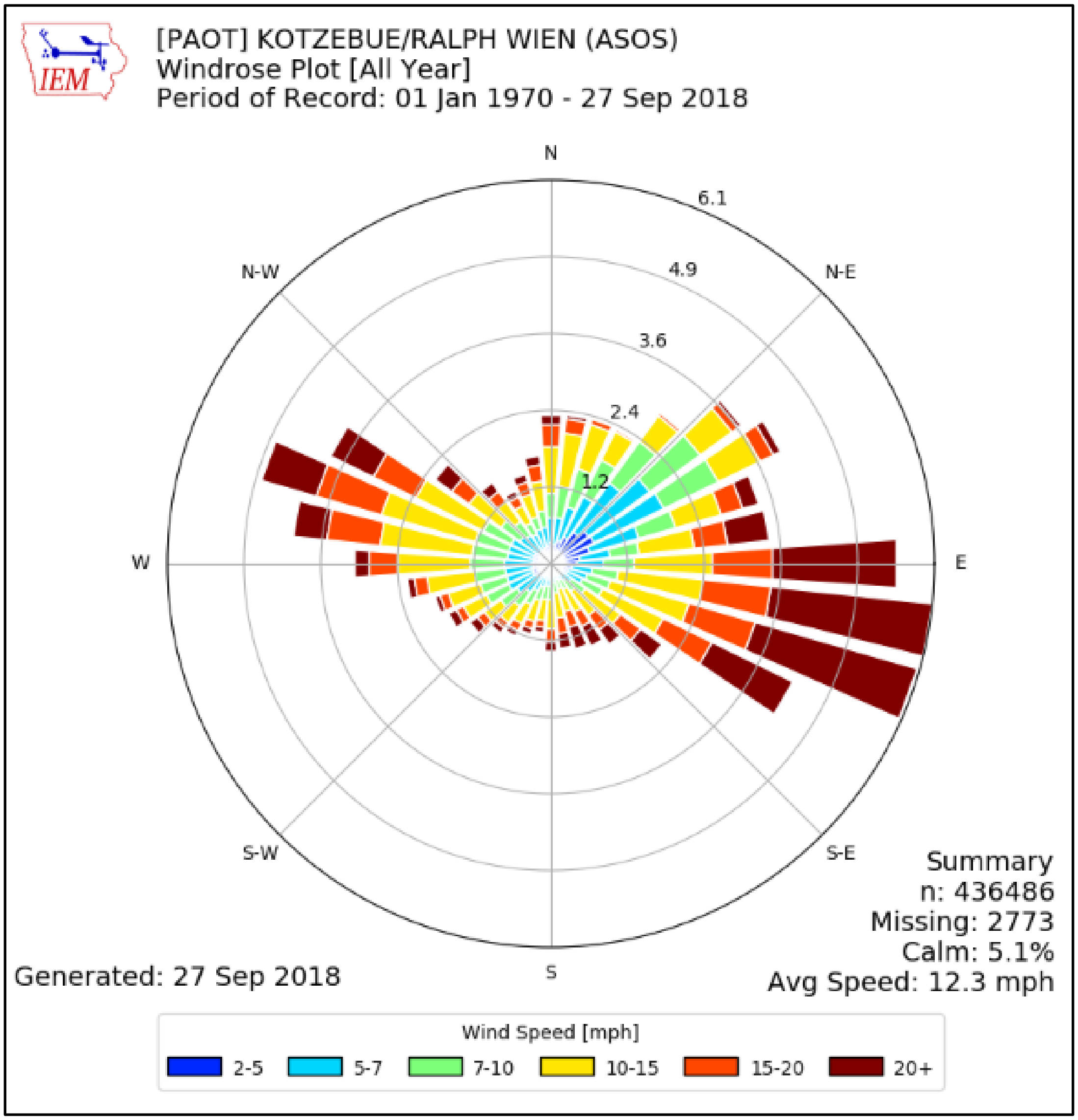


Figure 6. Wind direction for Kotzebue (all months) (*from* Iowa State University 2018).

3.1.3 Ice Conditions

3.1.3.1 Sea Ice

Sea ice can be present from October to July in most years and becomes shorefast early in its annual formation due to shallow bathymetric characteristics of the nearshore areas. Ice generally begins accumulating in October in the south Chukchi Sea, forming along the northeast coast of Russia and then proceeding down the Chukchi Peninsula to Cape Dezhnev (Figure 7). Generally, by the time ice has reached Cape Dezhnev, ice is also forming along the western Alaska coast. Ice along the Russian coast generally grows faster than the ice along the Alaska coast. Ice on both coasts continues to grow until access to the Chukchi Sea is cut off by ice in the Bering Strait. Shortly after the Bering Strait is iced up the Chukchi Sea ices over.

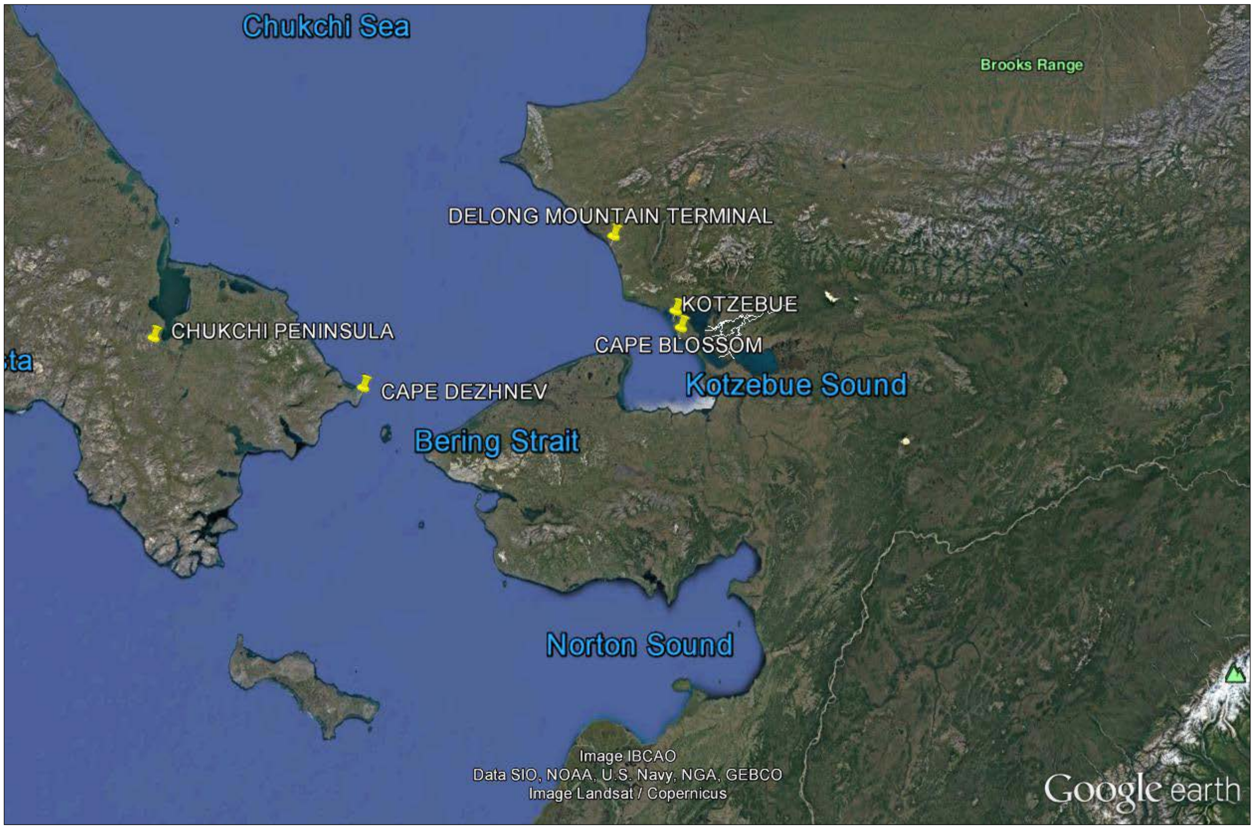


Figure 7. Location of Chukchi Peninsula, Cape Dezhnev, and Kotzebue.

The characteristics of the sea ice at Kotzebue are not typical of sea ice in the Chukchi Sea. Due to water depths of less than 4 ft offshore, the ice becomes grounded and does not move until breakup in June. Because of the lack of movement, the ice does not build up onshore or form pressure ridges close to shore. However, ice can be pushed onto the shore during breakup if the wind is from the west.

Little information is available regarding ice characteristics at Cape Blossom. Local reports indicate that the ice is similar to that at Kotzebue, with very little ice riding up onto the shore (Tetra Tech et al. 1983). Ice thickness measurements made offshore of Kotzebue in Kotzebue Sound are summarized in Table 3. These data may or may not be representative of the ice thickness at Cape Blossom; however, it is the closest location of thickness measurements.

Table 3. Maximum ice thickness for each measurement year

Date	Ice Thickness [inches]	Measurement Location
May 4/May 11, 1963	49	Offshore of Kotzebue 1½ miles NE of Weather Bureau Air Station
May 16, 1964	53	Offshore of Kotzebue 1½ miles NNE of Weather Bureau Air Station
April 29, 1967	44.5	Offshore of Kotzebue ½ miles NNE of Weather Bureau Air Station
April 27, 1968	42	Offshore of Kotzebue 1½ miles NNE of Weather Bureau Air Station
April 19, 1969	58	100 yards offshore of Kotzebue on Kotzebue Sound
April 25/May 2, 1970	47.5	Offshore from Kotzebue on Kotzebue Sound
May 5, 1973	48	Inner Kotzebue Sound
April 13, 1974	61	50 ft out from shore on Kotzebue Sound

References: Bilello and Bates 1966, 1971, 1972, 1991.

There is no open-water season ice condition data for the Kotzebue or Cape Blossom areas. However, historical data were evaluated for the Navigation Improvements Study at the Delong Mountain Terminal located approximately 80 miles north-northwest of Kotzebue. This earlier analysis (USACE 2005) indicates that the ice cover in the Kotzebue Sound region is out typically in June, but can extend into July, with the ice cover returning in October to late November (Table 4). The open-water season ranges from 78 to 160 days (Table 5). Discussions with local representatives from Kotzebue during the charette confirmed that ice is usually out of Kotzebue Sound at the end of June or beginning of July.

Table 4. Open water season dates 1972 to 2001

Ice Cover				
	0 Tenths Ice Cover		5 Tenths Ice Cover	
	Ice Out	Ice In	Ice Out	Ice In
Earliest Date	9 June	4 October	7 June	9 October
Mean Date	6 July	29 October	27 June	4 November
Latest Date	28 July	19 November	18 July	23 November

Reference: United States Ice Center's Sea Ice Grid (SIGRID) database from 1972 to 2001.

Table 5. Open water season length [days] 1972 to 2001

Ice Cover		
	0 Tenths Ice Cover	5 Tenths Ice Cover
Minimum Season	78	108
Mean Season	115	131
Maximum Season	148	160

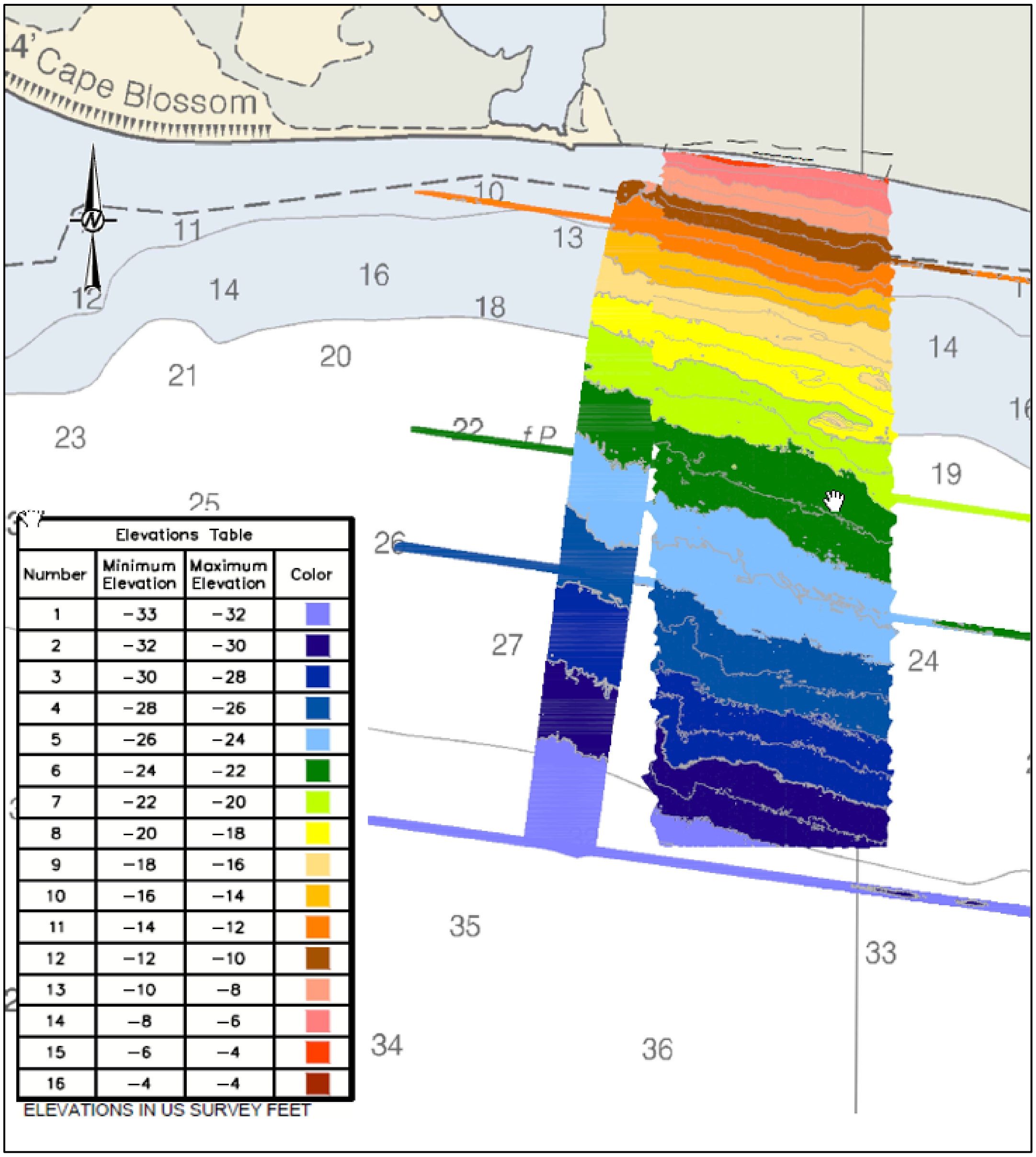
Reference: United States Ice Center's SIGRID database from 1972 to 2001.

3.1.3.2 Hotham Inlet, Selawik Lake, and Kobuk River Ice

During the charette, local community members noted that the ice in Hotham Inlet (locally known as Kobuk Lake) is typically out two to three weeks before the ice is out of Kotzebue Sound. Similarly, the U.S. Fish and Wildlife Service (USFWS) noted that the ice in Selawik Lake, Selawik River, and the lower Kobuk River is usually out between the middle of May and early June.

3.1.4 Bathymetry

The project area, which is located about 1.5 miles east of Cape Blossom, was selected due in part to its favorable bathymetry (deeper near shore). The bathymetry of the Cape Blossom area is shown in Figure 8. Bathymetry of the region is depicted in detail on NOAA Chart 16161 (see Figure 4).



Number	Minimum Elevation	Maximum Elevation	Color
1	−33	−32	
2	−32	−30	
3	−30	−28	
4	−28	−26	
5	−26	−24	
6	−24	−22	
7	−22	−20	
8	−20	−18	
9	−18	−16	
10	−16	−14	
11	−14	−12	
12	−12	−10	
13	−10	−8	
14	−8	−6	
15	−6	−4	
16	−4	−4	

Figure 8. Bathymetry of Cape Blossom Area (*from* Golder 2017).

3.1.5 Geology / Topography

The Baldwin Peninsula presents a gently rolling, sometimes flat, near-uniform topography, the surface of which is marked by polygonal ground thaw lakes. Broad morainal ridges rising up to 150 ft above the general surface form the topographic backbone of the peninsula. This rolling topography is typically bordered at the coast by bluffs 20 to 100 ft high (Tetra Tech et al. 1983).

The beach at the foot of the highest bluffs is usually less than 50 ft wide. The active erosion of the bluffs bordering the western edge of the peninsula provides evidence of a retrograding shoreline. The lakes which dot the surface of the peninsula and the surrounding lowlands appear to be thaw lakes that have originated due to the thawing permafrost. These lakes are typically shallow and freeze to the bottom in winter although some larger, deeper lakes may be potential sources of fresh water on a year-round basis. In general, the soils on Baldwin Peninsula are poorly drained. The active layer, which may thaw to a depth of about 2 ft during the summer, is typically saturated. The combination of fine grained and organic soils, gentle to flat slopes, and permafrost at the base of a shallow active layer all contribute to poor drainage conditions (Tetra Tech et al. 1983).

3.1.6 Soils / Sediments

Silt, organic silt, and peat are the predominant soil types at Cape Blossom. Brown organic silt and peat occur from the surface to depths typically between 10 and 20 ft. The thickness of these surficial soils, as exposed in the coastal bluffs, range from less than 5 ft to greater than 20 ft. Massive ice lenses are a common constituent of these soils. Gray silts, typically devoid of organics, underlie the surficial soils. Actively eroding slopes are common at the bluffs that border the coast (Figure 9). In some places the bluffs are completely bare of vegetation and are cut by steep-walled gullies. Mud flows, debris slides, and block slumping are common along the front of the bluffs (Tetra Tech et al. 1983)

Figure 9. Beach bluff face in project area in 2016, showing ice lenses and active erosion.

The 2017 geophysical investigation indicated that the sea floor within the project area consists of loose to soft silt and fines underlain by loose to medium dense sand, silt, and gravel (see Appendix B, Geotechnical Engineering). The loose upper layer of sediments appears to be approximately 15 ft thick with the coarser loose to dense layer extending to the depth of exploration at -100 ft MLLW.

3.1.7 Water Quality

Water quality at Cape Blossom is presumably very good. The Alaska Department of Environmental Conservation's (ADEC) contaminated sites database has no records of anthropogenically contaminated sites within 12 miles of the proposed project location that might potentially affect localized water quality parameters. Furthermore, currents, tidal forcing, bathymetric characteristics, storm events, and sea ice formation and movements act to thoroughly mix the nearshore water column.

Cape Blossom's retrograding shoreline contributes significantly to the quantity of suspended organic matter in its nearshore waters in the form of particulate organic material. Partially decomposed peat, vegetative matter, and their respective decomposer microbial colonies are liberated into the swash zone by wave action. Storm-driven waves break further up the shallow beaches that are characteristic of the Baldwin Peninsula and undermine the existing bluff faces. This erosion causes peat-bergs, for lack of better terminology, to calve away from the bluff face and disintegrate and disperse via thawing and wave action.

3.1.8 Tides / Currents / Surface Water / Stream Flow

3.1.8.1 Tides

Kotzebue is in an area of small semi-diurnal tides with two high waters and two low waters each lunar day. The difference between the Mean Higher High Water (MHHW) and Mean Lower Low Water (MLLW) tides is 0.71 ft based on data from the Kotzebue Station 9490424 as determined by NOAA (Table 6).

Table 6. Tidal Parameters - Kotzebue (9490424)

Parameter	Elevation (ft MLLW)
Mean Higher High Water (MHHW)	0.71
Mean High Water (MHW)	0.64
Mean Tide Level (MTL)**	0.39
Mean Sea Level (MSL)*	0.34
Mean Low Water (MLW)	0.13
Mean Lower Low Water (MLLW)	0.00

*MSL The arithmetic mean of hourly heights observed over the National Tidal Datum Epoch. Shorter series are specified in the name; e.g. monthly mean sea level and yearly mean sea level.
**MTL The arithmetic mean of mean high water and mean low water.

3.1.8.2 Currents

The USACE directly measured local current climate characteristics in the nearshore waters off Cape Blossom via Acoustic Doppler Wave and Current profiler (AWAC), deployed from September 14 –October 20, 2016. The profiler was deployed in close proximity to the envisioned channel location at a depth of approximately -30 ft. Measured current velocities and direction from the first bin of the water column above the instrument (approximately 5 ft above the bed) are shown in Figure 10. A direction of zero degrees indicates current flowing to the north; 180 degrees indicates current flowing to the south. The local shoreline azimuth at the study site is about 270 degrees. Currents with a direction of 270 degrees are moving along the coast to the west; currents with directions of 90 degrees are moving along the coast to the east. A direction of zero degrees indicates current flowing to the north; 180 degrees indicates current flowing to the south. For the measurement period, the current direction fluctuated between east and west.

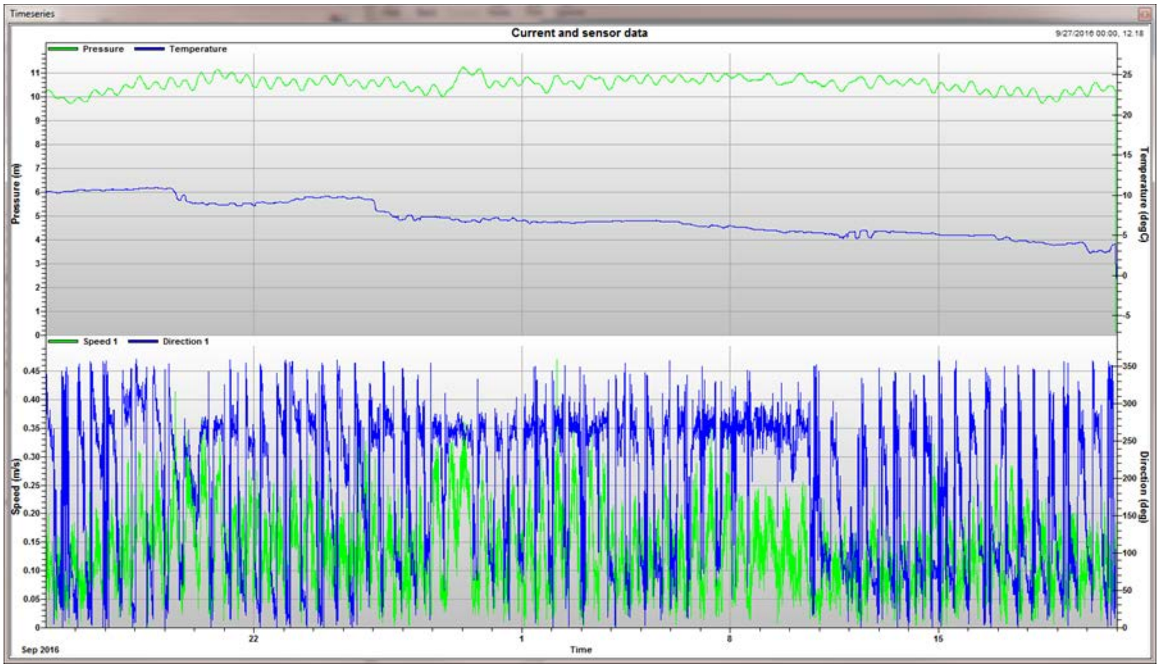


Figure 10. Current Speed and Direction Time Series

3.1.9 Sea Level Rise

The USACE requires that planning studies and engineering designs over the project life cycle, for both existing and proposed projects, consider alternatives that are formulated and evaluated for the entire range of possible future rates of sea-level change (SLC), represented by three scenarios of “low,” “intermediate,” and “high” SLC. The Permanent Service for Mean Sea Level (PSMSL) has sea-level trends published for Providenia, Russia; which is the closest station to Kotzebue with a long term record. In addition to looking at the SLC based on Providenia, Russia, the SLC was evaluated using the Global Mean Sea Level (GMSL) change with vertical land movement (VLM) at Kotzebue as measured by the Jet Propulsion Laboratory (JPL). As described in Appendix C (Section 6.3.4), over a 50-year project life the Kotzebue area could have a sea level rise of 0.54 ft to 2.52 ft (Table 7).

Table 7. Sea level rise prediction for a 50 year project life

	Low	Intermediate	High
Using Providenia Russia Mean Sea Level Trend	0.54 ft	1.01 ft	2.51ft
Using GMSL and VLM at Kotzebue	0.55 ft	1.02 ft	2.52ft

A dredged navigation channel would not be adversely affected by sea level rise. Maintenance dredging depth requirements could be re-evaluated in the event that the sea level rises to a level where the under-keel clearance is greater than needed for the function of the facility. The local sponsor would need to consider the effects of SLC on the shoreside facilities that would connect to the channel in order to ensure that they can remain functional.

3.1.10 Air Quality

The Baldwin Peninsula exhibits excellent air quality. Its remote and somewhat inaccessible land mass compounded by long periods of sea ice deter establishment of significant anthropogenic sources of criteria pollutants (as defined by the Clean Air Act). Rigorous atmospheric processes associated with the north Bering Sea contribute to the constant mixing of the near-surface air column. Furthermore, Cape Blossom is not in or near a designated “non-attainment” area; therefore, “conformity determination” requirements of the Clean Air Act do not apply to this project, as proposed, at this time.

3.1.11 Noise

Cape Blossom is relatively free of anthropogenic noise. Wind is the predominant source of ambient noise at Cape Blossom and can attenuate other noises at higher velocities. Other sources of ambient noise at Cape Blossom include those associated with wave action, sea ice movement, and, to a much lesser degree, wildlife.

3.1.12 Visual Resources

The viewshed at Cape Blossom is representative of much of coastal Northwest Alaska. Visibility to the horizon is uninterrupted by anthropogenic influence, giving one the feeling of remoteness. Kotzebue Sound dominates the view to the south and west, while the tundra rolls gently to the horizon to the north and east. There are no trees within sight; their establishment is precluded by existing environmental conditions. Local vegetation is represented by small tundra species. Coastal bluffs marked by ice lenses emerge abruptly from the narrow, pebble beaches. Several coastal lagoons are visible to the east-southeast from the highest point of Cape Blossom.

3.2 Biological Resources

3.2.1 Federal & State Threatened & Endangered Species

None of the birds, terrestrial mammals, terrestrial vegetation, or marine vegetation within the project area are considered to be threatened or endangered species under the Endangered Species Act (ESA; 16 U.S.C. 1531 et seq.). Migratory birds which may temporarily reside in the area, such as long-tailed ducks (*Clangula hyemalis*), are protected under the Migratory Bird Treaty Act (16 U.S.C. 703-712). Golden eagles (*Aquila chrysaetos*), which may range into the Kotzebue region, are protected under the Bald and Golden Eagle Protection Act (16. U.S.C. 668-668d). Many of the marine mammals that can be found in the general vicinity are protected under the ESA. According to the NOAA’s “Alaska Endangered Species and Critical Habitat Mapper,” the following marine mammals within the region are listed under the ESA: bearded seal (*Erignathus barbatus*) within the Beringia Distinct Population Segment (DPS) (Threatened); Arctic ringed seal (*Pusa hispida hispida*) (Threatened); bowhead whale (*Balaena mysticetus*) (Endangered); fin whale (*Balaenoptera physalus*) (Endangered); humpback whale (*Megaptera novaeangliae*) within the Western North Pacific DPS (Endangered); and polar bear (*Ursus maritimus*)

(Threatened). Unlisted marine mammals protected under the Marine Mammal Protection Act (MMPA; 16 U.S.C. 1361 et seq.) include: ribbon seal (*Histriophoca fasciata*), spotted seal (*Phoca largha*), walrus (*Odobenus rosmarus*), beluga (*Delphinapterus leucas*), gray whale (*Eschrichtius robustus*), harbor porpoise (*Phocoena phocoena*), orca (*Orcinus orca*), northern minke whale (*Balaenoptera acutorostrata*), and narwhal (*Monodon monoceros*).

3.2.2 Terrestrial Habitat

Terrestrial habitat within and immediately adjacent to USACE's proposed project footprint is a microcosm of the surrounding coastal interface. To the west are expanses of low gradient, smooth-worn pebble beaches exhibiting a well-defined wrack line (Figure 11); to the east are narrow, smooth-worn pebble beach runs littered with the decomposing remnants of peat-bergs, calved from the adjacent bluff face (Figure 12). To the north and east of the bluff face the gently rolling tundra is marred by polygonal ground fractures and shallow lakes and ponds.

Figure 11. Beach view in 2016 to the west of project area.

Figure 12. Beach view in 2016 to the east of project area.

3.2.2.1 Terrestrial Vegetation

Vegetation in the immediate vicinity of the proposed project footprint is most accurately characterized in FHWA's Environmental Assessment and subsequent FONSI for the Kotzebue to Cape Blossom Road project. Although FHWA's analysis does not describe the entire USACE project footprint, a considerable degree of homogeneity exists among the contiguous habitats. FHWA's EA characterizes the coastal tundra in the vicinity of the USACE project footprint as wet sedge-shrub meadow and moist sedge-shrub meadow. Wet and moist sedge-shrub meadows represented the two most commonly encountered habitat types in the FHWA EA.

3.2.2.2 Freshwater Fishes

There are no freshwater fishes or freshwater fish habitat within the project footprint. A large unnamed lagoon is located adjacent to the project site, approximately 0.5 miles east of Cape Blossom. This lagoon was found to contain nine-spine stickleback (*Pungitius pungitius*) and Alaska blackfish (*Dallia pectoralis*) during limited sampling with minnow traps in August 2016 by USACE biologists. Other species may be present in this lagoon, including those species found in Sadie Creek (approximately 6 miles to the north) as detailed in the FHWA EA. The large unnamed lagoon is generally closed off to the marine waters of Kotzebue Sound, but likely overflows periodically from a relic outlet in its southeast corner. There are no anadromous fish streams in the project area.

3.2.2.3 Terrestrial Mammals

The terrestrial mammals on the Baldwin Peninsula are described in the FHWA EA. The ADFG has designed the Baldwin Peninsula as a designated caribou (*Rangifer tarandus*) migratory area. The Western Arctic Herd is currently estimated at 259,000 caribou (ADFG 2018a). The herd, which roams an area of about 157,000 square miles, had declined to about 75,000 animals in 1976. Its population grew annually until it peaked at 490,000 animals in 2003, after which it declined steadily to 201,000 animals in 2016 (ADFG 2011, 2018a). Moose (*Alces alces*) did not become a common sight on Baldwin Peninsula until after the 1960s (Georgette and Loon 1993). Moose can now be found year-round on the Baldwin Peninsula in low densities (FHWA 2013). Smaller terrestrial mammals occupying some areas of the Baldwin Peninsula include beavers (*Castor canadensis*), tundra hare (*Lepus othus*), and Arctic and red foxes (*Lepus* sp.) (Georgette and Loon 1993; Northwest Arctic Borough 2016). It is likely that small rodents such as the collared lemming (*Dicrostonyx groenlandicus*) and root vole (*Microtus oeconomus*) may also be present in the vicinity of Cape Blossom on the Baldwin Peninsula (MacDonald and Cook 2009).

3.2.2.4 Birds

Birds and their habitat encompassing the shoreline, land, and lakes of the Baldwin Peninsula are described in the FHWA EA. The proposed action and all of the action alternatives mainly involve nearshore marine bird habitat and a variety of waterfowl and seabirds. The National Audubon Society has designated Kotzebue Sound as an Important Bird Area (IBA) for breeding long-tailed ducks. This designation is somewhat misleading in that these ducks do not actually breed on Kotzebue Sound, but instead use the marine habitat in the spring for staging and again in late summer and fall for foraging; actual nesting and early rearing takes place along peninsulas, islets, or islands along ponds or lagoons. Long-tailed ducks and a variety of other waterfowl including Northern pintail (*Anas acuta*), pelagic cormorant (*Phalacrocorax pelagicus*), and glaucous gull (*Larus hyperboreus*) are among the most common birds that may be found in the project area in nearshore marine waters. Local traditional knowledge identifies the area between Kotzebue and Cape Blossom as important for gulls and waterfowl (Northwest Arctic Borough 2016). The USFWS conducted an eider survey in the Cape Blossom area in June of 2008 and 2009; relatively few or no common eiders (*Somateria mollissima*) were observed in Segment 26, the “Baldwin Peninsula – West Side” area (Bollinger and Platte 2012). A June 2012 survey on behalf of the ADOT&PF identified no golden eagles or other raptors or their nests at the bluffs along the southwest coast of Cape Blossom (FHWA 2013).

3.2.3 Marine Habitat

3.2.3.1 Marine Vegetation

Marine vegetation within the USACE's proposed project footprint is limited largely in part due to the seasonal scouring from sea ice and muddy sand bottom. The predominant coastal seagrass in Alaska is eelgrass (*Zostera marina*). Its range extends into Kotzebue Sound and has the potential to be within the project area. It is possible for eelgrass to survive the winter sea ice, if not scoured in shallow depths, due to its resistance and ability to survive in low light, low temperature, and anoxic conditions underneath the subsurface of the sea ice. Biomass of eelgrass is reduced by the sloughing off of flowering and old plants during the sea ice and allows for a new cycle of plants when the sea ice recede (McRoy 1970).

3.2.3.2 Marine Mammals

Multiple marine mammal species are found within Kotzebue Sound and nearby waters.

Bearded seals are large-bodied pagophilic seals that inhabit circumpolar, relatively shallow, and seasonally ice-covered Arctic and subarctic waters. Bearded seal presence is strongly correlated with the presence of sea ice, particularly pack ice. Additionally, the seasonal distribution of bearded seals is reliant upon changes in ice conditions. Bearded seals migrate north in the springtime as sea ice retreats, and again to the south in fall as the sea ice reforms.

Although bearded seals are a listed species under the ESA, the taking of bearded seals for subsistence purposes by Alaska Natives in Alaska is not prohibited. Bearded seals (*ugruk* in Iñupiat) are included in the subsistence harvest for the population of the Kotzebue Sound region, and are the most heavily relied upon marine mammal subsistence species in the area (Northwest Arctic Borough 2016).

Ringed seals are the smallest and most common of the Arctic pagophilic seals; they are circumpolar in distribution, closely associated with the pack ice edge, and are observed as far south as Bristol Bay in extreme ice years. Like the bearded seal, although listed on the ESA, ringed seals (*natchiq* in Iñupiat) are an important subsistence resource for the peoples of the Kotzebue Sound area and the taking of ringed seals is not prohibited.

Ringed seals are common in Kotzebue Sound after sea ice has formed until spring breakup, at which time they follow the retreating pack ice to the north. Kotzebue Sound may represent an important fall feeding area for ringed seals (Northwest Arctic Borough 2016).

Spotted seals are pagophilic and widely distributed along the Bering, Chukchi, and Beaufort continental shelves. From late fall through spring, they are primarily associated with seasonal sea ice. Kotzebue Sound is a known general migration and feeding area as well as a wintertime pupping area for spotted seals. Like bearded and ringed seals, spotted seals (*qasigiaq* in Iñupiat) constitute a significant contribution to the subsistence harvest of the Kotzebue Sound community (Northwest Arctic Borough 2016).

Ribbon seals inhabit the North Pacific Ocean and adjacent parts of the Arctic Ocean. In Alaskan waters, ribbon seals range from the North Pacific Ocean and Bering Sea into the Chukchi and western Beaufort Seas. Although ribbon seals are pagophilic and reliant upon sea ice, they are rarely seen on shorefast ice (NOAA 2015); much of the sea ice surrounding the Baldwin Peninsula is shorefast. Once the spring molting period has concluded, ribbon seals disperse throughout the North Pacific and are rarely observed again until the formation and southward expansion of the Bering Sea ice pack during the fall.

According to Ice Seal Committee, only 16 ribbon seals were harvested between 2009 and 2013 in the 64 Alaska Native communities that participated in its subsistence harvest information survey. Ribbon seals do not constitute a significant subsistence resource in Kotzebue Sound and are not mentioned as such in a regional subsistence report.

Walrus (*Odobenus rosmarus divergens*) mainly inhabit the shallow, continental shelf waters of the Bering and Chukchi seas. Their distribution varies seasonally with almost the entire population occupying the pack ice in the Bering Sea in the winter months. As the sea ice breaks up in the spring, their distribution becomes less clumped as they start to move northwards. Their range includes Kotzebue Sound in the summer and fall time periods; migrating through with the advancing and retracting ice. From May to June, walrus travel north past the Kotzebue and south from October to November (MacCracken et al. 2017).

Nearby known haulouts include Cape Blossom and Kotzebue Sound (Huntington et al. 2016). Walrus in Kotzebue Sound typically haulout on free floating sea ice and terrestrial areas. During the southern migration females and young use coastal haulouts along the way as they move in advance of the developing ice, but groups are relatively small and they only stay on land for a few days.

Walrus are an important subsistence and cultural resource to many Alaska Native cultures. According to local subsistence hunters, walrus occasionally haulout along the southern edge of Cape Krusenstern to Sisualiq Spit and inside Kotzebue Sound toward Deering (Huntington et al. 2016).

Beluga whales are distributed throughout the seasonally ice-covered arctic and subarctic waters in the Beaufort, Chukchi, and Bering Seas. Seasonal abundance and distribution is primarily dependent upon ice cover, prey availability, and over-summering and/or wintering site fidelity. Beluga from possibly three distinct populations, the Beaufort Sea, Eastern Chukchi Sea, and Eastern Bering Sea stocks, are thought to use waters of Kotzebue Sound either during their northward migration or as part of their usual summer distribution (NOAA 2017b). Additionally, Northwest Arctic Borough (2016) suggests the possibility of a specific Kotzebue Sound stock of beluga whales.

According to local traditional ecological knowledge, beluga enter Kotzebue Sound from the northwest in late spring to early summer when the shorefast sea ice begins to break up. Upon entering the waters of Kotzebue Sound, they move southeast past the Baldwin Peninsula and into

Eschscholtz Bay, where they calve in the deeper ice-free areas of the bay (Huntington 1998). During the charette, local expert knowledge also detailed beluga movements into Hotham Inlet and Selawik Lake.

Beluga whales from the Beaufort, Eastern Chukchi, and Eastern Bering Sea stocks are all taken in the subsistence harvest activities of Alaska Natives along the northwestern coasts of Alaska. In 2015, 43 animals were landed from the Beaufort Sea stock, 72 from the Eastern Chukchi stock, and 193 from the Eastern Bering stock (NOAA 2017b).

Narwhal (*Monodon monoceros*) are rarely observed in the waters of Kotzebue Sound. In summarizing NMFS' 2016 Stock Definition and Geographic Range report, local observations and traditional ecological knowledge are the primary source of data concerning narwhal presence in Bering Sea waters. A small sample size of narwhal observations in Kotzebue Sound is reinforced by the physical collection of a narwhal tusk on the beach at Kiwalik Bay (NMFS 2016b).

Harbor porpoise range almost the entirety of Alaska's coastal and nearshore waters, from southeast Alaska and the Gulf of Alaska to western portions of the Beaufort Sea. Harbor porpoises are typically observed in waters less than 100 meters deep. According to the Alaska Department of Fish and Game, the estimated population size of the Bering Sea stock of harbor porpoise is 66,076 animals. Because they are small and their inherent aversion to disturbance, harbor porpoise are difficult to detect (NOAA 2017; Frost et al. 1983). Detailed harbor porpoise abundance or behavior observations in Kotzebue Sound are not noted in any of the available peer-reviewed literature utilized during this assessment, however, NOAA's 2017 harbor porpoise Bering Sea stock assessment states that from 2011 to 2015, a single harbor porpoise was taken incidentally through entanglement in a Kotzebue commercial salmon set gillnet. No corroborating presence/absence information are available in regional subsistence reports.

Orcas, also known as killer whales, migrate northward through the Bering and Chukchi Seas in the spring as the pack ice retreats. Of the three distinct ecotypes of killer whale recognized as utilizing Alaska's coastal and nearshore waters, only the Gulf of Alaska, Aleutian Island, Bering Sea (GOA/AI/BS) transient ecotype is commonly observed in waters of the Bering, Chukchi, and Beaufort Seas. GOA/AI/BS ecotypes are known for their propensity to prey on marine mammals: baleen whales, dolphins and porpoises, Steller sea lions, sea otters, fur seals and true seals. Killer whales of the resident and oceanic ecotype have been identified in Russia's Bering Sea waters (Filatova et al. 2015), but peer reviewed literature searches available during the construction of this report describe very little about killer whale behavior in the northeast Bering, Chukchi, and Beaufort Seas. Sighting information is likely local, first-hand traditional ecological knowledge; fine-scale behavioral analyses for animals in Kotzebue Sound and areas adjacent to Cape Blossom are unavailable. No evidence of killer whale occurrence has been noted in subsistence reports for the areas of Kotzebue Sound.

Minke whales are found in all of Alaska's marine waters and in all oceanographic domains within those waters (coastal, middle shelf, and outer shelf/slope) (NOAA 2015b). Because of their surfacing behavior, often spending less than a minute at the surface, minke whales are difficult to detect during all survey methodologies. Aerial surveys of the south central Chukchi Sea conducted between 2008 and 2016 resulted in 38 sightings of 43 minke whales, they were observed from July to September in relatively shallow water (median depth 32m) (Brower et al. 2018). Frost et al. 1983 reports that there were only three sightings of minke whales in the coastal zone of the Chukchi Sea during their investigative period of 01 January 1981 – 31 December 1982. One of the reports, from Kotzebue Sound, was of two minke whales that beached themselves at the mouth of the Buckland River. From a regional perspective, no corroborating subsistence harvest data exists that would suggest that minke whales find the waters of Kotzebue Sound to be preferential habitat.

Bowhead whales occurring in the Bering, Chukchi and Beaufort Seas derive from the Western Arctic Stock, the majority of which migrates from the northern Bering Sea, through the Chukchi and into the eastern Beaufort Sea where they spend much of the summer before returning to the Bering Sea during the winter. Despite bowhead whale populations having suffered significant reductions as a result of commercial whaling practices, the Western Arctic Stock has been steadily rebounding, from an estimated 1,000–3,000 individuals prior to 1978 to an estimated 16,820 individuals in 2011 (NOAA 2017).

According to the International Whaling Commission’s most recent aboriginal subsistence whaling harvest data, 49 bowhead whales were harvested by Alaska Native subsistence hunters in 2015. Eleven coastal villages participate in the traditional subsistence hunt for bowhead whale. These communities are Gambell, Savoonga, Little Diomede, and Wales (On the Bering Sea coast); Kivalina, Point Hope, Point Lay, Wainwright, and Utqiaġvik (on the coast of the Chukchi Sea); and Nuiqsut and Kaktovik (on the coast of the Beaufort Sea) (US Department of Commerce et al. 2018).

Despite their extensive presence in the western Bering Sea during winter months, bowhead whales do not appear to preferentially utilize habitat in Kotzebue Sound. Once leads open in the sea ice, telemetry studies have revealed that bowhead whales migrate past the mouth of Kotzebue Sound and do not enter it while in route to feeding grounds in the eastern Beaufort Sea (Quackenbush et al. 2018).

Fin whale presence and distribution in the Bering and southern Chukchi seas has been identified by bottom-mounted offshore hydrophone arrays and vessel surveys (NOAA 2017a). However, no corroborating presence/absence information is mentioned for Kotzebue Sound in regional subsistence reports. According to NOAA (2017a), fin whales are consistently distributed along the central and eastern continental shelf of the Bering Sea.

Gray whales of the Eastern North Pacific Stock were delisted from the ESA in 1994 due to a rebounding population. Over-wintering in Baja, Mexico, the majority of gray whales from the Eastern North Pacific Stock spend summer and fall months feeding in the Beaufort, Chukchi, and Bering Seas, making theirs one of the most formidable seasonal migrations in the animal kingdom (NOAA 2015a; Marquette and Braham 1982). Gray whales are also the only mysticete whale to feed primarily upon benthic organisms. Nerini and Oliver (1983) propose that gray whales may turn over as much as 9–27 percent of the northern Bering Sea benthos every year.

According to regional subsistence traditional ecological reporting, gray whales do not tend to utilize the habitat areas of inner Kotzebue Sound. Rather, they predominantly occur over shallow continental shelf areas of the north Bering and south Chukchi Seas (Marquette and Braham 1982).

Humpback whales are generally considered to be a subarctic species, and as such, literature describing their relative abundance and distribution in the northern Bering, Chukchi, and Beaufort Seas is limited. However, there has been an increased number of humpback whale sightings from 2008–2016, in comparison to a similar baseline survey searching for gray and bowhead whales from 1982–1991. But this may be attributable to survey methodology bias (Brower et al. 2018). Similarly, no corroborating evidence regarding relative abundance and distribution of humpback whales in Kotzebue Sound was identified in regional subsistence harvest reports.

According to NMFS guidance, humpback whales observed in the Aleutian Islands, Bering, Chukchi, and Beaufort Seas derive from three recognized North Pacific DPSs: the Western North Pacific DPS, the Hawaii DPS, and the Mexico DPS. Humpback whales deriving from the Western North Pacific DPS, which are listed as Federally endangered, are the least likely to be encountered in Alaskan waters at only 4.4 percent. Humpback whales deriving from the Mexico DPS, which are listed as federally threatened, have a similarly low encounter probability at 11.3 percent. Humpback whales deriving from the Hawaii DPS are not listed under the ESA; they are most likely to be encountered in Alaskan waters, at 86.5 percent. It should be noted that among these DPSs, individual whales do not exhibit physical traits that would allow for visual confirmation of population lineage (NMFS 2016a).

Polar bear (*Ursus maritimus*) populations are declining on a global scale; however, the specific status of the Bering/Chukchi seas sub-population is unknown. Polar bears are listed as threatened under the ESA because the sea ice on which they depend for hunting, feeding, reproduction, and seasonal movements is declining (ADFG 2018b).

Regional ice dynamics is the primary driver for polar bear seasonal movements. Most polar bears remain with the pack ice as it recedes north during the summer melting season; however, along Alaska’s Beaufort Sea coast, some polar bears also come on land to rest until shore-fast ice begins to develop along the coast in late fall and the pack ice advances south, once again providing them with a suitable platform for hunting seals. In winter, pregnant females create dens in nearshore ice or along the coast and emerge in the spring.

Critical habitat exists along the northern edge of Kotzebue Sound and Hotham Inlet (Figure 13). Females and cubs utilized this area for denning in the winter. No critical habitat exists within the proposed project area.

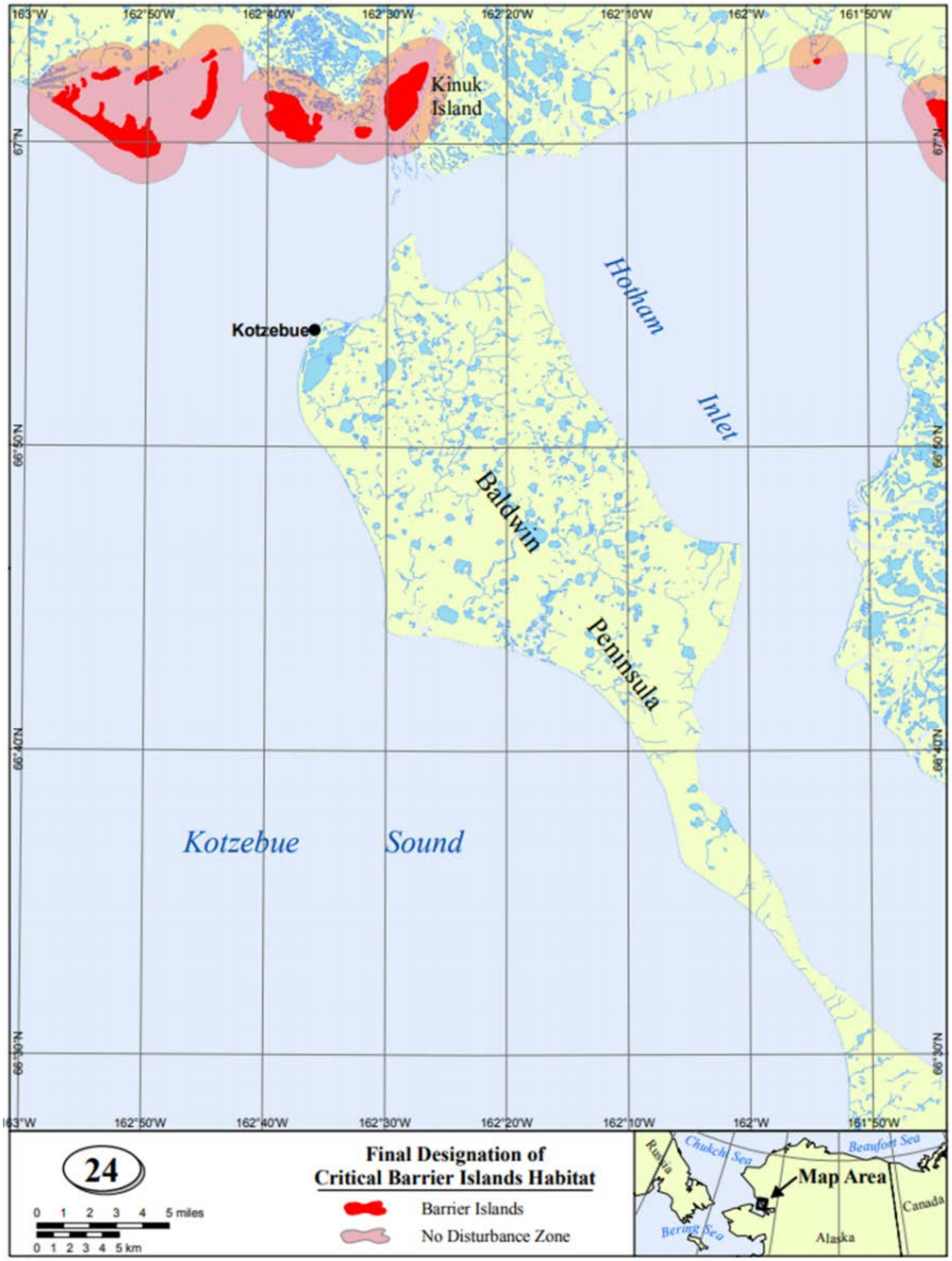


Figure 13. Critical habitat for denning polar bears in Kotzebue Sound (*from* USFWS 2018b).

3.2.3.3 Marine Fishes

A limited number of marine sampling efforts have been conducted in the general vicinity of Cape Blossom (e.g., Feder et al. 2007; Whiting et al. 2011). Marine fish species assemblages within the proposed project footprint are representative of these studies, a Cape Blossom nearshore water sampling effort conducted by USACE in 2016, and local commercial salmon fishery reports from ADFG (Table 8). The USACE nearshore biota study of Cape Blossom sampled fish and invertebrates via beach seines and bottom trawling. Saffron cod (*Eleginus gracilis*), starry flounder (*Platichthys stellatus*), rainbow smelt (*Osmerus mordax*), and Arctic flounder (*Pleuronectes glacialis*) were the dominant fish species of the total catch. Kotzebue Sound is subject to seasonal sea ice floes and the fishery is a large source of the subsistence harvest and a large commercial salmon season.

Table 8. Marine fishes that may be found within the project area

Common Name	Scientific Name	Ecological Region
Pacific herring	*Clupea pallasii*	Epipelagic
Pond smelt	*Hypomesus olidus*	Epipelagic
Rainbow smelt	*Osmerus mordax*	Epipelagic
Whitefish	*Coregonus* sp.	Epipelagic
Bering cisco	*Coregonus laurettae*	Epipelagic
Least cisco	*Coregonus sardinella*	Epipelagic
Chum salmon	*Oncorhynchus keta*	Epipelagic
Chinook salmon	*Oncorhynchus tshawytscha*	Epipelagic
Sockeye salmon	*Oncorhynchus nerka*	Epipelagic
Pink salmon	*Oncorhynchus gorbuscha*	Epipelagic
Coho salmon	*Oncorhynchus kisutch*	Epipelagic
Saffron cod	*Eleginus gracilis*	Epipelagic
Threespine stickleback	*Gasterosteus aculeatus*	Epipelagic
Whitespotted greenling	*Hexagrammos stelleri*	Epipelagic
Great sculpin	*Myoxocephalus polyacanthocephalus*	Demersal
Fourhorn sculpin	*Myoxocephalus quadricornis*	Demersal
Plain sculpin	*Myoxocephalus jaok*	Demersal
Arctic staghorn sculpin	*Gymnocanthus tricuspis*	Demersal
Bering poacher	*Occella dodecaedron*	Epipelagic
Blackline prickleback	*Acantholumpenus mackayi*	Epipelagic
Slender eelblenny	*Lumpenus fabricii*	Epipelagic
Longhead dab	*Limanda proboscidea*	Demersal
Yellowfin sole	*Limanda aspera*	Demersal
Starry flounder	*Platichthys stellatus*	Demersal
Arctic flounder	*Pleuronectes glacialis*	Demersal
Alaska plaice	*Pleuronectes quadrituberculatus*	Demersal

3.2.3.4 Marine Invertebrates & Associated Habitat

A limited number of macrobenthos sampling efforts have been conducted in the general vicinity of Cape Blossom (e.g., Feder et al. 2007; Jewett et al. 2009; Whiting et al. 2011). Marine invertebrates within the proposed project footprint are representative of these studies, a Cape Blossom nearshore biota sampling conducted by USACE in 2016, and Essential Fish Habitat (EFH) species data (NPFMC 2009; Table 9). The USACE nearshore biota study of Cape Blossom sampled fish and invertebrate through beach seines and bottom trawling. Dominant taxa of the USACE sampling were the Northern Pacific sea star (*Asterias amurensis*), mysids (*Neomysis* sp.), and Alaskan shrimp (*Crangon alaskensis*). Kotzebue Sound is identified as EFH for the snow crab (*Chionoecetes opilio*).

Table 9. List of invertebrates likely within the project area

Common Name	Scientific Name
Snow crab	*Chionoecetes opilio*
Helmet crab	*Telemessus cheiragonua*
Alaskan bay shrimp	*Crangon alaskensis*
Argid shrimp	*Argis* sp.
Mysid	*Neomysis* sp.
Baltic clam	*Macoma balthica*
Ugly clam	*Entodesma* sp.
Astarte clam	*Astarte* sp.
Whelk snail	*Neptunea* sp.
Northern Pacific sea star	*Asterias amurensis*
Six-rayed sea star	*Leptasterias* sp.
Basket star	*Gorgonocephalus* sp.
Blood star	*Henrisha* sp.
Moon jelly	*Aurelia labiata*
Lion’s mane jelly	*Cyanea capillata*
Sea anemone	*Metridium* sp.
Polychaete	*Galathowenia oculata*
Disc bryozoan	*Alcyonidium disciforme*

3.2.4 Special Aquatic Sites

Special aquatic sites are identified by the Clean Water Act regulations as “geographic areas, large or small, possessing special ecological characteristics of productivity, habitat, wildlife protection, or other important and easily disrupted ecological values” [40 CFR § 230.3(m)]. These areas are generally recognized as significantly influencing or positively contributing to the general overall environmental health or vitality of the entire ecosystem of a region. The following ecosystems are considered to be special aquatic sites:

- Wetlands
- Coral reefs
- Sanctuaries and refuges
- Mudflats
- Vegetated shallows
- Riffle and pool complex

Wetlands are the only special aquatic site found in the vicinity of the project area; however, they do not occur within the project footprint. A large unnamed lagoon is located west of the project site, approximately 0.5 miles east of Cape Blossom. It is generally closed off to the marine waters of Kotzebue Sound, but likely overflows periodically from a relic outlet in its southeast corner.

Wetlands are defined as those areas inundated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation adapted for life in saturated soil conditions. In order for an area to meet the joint USACE-EPA definition of wetland, the area must meet the three parameters of appropriate hydrology, soils, and vegetation.

3.2.5 Essential Fish Habitat

Nearshore waters included in USACE's proposed project footprint are designated as Essential Fish Habitat (EFH) under the Fishery Management Plan for Fish Resources of the Arctic Management Area and the Fishery Management Plan for the Salmon Fisheries of the Exclusive Economic Zone off Alaska. Specifically, Kotzebue Sound is EFH for Arctic cod, saffron cod, snow crab, and chum salmon. Either eggs, marine juvenile, late juvenile, marine immature and maturing adult, or adult critical life history stages occur for each of the aforementioned species in the nearshore waters of Kotzebue Sound (see Appendix H).

3.3 Cultural Resources

The geography of coastal northwest Alaska has changed significantly since the Late Pleistocene, when the earliest known evidence of human occupation in Alaska occurs at approximately 14,000 years ago. During the Late Pleistocene, most archaeological sites identified in northwest Alaska were temporary hunting camps, as groups of people followed prey, especially herd animals such as caribou (Harritt 1994). Over time, populations along the western coast developed new tools and techniques for hunting marine mammals, which became the primary food source (Dixon 2013). Populations were semi-mobile; there is both archaeological and oral history evidence for stable winter communities and seasonal family hunting or fishing camps (D. Anderson 1988; Giddings and Anderson 1986). Indigenous trade networks also played an important role in acquiring materials, relationships, and information. These trade networks spanned enormous distances, including across the Bering Strait (Dixon 2013).

Occupation of Kotzebue Sound dates to approximately 5,200 years ago (Friesen and Mason 2016). The surrounding area was a good place for hunting and fishing, but the marshy nature of the topography was not suitable for building houses, so large communities were infrequent. *Igluġruat*, the only known village at Cape Blossom, was reported in 1800 as a fall and winter settlement having between one and two houses occupied by 8 to 16 people. A second settlement, *Kaŋilik*, was located east of the second slough, approximately 6 miles southeast of Cape Blossom, and was estimated to have two houses and approximately 16 people (Burch 1998).

The Iñupiat of Kotzebue Sound were first contacted by Europeans in 1817, when the German Lieutenant Otto von Kotzebue explored the area during a voyage chartered by the Russian Empire (Orth 1967). Captain Beechey of the *H.M.S. Blossom* visited the Baldwin Peninsula area in 1827, where he found several settlements (DePew and Buzzell 2002). Visitors to the region throughout the second half of the nineteenth century reported several small settlements of two or three occupied houses on the Baldwin Peninsula (Burch 1998). In 1880, the annual indigenous summer trade fair in Kotzebue Sound, usually held at *Sheshalik* just west of the outlet of the Noatak River, was instead held at Cape Blossom (Gal 1986). That same year, the U.S. Revenue cutter *Corwin* temporarily used Cape Blossom as an inspection station, checking European vessels for contraband. The *Corwin* reported that the Cape Blossom trade fair had a population of 1,200, which was likely composed of people from as far north as Point Hope and as far south as the Yukon River Delta (Burch 1998; DePew and Buzzel 2002; Gal 1986; Hooper 1884). The trade fair was moved to the *Qikiqtaġruq*, near the city of Kotzebue is today, around 1883 (Burch 1998).

Relocation of the trade fair to *Qikiqtaġruq* and increased interactions between Alaska Natives and Euroamericans led to the founding of the permanent settlement of Kotzebue, which was named in 1899 when the first post office was established. The community continued to grow through World War II and the Cold War, with local Iñupiat men being recruited into the Alaska Territorial Guard, also known as the "Eskimo Scouts." The U.S. War Department also constructed an Aircraft Control & Warning (AC&W) station at Kotzebue to identify any impending attack along the coast. A White Alice Communication System (WACS) station was constructed in 1956, and in 1973 the AC&W was converted into a North American NORAD surveillance station (Denfeld 1994; Mighetto and Homstad 1997).

3.3.1 Previous Archaeological Investigations

A number of archaeological surveys have been conducted near Cape Blossom over the years, both independent from and in connection to the proposed project. The Bureau of Indian Affairs (BIA) surveyed Native Allotments in the area in 2009, specifically to locate a grave listed in the Alaska Heritage Resources Survey (AHRS) as KTZ-312. However, it was not found during their pedestrian survey (Goad 2011). Northern Land Use Research Alaska (NLURA) conducted helicopter and pedestrian surveys for a proposed road from Kotzebue to Cape Blossom for the State of Alaska Department of Transportation and Public Facilities in 2012. NLURA did not identify any cultural resources within the general area of the navigation improvements would be located (Blanchard 2013).

While not identified on the AHRS, the historic village of *Igluġruat* is said to be located east of a river on Cape Blossom (Burch 1998). Additional historic resources thought to be nearby include the wrecks of a side-wheel steamer called the *John Reilly*, which was blown into the rocks 4 miles east of Cape Blossom on October 13, 1905, and two vessels, the *Defiance* and the lighter it was attempting to rescue, which sank somewhere off of Cape Blossom on October 15, 1930 (BOEM 2011; NOAA 2018). In order to determine whether *Igluġruat* or any other cultural resources were present within the general area of the proposed navigation improvements, a USACE Archaeologist, Kelly Eldridge, and two USACE Environmental Scientists, Chris Hoffman and Mike Rouse, conducted a pedestrian survey of the associated uplands and beach on August 12, 2016. No cultural resources were identified (USACE 2018).

3.4 Subsistence

The Baldwin Peninsula and Kotzebue Sound has been a subsistence hunting area for the Iñupiat for over 1,000 years, and subsistence hunting and gathering continues to be an important cultural and economic practice in the region today. Subsistence hunting is an important part of local culture, in which approximately 500 pounds of locally hunted and gathered food is acquired per person per year (Magdanz et al. 2010). These regional subsistence practices include a number of different resources (Figure 14), which focus heavily on the taking of caribou. Previous studies have found that on average 2.2 caribou are taken per household per year (Godduhn et al. 2014). In 1986, 3.5 percent of households in Kotzebue had seasonal subsistence camps on the Baldwin Peninsula. This included that areas of "North Tent City," "South Tent City," "Sadie Creek," and *Iḷuviaq*, all of which are immediately adjacent to or near Kotzebue. Seasonal camps on Baldwin Peninsula are primarily used from May through October for fishing, seal and beluga hunting, and berry picking (Georgette and Loon 1993).

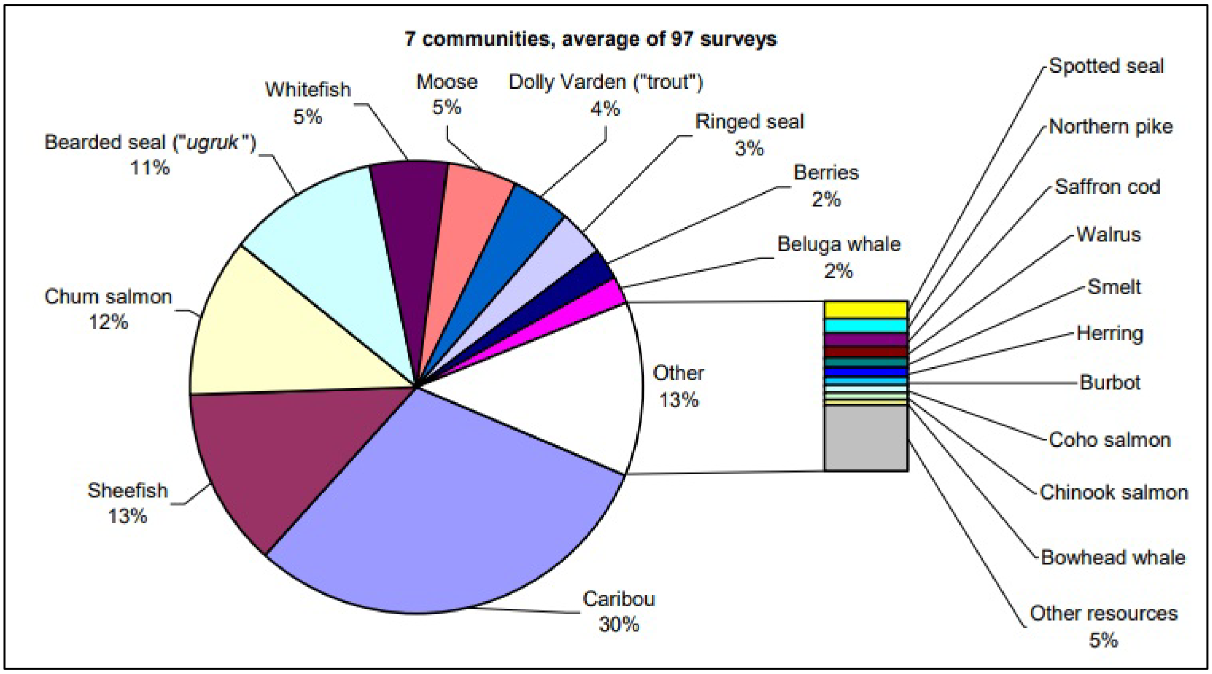


Figure 14. Subsistence averages by edible weight, 1964-2007. Data: Kotzebue, Kivalina, Noatak, Deering, Shungnak, Buckland, and Kiana (*from* Magdanz et al. 2010).

3.5 Socio-Economic Conditions

3.5.1 Population & Demographics

The study area and population numbers for each village in the Northwest Arctic Borough are in Section 1.4 above. For Kotzebue, the population is approximately 74 percent Alaska Native, 16 percent white, and 8 percent of the population consists of two or more races in combination. The median age of the population is 27.2 years. The regional ethnic makeup consisted of about 10% more Alaskan Natives than in Kotzebue and 40% reported speaking Inupiaq at home. There are slightly more men than women in the region (ADCCED 2018).

3.5.1.1 Migration

Since 2000, the number of people living within the Kotzebue region has fluctuated annually by +/-100 people per year. Total net migration over that period was negative 1,071 people. This period of time contained significant swings in employment, fuel prices, and other factors (ADCCED 2018). Outmigration trends threaten long-term community and regional viability.

3.5.2 Employment & Income

Kotzebue and the outlying villages in the region have a mixed, subsistence-cash economy in which the subsistence and cash sectors are interdependent and mutually supportive. The ability to successfully participate in subsistence activities is highly dependent on the opportunity to earn some form of monetary income and access the resources needed to engage in subsistence activities.

Approximately 10 percent of Kotzebue residents over the age of 16 were unemployed. This is representative of Kotzebue; the rate has never gone below 9.0 percent. By comparison, the state's unemployment rate has stayed between 6.5 - 8.0 percent since 2001, while the national rate has fluctuated between 4.2 - 10.0 percent. Public sector employees (including school employees) make up the majority of the workforce. In Kotzebue, 23 percent were employed in local government, while approximately 23.8 percent of the resident workforce were employed in education and health services, and 17.9 percent were employed in trade, transportation, and utilities. Regionally, for the Northwest Arctic Borough, 63 percent of the labor force is employed (U.S. Census 2018). The sector breakdown for the Northwest Arctic Borough is unknown.

Median household income in Kotzebue is $85,278 per year. This is higher than $74,444 per year for the state of Alaska and $55,322 per year for the United States. However, the share of people living below the federal poverty threshold in Kotzebue is 18.1 percent, which is higher than the state's percentage of 10.1 percent (U.S. Census 2018). In the Northwest Arctic Borough, 26.3 percent of persons are living in poverty. Given price indexing disparities for fuel and goods, as well as the availability of subsistence resources, poverty may be higher or lower than this estimate. The regional businesses focus group interviewed by USACE on August 16-17, 2017 verbally estimated a poverty rate of 33 percent to 40 percent depending on the village.

As previously discussed, unemployment is part of the explanation for net negative migration from the region (Berman 2017). Population movements regularly occur from rural communities to regional hubs and back as employment dynamics change. The retention of qualified professionals has also been an issue for remote Alaskan communities. This is true for medical professionals, teachers, and other specialists. Typical turnover for these professions is two years. A lack of many key community characteristics contribute to this high rate of turnover, such as inadequate transportation infrastructure, entertainment, housing, relationships, recreation, vehicles, and access to healthcare (DeFeo et al. 2018). Occupations requiring skilled labor, like small engine repair and maintenance, are rare in rural Alaska as well. This work is often completed by the vehicle owner or by community members rather than by a mechanic with vocational training. The problem of retaining professionals may also contribute to out-migration and long-term regional and community instability.

3.5.3 Education

In the Northwest Arctic Borough, 7.4 percent of persons aged 25 and older have a bachelor's degree. This is significantly lower than the state rate of 18.4 percent; however, specialization, the division of labor, and comparative advantage within the Northwest Arctic Borough usually considers traditional knowledge and access to resources as important as formal education. The society passes on specialized resource availability knowledge, divides labor into hunting, gathering, and processing tasks among families and groups, and trades regionally as well as with neighboring regions to support the populace. At the same time, higher levels of resident professional education would help in the retention of important professionals as discussed.

3.5.4 Property Values

The median home value in the Northwest Arctic Borough in 2016 was $146,400. This is significantly lower than the state median value of $257,100. Northwest Arctic Borough property values are depressed for numerous reasons. According to the interviews conducted in August of 2017, housing demand is insufficient to raise home prices. The high price of transported construction materials can also make repairs cost-prohibitive for some, cause families to vacate or group together. The crowding effect, the availability of quality housing, and poor housing conditions are also contributors to outmigration and the aforementioned professional retention problems.

3.5.5 Government & Other Organizations

Federal, state, regional, and tribal organizations within Kotzebue and the Northwest Arctic Borough could be affected by navigation improvements at Cape Blossom. Effects stem mostly from reduced lightering costs, and, potentially, the lowered cost of goods. Organizations such as NANA, the Alaska Native Claims Settlement Act (ANCSA) regional corporation, and the Northwest Arctic Borough School District order large amounts of fuel and freight. Each village also has a city government, a Federally-recognized tribe, and a ANCSA village corporation. Most ANCSA corporations have multiple business interests. For example, the Kikiktagruk

Inupiat Corporation (KIC) is the village corporation for Kotzebue; KIC owns a construction business and a gravel pit that would benefit from a project at Cape Blossom.

Other organizations like USFWS, which manages the Selawik National Wildlife Refuge, or NOAA/NFMS, which manages marine mammal protection, could incur costs. Federal agencies should be able to absorb any increases in managed resource use due to the project (see impacts sections and Appendix D for more information).

3.5.6 Infrastructure

Roads in Northwest Arctic Borough are used by all-terrain vehicles (ATVs) and snowmachines more than they are by trucks and cars. Other utilities, including those provided by the Alaska Village Electrical Cooperative (AVEC) are listed in Table 10 below. There is an existing small boat harbor at Swan Lake in Kotzebue. Other communities beach boats and may have mooring posts for the freight and fuel barges. Please see USACE, 2016, *Fuel Transportation Improvement Report*, prepared for the Alaska Energy Authority for recommendations on navigation improvements for each community in the Northwest Arctic Borough other than Kotzebue / Cape Blossom. Infrastructure improvement projects that would benefit from navigation improvements at Cape Blossom and reduced construction costs are quantified through the freight and aggregate lightering cost reductions calculated later in this report.

Table 10: Infrastructure in the Northwest Arctic Borough

Community	Utility Summary
Ambler	Piped Water, Piped Sewer, Roads, Landfill, Health Clinic, Electric (AVEC), Volunteer Fire, Cable TV, Dock, Sewage Lagoon
Buckland	Water, Sewer, Flush Haul, Washeteria, Electric, Refuse Collection, Landfill, Health Clinic, Police (VPO), Volunteer Fir, Public Safety Office, Dock, Roads, Ice Roads, Recreation, Cable TV, Gravel Sales, Sewer Lagoon
Deering	Piped Vacuum Sewer, Water Delivery, School Water, Watering Point, Washeteria, Electric, Volunteer Fire, Public Safety Office, Post Office Lease, Health Clinic, Library, Roads
Kiana	Piped Water, Watering Point, Piped Sewer, Electric (AVEC), Landfill, Health Clinic, Police, Public Safety Building, Volunteer Fire, Fire Hall, Dock, Lodging, City Office, Bingo Hall, Old Bingo Hall, Roads, Fuel Sales, Equipment Rental
Kivalina	Watering Point, School Water, Washeteria, Electric (AVEC), Volunteer Fire, Fire Hall, Airport (State Contract), Roads, Ice Roads, Bingo, Bingo Hall, City Office
Kobuk	Watering Point, School Water, Honey Bucket Hauling, Washeteria, Electric, Health Clinic, Dock, Airport, Fuel/Oil Sales, Roads, Post Office, Equipment Rental, Hotel, State Funded Public Safety Officer, Bureau Funded Village Police Officer
Kotzebue	Piped Water, Piped Sewer, Refuse Collection, Landfill/Baling Facility, Harbor/Dock, Police, Volunteer Fire/EMS/Ambulance, Fire Training Center, City Hall, Recreation Center, Bingo/Pull Tabs, Parks, Roads, Fiber Optic Internet
Noorvik	Piped Water, Piped Sewer, Electric(AVEC), Refuse Collection, Landfill, Health Clinic, Volunteer Fire, Public Safety Building, Roads, Ice Roads, Bingo/Pull Tabs, Equipment, Office and Shop Rental
Shungnak	Piped Water, Watering Point, Piped Sewer, Honey Bucket Hauling, Electric (AVEC), Refuse Collection, Landfill, Health Clinic, Police, Volunteer Fire, Public Safety Building, Dock, Post Office, Cable TV, Roads, Building Rental

3.5.7 Services and Businesses

The Northwest Arctic Borough does have a number of retail services, hotels and lodges, and businesses in addition to facilities run by the government, regional corporations, or schools. Nearly every community in the Northwest Arctic Borough has a trading post, market, or store that supplies food and other amenities. There are also hardware, hunting, and fishing stores in the borough. Subsistence foods are usually traded outside of store fronts, and this type of trading is part of the daily lives of residents. Communities in the region may have periodic shortages in fresh food, building materials, household items, and the like.

3.6 Existing Fleet, Commodities Transported, Waterway, Dock, and Operating Costs

The Waterborne Commerce Statistics Center (WCSC) reports the vessel movements into and out of Kotzebue Sound (Table 11). These data were edited to eliminate larger vessel movements headed exclusively for DeLong Mountain Terminal/Red Dog Mine, or other vessels which were judged to be independent of fuel and freight movements heading to Kotzebue and the other Northwest Arctic Borough villages.

Table 11. Historical Vessel Movements to Kotzebue Sound, 2006-2016

Vessel Type	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Cargo Barge	20	46	27	10	10		16	30	14	5	
Liquid Barge	14	23	29	16	27	35	29	27	75	56	32
Towboat	5	16	10	6	8	2	14	6	21		7
Products Tanker								2	6	2	11
Cruise Vessel							2				
Landing Craft							2			2	

NOTE: No data exists for empty cells.
Reference: WCSC 2018.

Line ships, such as tanker vessels hauling bulk fuel, may come up the outer west coast of Alaska, paralleled by a coastal barge. This has occurred over the last 5 years, as reflected by the tanker movement totals appearing in 2013 (see Table 11). Typically, tankers would transfer fuel to a coastal barge, then a second at-sea transfer to a lightering barge is performed about 15 miles from Kotzebue.

Lightering barges and tugs then bring fuel, freight, and construction material into Kotzebue. Landing craft are also used. A portion of the fuel and goods (usually initially delivered to Kotzebue) are loaded onto river bound barges for transportation to outlying communities in the Northwest Arctic Borough region.

Several barges bring fuel into Kotzebue Sound. These barges often are affected by high winds which cause a “draw down” effect. The draw down can be as much as 4 ft lower than MLLW levels. Thus, for the design barge to make it all the way in, it would need 25/27 ft at MLLW.

Freight might come from Anchorage, Dutch Harbor, or elsewhere. Freight deliveries start occurring as soon as the ice goes out and end when the sea begins to ice up again.

Compulsory pilotage is required for vessels larger than 300 gross register tonnage (GRT) or longer than 65 ft (although there are exemptions for vessels up to 175 ft). These vessels must contact the Alaska Marine Pilots when sailing to Kotzebue. NOAA’s Coast Pilot reads, “During ice-free months privately maintained buoys mark the entrance to the navigation channel. The channel is difficult to follow and is restricted to vessels with drafts under 6 ft. The trip by small boat from the anchorage to Kotzebue is about 15 miles and over many sandbars that are constantly shifting.” The Coast Pilot also describes the local draw down condition, including observations of draw down and ebbs and flows at Cape Blossom.

Crowley Marine (Crowley) reported that their existing dock in Kotzebue will need repair within the foreseeable future (personal communication, Crowley, 8 March 2018). At the time of this report, total cost and timeline of repairs was unavailable.

3.6.1 Fuel

Residents purchase heating oil for their homes before most other goods, or at the expense of some of those goods due to home heating being a primary concern for the people of the region. Therefore, heating oil demand is somewhat inelastic with respect to price. Focus group interviews conducted by USACE in Kotzebue indicate that more fuel oil, diesel, and other energy (especially gasoline) would be purchased with lower prices. The current fuel capacity, use, and electrical generation for each community is given in Table 12 below:

Table 12. Northwest Arctic Borough Fuel Capacity, Use, Electrical Generation, and Subsidy by Community in 2016

Community	Fuel Capacity (Gallons)	Usage (Gallons)	Diesel for Electrical Generation (Gallons)	PCE Subsidy (Dollars)	Non-Diesel kWh Generated (%)	Cost of kWh (Dollars)	Cost of kWh to Residential Customer (Dollars)
Kotzebue	6,132,000	6,065,370	1,200,444	$1,153,179	20.04%	$0.41	$0.19
Selawik	629,500	1,267,157	196,437	$471,220	4.36%	$0.55	$0.22
Noorvik	755,200	662,757	131,544	$382,083	0.00%	$0.59	$0.22
Kiana	419,700	510,019	113,839	$262,987	0.00%	$0.59	$0.22
Ambler	410,400	376,461	94,586	$228,552	0.00%	$0.72	$0.23
Shungnak	236,400	428,824	Intertie Total 121,883	$217,216	0.00%	$0.73	$0.23
Kobuk	44,100	137,236		$199,080	0.00%	$0.73	$0.23
Noatak*							
Portsite**							
Kivalina	297,800	593,356	87,675	$200,102	0.00%	$0.57	$0.22
Buckland	451,000	501,967	110,049	$113,849	10.51%	$0.47	$0.30
Deering	252,000	168,690	44,154	$83,721	0.00%	$0.70	$0.39
Totals	9,628,100	10,711,837	2,100,611	$3,311,989			Unweighted Average $0.25

Reference: Data from Alaska Energy Authority 2017

* No data.

** No data for Portsite, Red Dog, or Delong Mountain Terminal.

Vessel operators estimated the costs passed to the end user for lightering ranging between $44,000 and $50,000 per consumer. Additional difficulties associated with lightering include minor damage to vessels, delays in access to critical services for crew members, and delays ranging between 3 and 10 days for supply offloading due to lightering. Costs from these delays are included in the estimate lightering costs to the end user.

3.6.2 Freight

One of the main companies sailing freight to the Northwest Arctic Borough uses a tug on trailer set-up where the vessels draft 12.5 ft. However, the barge's load line is actually 15 ft. This vessel is 250 ft long by 70 ft wide. The company's preferred channel depth is 15 to 18 ft. MLLW according to the interviewee. The preferred facility design for cargo is pass-pass with a drive-down ramp and a travel lift considered. The travel lift may be for bringing small craft and vehicles ashore. The barge has a 435 twenty-foot equivalent unit (TEU) container capacity. They usually use a landing craft to lighter goods from the 9 fathom buoy, but in the past have run up to three different lightering vessels to get commodities into Kotzebue. Additionally, they have also dropped all goods bound for Kotzebue off in Nome. They do two sailings per year and it takes 5 to 15 lightering trips per sailing to fully unload with each lightering roundtrip requiring 9-10 hours. Additionally, the company felt that an ideal situation would be unloading in 24 hours, as is accomplished elsewhere in the state. Lightering costs to consumers were estimated at $20,000 per day (quite a bit less than fuel). Total amounts are greater than a million pounds delivered each year. Commodity amounts transported were said to increase when there is a new construction project such as a school or health clinic. Generally, the captains interviewed thought that there may be additional demand for transporting stick construction and construction equipment in the region.

3.6.3 Construction

Several companies were able to provide insight into construction materials and equipment transported. The results described are generalized and assumptions about the industry are made that don't always occur year-to-year. USACE assumes that each company gets one large project every five years. For instance, transporting materials for the Cape Blossom road construction project underway, or transporting rock and armor rock for the Kotzebue Airport renovations project recently finished. For that project, 100 loads of 1000 tons of rock were sailed over 75 days. Rock construction material stockpiling work was also occurring continuously during USACE's time in Kotzebue in August 2017. Construction companies described a desire to have upland pad space for material storage, warehouses to lease, and at least a six inch fuel transfer line to tank farm storage. Other facility features that were desired were drive down access, or a conveyor for aggregate, and cranes for passing cargo and containers.

One company was able to provide a case where shallow channel depths and wind draw down resulted in significant damages and time-costs to one of their vessels. Damages were estimated at $100,000 once every five years, or $20,000 per year for two companies in the population of fuel, freight and construction companies shipping goods to the Northwest Arctic Borough.

3.6.4 Fishing

Data available did not track any refrigerated products vessels. Also, ADFG’s commercial fishing database only has six vessels homeported in Kotzebue, all less than 30 ft long, and less than 200 horsepower (drafts were not available). During August interviews, additional fishing vessels were observed and frozen fish exports from Cape Blossom were described as a possibility. However, given the quantity and quality of commercial fish produced by the region, continuing to fly the product out is equally likely.

3.6.5 Mining

There may be benefits to offloading fuel at Delong Mountain Terminal first and then sailing a lighter vessel into Kotzebue. Direct benefits to Red Dog from a project at Cape Blossom are unlikely; however, there may be secondary benefits in that their employees get cheaper prices or cheaper goods when in the region.

Sailing additional equipment into Kotzebue for use on private claims, such as in the Ambler mining district, or within Northwest Arctic Borough could occur, but associated cost savings are not quantifiable without conducting a larger survey effort.

4 FUTURE WITHOUT PROJECT CONDITIONS

4.1 Physical Environment (Future Projections, Climate Change)

Forecasting impacts to the physical environment as a result of not implementing the aforementioned project is difficult, primarily due to the projected instability of the Arctic ecosystem in the face of predicted climate change. Natural forces acting upon Kotzebue Sound and the Baldwin Peninsula actively shape its landmass, drive regional and local ocean currents, dictate local weather patterns, and influence the cryogenic cycling of the region.

Sea ice extent has been steadily declining in the Arctic since 1979 along with increasing sea surface temperatures and air temperatures. The Arctic has warmed more than any other region on earth and it causing changes to sea ice, snow, and extent of permafrost in the Arctic. The National Snow and Ice Data Center (NSDIC) estimates a 30 percent decline in sea ice cover since 1982 (NSDIC 2018). A trend observed in the Alaskan Arctic is the delayed formation of sea ice in the fall/winter and the early retreat in the spring/summer, causing a longer open water season (Gorokhobivh et al. 2012). Sea ice is important because it acts as a buffer to wave action from offshore storms, aiding in protecting shorelines from erosion.

Coastal changes in the Kotzebue Sound region are closely associated with the sea-ice regime and permafrost (Mason et al. 1998; Gorokhobivh et al. 2012). Natural coastal dynamics and global sea-level rise are contributing to changes in the erosion and accretion of beaches. Specifically, beach erosion has become one of the most critical issues in the region (Gorokhobivh et al. 2012). The shoreline within the project area is actively retrograding.

4.2 Biological Resources (Future Projections)

Changes to both marine and terrestrial habitats in the region are anticipated due to climate change (e.g., Markon et al. 2018; Marcot et al. 2015; Weslawski et al. 2011; Sun et al. 2009). A recent study projected the future of terrestrial ecotypes and their associated bird and mammal species in northern Alaska to the end of the century. Three models were tested in the analysis: time-dependent, temperature-dependent, and rate-adjusted. The temperature-dependent model projected habitat loss for 44 bird and 16 mammal species, and habitat increase for 64 bird and 6 mammal species, by the end of the century (Marcot et al. 2015). Marcot et al. (2015:150) noted that "upland- and alpine-breeding shorebirds, passerines, ptarmigan, and raptors are among the most vulnerable avian species because of the projected large losses to key, currently common habitats in the region that will not likely be replaced elsewhere." Their study also projected adverse impacts on very small burrowing mammals, small mammals associated with fresh water habitats, and caribou. A "loss of lichens from increased fire and loss of upland dwarf birch tussock-shrub from thermokarst and shrub expansion will reduce foraging habitat for caribou," while "a shift to more forested conditions may result in habitat increases" for moose (Marcot et al. 2015:150-151).

Future changes to the marine ecosystem are predicated on an assumption of rising water temperatures, changes in sea ice cover, increased storminess, increased coastal erosion, increased freshening of surface waters, and increased ocean acidification. For the Cape Blossom area, an increase in water temperature will be of minor concern as most nearshore species are adapted to a wide temperature range; however, all other projected changes will likely reshape the coastal marine biological community (Węsławski et al. 2011). Future reductions in sea ice cover and thickness will cause a shift in the relative contribution of ice algae versus phytoplankton to benthic communities. A recent experiment in Kotzebue Sound found that local clams (*Macoma balthica*) and amphipods (*Monoporeia affinis*) reacted differently to controlled changes in ice algae and phytoplankton availability. The study concluded that individual species' ability to shift feeding modes must be considered when attempting to predict future responses to climate change (Sun et al. 2009).

Most of the marine mammals in the region feed on benthic organisms. Spotted seals feed mainly on fishes with occasional consumption of shrimp. Ringed seals and beluga eat fishes and small crustaceans. Bearded seals consume bivalves, gastropods, shrimp, and 'true' crabs (Feder et al. 2005). Any impact on marine invertebrates or influx of boreal species will have a cascade effect up the food chain. Future competitive and predator-prey interactions are difficult to predict (Węsławski et al. 2011). Decreasing sea ice cover and thickness will also adversely impact the marine mammals of the region, as they are pagophilic; they require established sea ice for breeding, whelping, and resting. The lowest recorded Bering Sea ice extent occurred over the 2017-2018 winter (Figure 15).

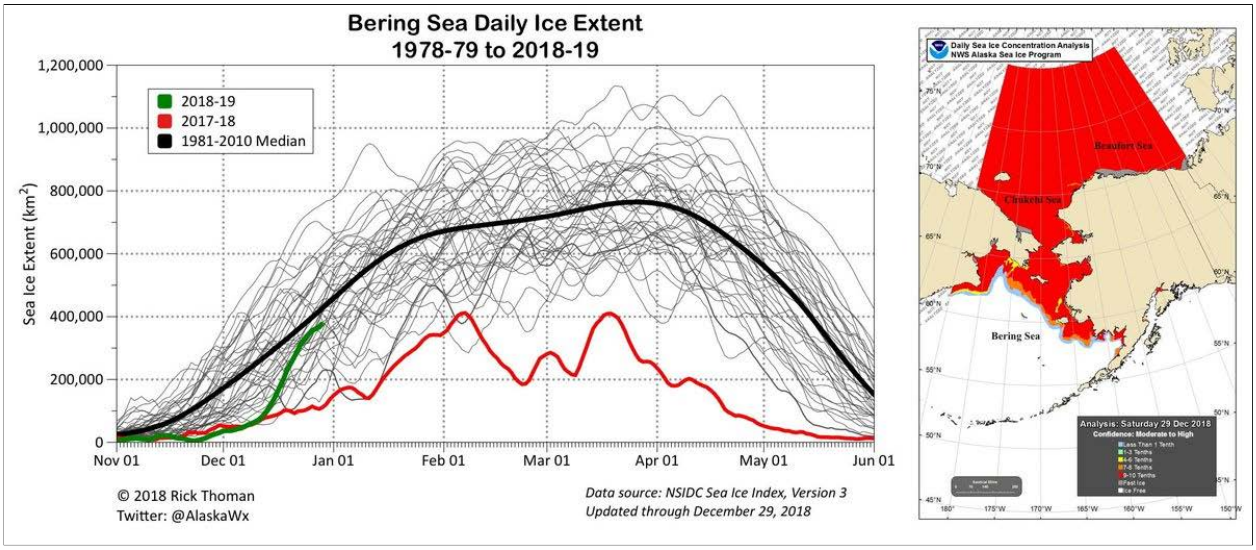


Figure 15. Annual extent of Bering Sea Ice since 1978 (Thoman 2018).

4.3 Cultural Resources

While previous archaeological surveys have not identified any cultural resources in the area, any unknown terrestrial subsurface archaeological sites could be impacted by permafrost degradation and naturally occurring coastline erosion. Additionally, any maritime cultural resources could be impacted by the annual freeze-thaw cycle of sea ice within Kotzebue Sound.

4.4 Economic & Political Conditions

In the without-project condition, there would be no change in the future of the fleet. Without Federal action, no improvements to the waterway are expected. For certain construction jobs, temporary dredging efforts could possibly occur to bring an ATB or landing craft into a more optimal beaching point for unloading; but this would be job specific. The existing dock is expected to be repaired in the future without a disruption in service. Annual lightering costs and expected damages were nominally modeled to be $1,678,000 per year (in present value terms). Construction activity to move materials from staged barges is estimated to be 68 days annually and vary between companies more from year-to-year than the total amount of work. Total lightering days for all vessels is estimated to average 130. These lightering activities all occur during the open water season at Kotzebue which varies from extreme low 78 to maximum of 178 days depending upon local climatic conditions. This puts the Crowley dock and the space next to it in use for a large portion of the time when the Sound has open water.

No vessels currently launch for subsistence purposes from Cape Blossom. Subsistence hunters motor around the tip of Baldwin Peninsula after there is open water; however, good information on the number of existing days the Cape Blossom area is used, and the number of days in the future when the Cape Blossom road would be used instead of motoring around the Peninsula was not available. Calculations on the area’s increased subsistence use in the following sections therefore is based on the fact that the Cape Blossom area has a longer open-water season compared to Swan Lake

4.5 Planned Development (With Implications for this Project)

The Cape Blossom road is being constructed and is anticipated to be finished in the future without-project condition. Further coordination is underway as to what infrastructure would be developed with or without a USACE project. This may affect the future without project condition.

4.6 Summary of the Without Project Condition

The expected without-project conditions form the basis of evaluation against which the with-project conditions are compared. The future without-project conditions mirror those under the No Action Alternative.

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 (measures) can be an activity or structural feature or element that can be implemented at a specific geographic location to address one or more planning objectives. An activity is defined as a non-structural action such as proposed operational changes to improve navigation efficiency. A structural element requires construction or assembly, typically within the project area or site.

Planning charette 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 to adhere to study constraints. Each alternative plan shall be formulated in consideration of the national criteria noted in Section 2.7: completeness, efficiency, effectiveness, and acceptability. Additional screening criteria identified during the planning charrette included:

- Cost Affordability is the inverse of rough order of magnitude costs as judged by the team. For example, a measure with low costs would be estimated to have high cost affordability and vice versa. The associated metric is “High/Medium/Low.”

- Constraint avoidance is defined as a measure's ability to avoid study constraints. The associated metric is "Yes/No."
- Social Considerations is defined as "The extent to which a measure is judged to be acceptable to agencies, tribes, and the general public. The associated metric is "High/Medium/Low."

5.3 Management Measures Considered

A total of 19 measures were initially identified during the charette. These measures were initially evaluated during the charette and subsequently during various project team meetings using the study specific objectives and the qualitative criteria referenced in the above. Completeness as a criteria was not considered in the measures evaluation during the charette, possibly because an individual measure, on its own, would not typically yield a complete alternative plan. Eight measures were carried forward (Table 13).

Table 13. Initial Measures and Screening Result

	Plan Formulation Criteria / and Qualitative Metric						
	Effectiveness	**Constructability**	**Acceptability**	**Cost Affordability**	**Avoid Constraints**	**Social Consideration**	**Carry Forward**
Measure Description	***H/M/L***	***Y/N***	***H/M/L***	***H/M/L***	***Y/N***	***H/M/L***	**Y/N**
In Water							
~~Operational changes (seasonal changes for hunting/fishing)~~	~~L~~	~~N/A~~	~~H~~	~~L~~	~~N~~	~~H~~	~~N~~
~~Shallow-draft vessels~~	~~L~~	~~Y~~	~~H~~	~~M~~	~~N~~	~~L~~	~~N~~
Dredged channel	**H**	**Y**	**H**	**L**	**Y**	**H**	**Y**
~~Underwater pipeline for fuels~~	~~M~~	~~Y~~	~~H~~	~~L~~	~~Y~~	~~M~~	~~N~~
Causeway	**H**	**Y**	**H**	**M**	**Y**	**H**	**Y**
~~Pile-supported pier/trestle~~	~~H~~	~~Y~~	~~H~~	~~L~~	~~Y~~	~~H~~	~~N~~
Gravity-filled supports for pier / trestle	**H**	**Y**	**H**	**M**	**Y**	**M**	**Y**
New dock(s)	**H**	**Y**	**H**	**M**	**Y**	**H**	**Y**
~~Uplands channel/canal~~	~~M~~	~~Y~~	~~M~~	~~L~~	~~N~~	~~L~~	~~N~~
Breakwater	**M**	**Y**	**H**	**M**	**Y**	**H**	**Y**
~~Anchorage areas~~	~~L~~	~~Y~~	~~H~~	~~H~~	~~Y~~	~~H~~	~~N~~
Upland Facilities							
Bulk fuel storage tanks	**H**	**Y**	**H**	**H**	**Y**	**H**	**Y**
Upland laydown area	**H**	**Y**	**H**	**L**	**Y**	**H**	**Y**
~~Upland storage facilities~~	~~H~~	~~Y~~	~~H~~	~~H~~	~~Y~~	~~H~~	~~N~~
Small boat launch	**H**	**Y**	**H**	**M**	**Y**	**H**	**Y**
~~Road(s) in Uplands Facility~~	~~H~~	~~Y~~	~~H~~	~~M~~	~~Y~~	~~H~~	~~N~~
~~Canal at Isthmus~~	~~N~~	~~N~~	~~L~~	~~L~~	~~N~~	~~L~~	~~N~~
~~Commercial fish processing plant~~	~~N~~	~~N~~	~~L~~	~~L~~	~~N~~	~~L~~	~~N~~
~~Power transmission / generation~~	~~N~~	~~N~~	~~L~~	~~L~~	~~N~~	~~L~~	~~N~~

Notes: H/M/L = high, medium, low. Strike-through indicates measure was not carried forward.

5.3.1 A discussion of each measure not carried forward is summarized below:

- The in-water measure, underwater pipeline, has a high environmental risk associated with operating and maintaining a petroleum fuel pipeline that would have extended from the shoreline to a moorage area in deep water where the fuel barges would off-load fuel through the pipeline. In addition, if barges moored off-shore then cargo would still have to be lightered to shore potentially not reducing transportation costs.
- A pile supported pier or trestle over the water was not carried forward because the lack of ice condition data. Lacking such data, the design would need to incorporate robust ice-

protection measures/designs to ensure long-term viability of the structure likely resulting in excess construction costs. Gravity-filled supports such as a rubble-mound causeway or caissons have been a proven design in arctic sea ice conditions.

- The uplands channel, although constructible, would have challenges with the permafrost conditions in the upland that would result in high costs to construct and maintain.
- Anchorage area developed off shore would not improve navigation efficiency since lightering would still be necessary to get fuel and cargo to shore, and there would likely be delays due to inclement weather unless an effective detached breakwater was constructed.
- Although initially carried forward during the charette, the upland storage facilities were interpreted to be redundant to the laydown area. Although the upland storage feature maybe important to the local users at some point in the life of the project, it is not critical to the study-specific objective of improving navigation efficiency.
- Although initially carried forward during the charette, roads in the upland area were not carried forward because the facility would likely utilize the ADOT road that is reportedly terminating at the top of the bluff.
- The last three measures listed in Table 13: Canal at Isthmus, Commercial Fish Processing plant, and power transmission / generation were not carried forward mostly because they were not associated with improving navigation efficiency to Kotzebue.

5.4 Measures Carried Forward

The measures carried forward decrease endemic navigational inefficiencies associated with delivery of fuel and freight; increase the number of days of barge access to Kotzebue and the region; increase and make safer marine subsistence opportunities in the Cape Blossom Area. Measures carried forward for further consideration are presented in Table 14.

Table 14. Measures Carried Forward

Measure Description	Comments
Dredged channel	Channel to allow deeper draft vessels to access the port increasing navigation efficiency
Causeway	Rock rubble-mound structure to dock or with integrated dock depending on design allows efficient moorage to and could provide some wave protection
Gravity-filled supports for pier / trestle / dock	Typically sheet-pile caissons filled with rock that support the trestle and dock allows for an efficient handling of fuel and freight
New dock(s)	Stand-alone dock or integrated in to causeway allows for efficient handling of fuel and freight
Breakwater	A detached breakwater in deep water as a standalone feature to make lightering more efficient by providing some wave protection and shorter lightering distance
Bulk fuel storage tanks	Upland feature with a pipeline to and from marine header and truck rack considered an LSF feature needed to efficiently manage fuel at the port
Upland laydown area	Cargo and equipment laydown area for temporary cargo storage and parking considered an LSF feature needed to efficiently handle freight at the port
Small boat launch	Improves marine subsistence access, provides another boat retrieval location improving safety in unexpected inclement sea conditions, and reduces boat travel cost to access the Cape Blossom Area

5.5 Design Vessel

The proposed channels for a port at Cape Blossom are designed for a hybrid design vessel that measures 380 ft in length, 96 ft in width, and drafts 20 ft. This design vessel is based upon the Waterborne Commerce Statistics Center data, as well as focus group interviews conducted by USACE.

5.6 Preliminary Alternative Plans

An array of alternative plans were formulated and initially evaluated by the multi-disciplinary group during the charette. Each group then reported out and received feedback from the other groups on ways to incrementally improve the various plans. The initial array of alternative plans developed and screened during the charette were all carried forward by the project team.

5.6.1 Alternatives Carried Forward

This section identifies the array of alternative plans that were formulated, including Alternative 1 (No Action). These alternative plans (Table 15) are grouped by the relative amount of dredging required for the alternative to perform. Alternative 2, Dredge to Shore, requires the most dredging. Alternatives 3 through 6 require the least amount of dredging because the docking or dolphins are located in deep water. Alternative 7, is the optimized design that uses dredging to reduce the total project cost because it would minimize the amount of in-water infrastructure; which could cost more than dredging, if maintenance dredging is infrequent.

Table 15. Alternative Plans

Number	Alternative Plan Name
Alt. 1	No Action
Highest Dredging Volume Alternative	
Alt. 2	Dredge to Shore
Limited Dredging or Deep Water Alternatives	
Alt. 3	Detached Breakwater
Alt. 4	Trestle to Dock in Deep Water
Alt. 5	Causeway to Dock in Deep Water k
Alt. 6	Trestle and Causeway Combination to Dock in Deepwater
Optimized Dredged Channel Design	
Alt. 7	Dredged Channel with Trestle and / or Causeway to Dock (optimized design)

For each action alternative above, upland and in-water Local Service Facility (LSF) features are needed to realize benefits, except Alternative 1, No Action. The Upland LSF features (Table 16) are consistent between alternatives, and as a result cost is the same for each alternative so they do not differentiate between alternatives. The In-Water LSF features can differentiate between alternatives due to the carrying cost for each alternative. Alternatives with a trestle or causeway have a driving surface on the trestle or causeway.

Table 16. Local Service Facility Features

Uplands LSF
Bulk fuel storage facility with truck fueling rack
Boat ramp for increased subsistence/recreation and marine safety
Gravel pad area for future upland LSFs that may include:
Lay-down yard for incoming and outgoing cargo
Parking areas
Warehouses, maintenance shops
In-Water LSF
Marine fueling head (8”) and pipeline to the bulk fuel storage facility
Pass-pass facilities (ship to ship or ship to pier or causeway as to applicable Alternative)
Trestle
Causeway
Docks
Bridge to trestle / causeway

An important aspect of this project is that as currently presented LSF are a much larger cost than general navigation features (GNF). Further assessment would be done to ascertain what truly would be considered LSF and what might be more properly considered the without project condition.

6 COMPARISON & SELECTION OF PLANS*

6.1 Four Accounts Summary

USACE planning guidance establishes four accounts to facilitate and display effects of alternative plans.

6.1.1 National Economic Development

Consistent with the Implementation Guidance, to compare alternative plans this study first conducted an NED analysis sufficient to determine that no NED Plan is attainable, then evaluated non-monetary benefits through a Cost Effectiveness and Incremental Cost Analysis (CE/ICA). The NED analysis evaluated benefits associated with reducing transportation costs and vessel damages. Benefit/cost ratios ranged from 0.11 to 0.47 for the alternatives considered. As there is no NED plan, this project relies on Section 2006 of WRDA 2007, the remote and subsistence harbors authority, to select the TSP.

6.1.2 Regional Economic Development

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 Appendix D. 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.

In addition to jobs created through construction spending, it is expected that some permanent jobs would be created through the benefits of the project. For instance, increased expenditures on fuel, hunting and fishing, and durable goods could lead to job growth in subsistence, retail, tourism, and other direct and indirect spending areas.

6.1.3 Environmental Quality

Environmental Quality (EQ) displays the non-monetary effects of the alternatives on natural resources and is described more fully in the environmental assessment sections of this report. Qualitative enhancements to the environment include a reduction in fossil fuel usage and emissions due to decreased lightering.

6.1.4 Other Social Effects

The categories of effects in the Other Social Effects (OSE) account include urban and community effects; life, health, and safety factors; displacement; long-term productivity; and energy requirements and energy conservation. The OSE can be either beneficial or adverse (positive/negative) depending on the standard being measured.

Construction of a project supports the local and regional economy and provides income to a small community. This injection of income to the City of Kotzebue allows for the provision of social services to the community, increasing community resilience and quality of life. Enhanced revenue to local businesses provides incentive to hire additional personnel, providing income stability to more of the local citizenry.

Construction of a project is also expected to result in non-monetary benefits from reduced lightering days and increased substance vessel days (as evaluated in the CE/ICA), which would improve the long-term viability for communities in the Northwest Arctic Borough. Upon construction completion of the project, increased public health and safety, greater access to natural resources, and increased welfare of the population would add to social and cultural value as well as regional stability.

6.2 Cost Effectiveness and Incremental Cost Analysis

6.2.1 CE/ICA Metric and Non-Monetary Significance

The CE/ICA metric for this study is reduced lightering days and increased subsistence vessel days. This metric directly address the study's objectives. Reduced lightering days allows for vessel-class specific evaluation of the ability of each alternative to meet the objectives of increasing barge access and reducing navigational efficiencies. Increased subsistence vessel days assesses the ability of each alternative to meet the objective of increasing safe subsistence opportunities. Increased subsistence vessel days is publicly significant in that it specifies the amount of additional local subsistence use and procurement of resources expected to occur, while also increasing the continuity of cultural heritage customs associated with those resources. Both components of the metric directly addresses the study's objectives.

As the output of the CE/ICA, reduced lightering days and increased subsistence vessel days are significant for non-monetary benefits in terms of the output's institutional, public, and technical significance. The combined metric is institutionally significant in that it supports the Federal government's Trust responsibility to Tribes per the Department of Defense's American Indian and Alaska Native Policy. For more information about the CE/ICA metric, please see Appendix D.

By including a boat ramp in each alternative design, the future with-project provides opportunities for additional subsistence resource use. This increases the continuity of culture, heritage, and traditional customs that have been built on subsistence lifestyles. Should inclement weather arise, the boat ramp also promotes life, health, and safety by providing mariners a safe spot where they can pull their vessels out of the water instead of having to motor around Cape Blossom. Increased safety and increased subsistence are publicly significant in Alaska and were considered important during the USACE focus group interviews in Kotzebue.

The metric is technically significant in that it would lower the cost of fuel and goods required to live subsistence lifestyles, and to assist with keeping the threatened Northwest Arctic Borough distressed communities viable. Viability at risk within communities of the region is documented in the data for distressed communities in the Northwest Arctic Borough from the 2017 Distressed Communities Report (Denali Commission 2018). For 2017, all the Northwest Arctic Borough communities are labeled as in a "Distressed" status except Kotzebue and Deering. The high cost of living has negative sociological, psychological, health, and anthropological consequences.

6.2.2 Effects of Reduced Lightering Related to the Section 2006 Authority

The effects of reduced lightering related to the Section 2006 authority address benefits of the project to public health and safety, access to natural resources for subsistence, local and regional economic opportunities, welfare of local population and social and cultural values.

Feedback from focus group interviews and other information gathered during the study support identified effects stemming from reduced fuel and freight lightering. These anticipated benefits were well documented in our focus group interviews. The first benefit is that lowered fuel oil costs would result in more affordable housing costs. This in turn would provide opportunities to perform additional subsistence activities by freeing up resources for other uses. Freeing up resources may also provide opportunities to save for travel related costs that are needed for medical/dental or social services. Increased subsistence and a healthy populace builds community identity, pride, and self-determination; which all improve community viability and is in-line with the 2006 authority. The second effect is that lowered gasoline prices would directly equal more snow machine and boating days and could equal more small aircraft days. This greater access to natural resources provides subsistence opportunity as well as the potential for greater tourism and other regional economic activity.

Effects also stem from lowered freight costs. A lowered cost to bring newer vehicles (e.g., snow machines, ATVs, vessels) into the region could create safer subsistence resource access; which can provide life safety benefits. A lowered cost to transport of durable goods (e.g., construction materials) could provide for better housing conditions at less cost; thereby, reducing outmigration, and increasing professional retention. Life safety and community viability are both considered under the 2006 authority.

Lowered costs for construction companies, tourism, and mining could also generate regional economic opportunities that can be considered under the 2006 authority.

6.3 Alternatives

6.3.1 Alternative 1: No Action

The No Action Alternative provides no navigation improvements. Fuel and freight deliveries would continue to be inefficient. There would be no reduced lightering days. The Cape Blossom road is likely to still proceed in accordance with the timeline established by ADOTD&PF. A boat launch is not part of the ADOTD&PF road project. Therefore, there would be no increased subsistence vessel days. The CE/ICA benefits are thus zero reduced lightering days and zero increased subsistence vessel days.

6.3.2 Alternative 2: Dredge to Shore

Alternative 2 includes constructing a 5,600 ft-long by 448 ft-wide dredged channel from deep water with a turning basin near shore. Over all, approximately 1.3 million cubic yards (CY) of dredged material would be created and placed to the east of the channel in about 13 to 19 ft of water. This alternative, as represented by Figure 16, does not have any dock features, which distinguishes it from Alternative 7.

Figure 16. Barge unloading to a beach

The present value cost is $115.4 million or $4.1 million annually. Maintenance dredging is estimated to be needed in years 5, 15, 25, and 45 of the period of analysis. Maintenance dredging costs are estimated to be $38.6 million and are included in the present value cost above.

Input from shipping companies during the course of the study indicated that the existing lightering setup would be preferred over beaching the coastal barge with no dock (despite the fact that this is an existing practice with the lightering barges). Therefore, this alternative results in zero reduced lightering days for the shipping fleet, and thus the NED benefit value is zero. There is a positive effect with regard to other social effects (OSE) since a boat launch ramp would be implemented in this alternative, which does result in an estimated 21 increased subsistence days because of the longer ice-free period compared to the existing Kotzebue Harbor. Therefore, the CE/ICA benefits are zero reduced lightering days and 21 increased subsistence vessel days.

6.3.3 Alternative 3: Lightering With Detached Breakwater and Mooring Dolphins

Alternative 3 is a deep-water alternative that minimizes dredging. This alternative includes constructing an offshore detached breakwater with associated mooring dolphins in deep water (Figure 17). The breakwater and dolphins would be located approximately 6,000 ft from shore.

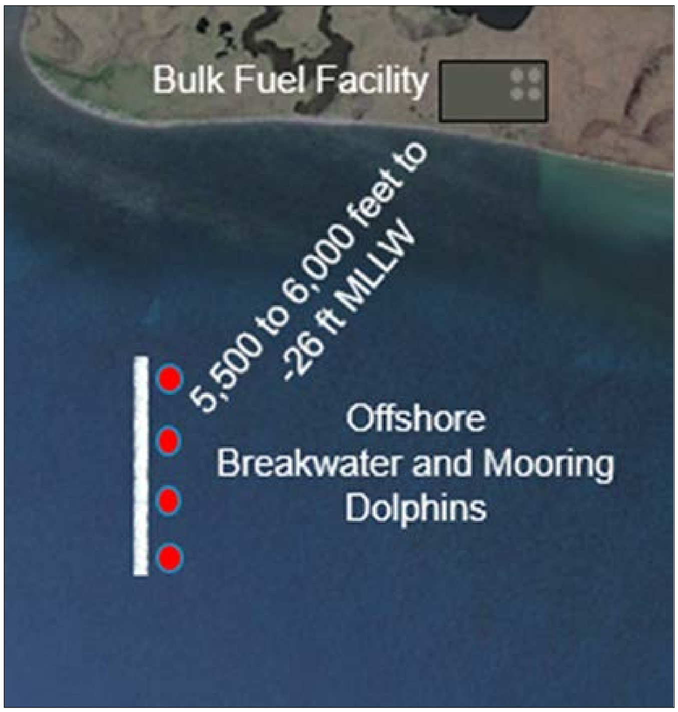


Figure 17. Alternative 3 - Detached Breakwater

In this alternative coastal barges must moor behind the detached breakwater and offload to lightering barges. The lightering barges then sail a distance fifteen times shorter (each way) than they currently do and offload again to a shore side dock. This is less efficient than a coastal barge unloading directly to a shore side dock. Given that there is twice as much loading/unloading as in the ideal condition, and that loading/unloading is less efficient, a rough estimate is that 75% of project benefits are achieved (see Appendix D, Addendum III). Given that project costs for this alternative are more than other alternatives which achieve higher benefits such a rough estimate is acceptable.

The present value cost for this alternative is $163.1 million or $5.8 million annually. The total benefit value is $35.6 million or $1.3 million annually, resulting in a benefit cost ratio (BCR) of 0.22. Net present value (NPV) is negative $127.6 million. This results in an equivalent annual cost (EAC) of $4.5 million.

This alternative is estimated to reduce annual lightering by 97.5 days resulting in the cost of a reduced lightering day of $59,220 (Appendix D). This alternative preserves more of the captain and crew jobs for lightering vessels than other alternatives where the need for lightering barge services only exists when goods are transported from Kotzebue to the surrounding communities. It also has a positive effect on job creation through construction spending, and regional job creation through annual benefits to the area. There is a positive effect with regard to OSE, but it is less than in Alternatives 4 through 7. Lowered fuel costs and home heating costs would reflect reduced lightering costs and would have stemming-from effects such as those described in 6.2.2. This alternative would allow an additional three weeks of subsistence hunting, while providing additional life and safety benefits, from eliminating the need to sail around the tip of the Baldwin Peninsula if inclement weather were to occur while hunters are in the Cape Blossom area. The CE/ICA value for this alternative is 97.5 reduced lightering days and 21 increased subsistence vessel days.

6.3.4 Alternative 4: Trestle to Dock in Deep Water

Alternative 4 is a deep-water alternative that minimizes dredging. This alternative includes constructing a gravity structure-supported pier from shore to deep water at a dock (Figure 18). This structure does not afford any wave protection, and it would require robust ice-protection measures for long term endurance. The dock would be located approximately 5,250 ft from shore at a depth of approximately minus 26 MLLW. No dredging is anticipated for this alternative. The trestle and dock are supported by gravity structures (sheet pile cells).

Figure 18. Alternative 4 - Trestle to Dock in Deep Water

The present value cost for this alternative is $155.6 million or $5.5 million annually. There is no maintenance dredging. All lightering is eliminated. Therefore, the total benefit value is $47.4 million or $1.7 million annually. The resulting BCR is 0.30. NPV is negative $108.2 million. This results in an equivalent annual cost (EAC) of $3.8 million.

This alternative is estimated to eliminate all 130 lightering days that occur under existing conditions, resulting in the cost of a reduced lightering day of $42,370. This alternative has a positive effect on job creation through construction spending, and on regional job creation through annual benefits to the area; however, the only need for small barge operations would be from Kotzebue to surrounding communities, so some work associated with small barge operations may be lost. This alternative is estimated to reduce annual lightering days by 130, and it results in the cost of a reduced lightering day of $42,370. This alternative has a positive effect on job creation through construction spending, and on regional job creation through annual benefits to the area; however, the only need for small barge operations would be from Kotzebue to surrounding communities, so some work associated with small barge operations may be lost.

There is a positive effect with regard to other social effects (OSE). Lowered fuel costs and home heating costs would reflect reduced lightering costs and would have stemming from effects such as those described in 6.2.2. This alternative would allow an additional three weeks of subsistence hunting, while providing additional life and safety benefits, from eliminating the need to sail around the tip of the Baldwin Peninsula if inclement weather were to occur while hunters are in the Cape Blossom area. The CE/ICA value for this alternative is 130 reduced lightering days and 21 increased subsistence vessel days.

6.3.5 Alternative 5: Causeway to Dock in Deep Water

Alternative 5 is a deep water alternative that minimizes dredging. This alternative includes constructing a rubble-mound causeway from shore to deep water that would be similar to the structure shown in Figure 19, and because it is a solid structure it would provide some additional wave protection benefit to vessels during certain storm and tide conditions. Depending on tide and draw down, certain vessels could weather out storms on one side or the other side of the causeway. The dock would located approximately 5,760 ft from shore. No dredging is anticipated for this alternative. The dock at the end of the causeway is supported by gravity structures appropriate for site conditions, including sea ice. The actual design would include several bridged open spans, including at the shoreline, to allow passage for fish, marine mammals, and boats. Causeways designs are proven resistant to sea ice forces.

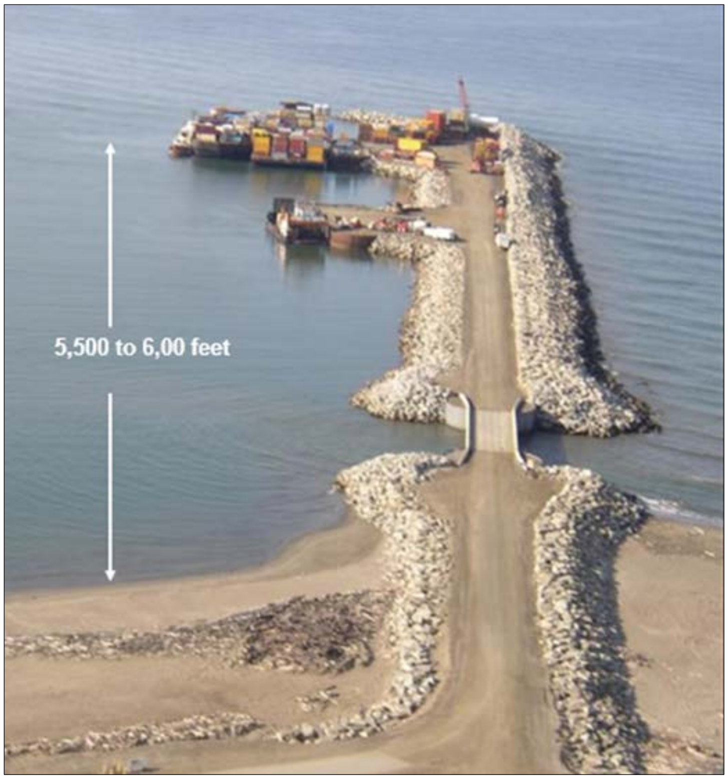


Figure 19. Alternative 5 - Causeway to Dock in Deep Water

The present value cost for this alternative is $416.9 million or $14.8 million annually. The total benefits value is $47.4 million or $1.7 million annually. The resulting BCR is 0.11. NPV is negative $369.5 million. EAC is $13.1 million.

This alternative is estimated to reduce annual lightering days by 130, and it results in the cost of a reduced lightering day of $113,530. This alternative has a positive effect on job creation through construction spending, and as before, on regional job creation through annual benefits to the area. OSE effects are the same as Alternative 4. The CE/ICA value for this alternative is 130 reduced lightering days and 21 increased subsistence vessel days.

6.3.6 Alternative 6: Trestle and Causeway Combination to Dock in Deepwater

Alternative 6 is a deep water alternative that minimizes dredging. This alternative as initially introduced as a combination of Alternative 4 (Trestle to a Dock in Deep Water) and Alternative 5 (Causeway to a Dock in Deep Water) to see if there is some optimization between the two design types. This comparison was done because it was assumed that costs by depth would influence the cost for trestle versus causeway. In reality this alternative became Alternative 4 because Causeway was more cost at all depths.

The present value cost for this alternative are $153.2 million or $5.4 million annually. Compared to Alternative 4 which is only trestle, total project costs were reduced by $2.4 million ($84,000 annually). No maintenance dredging would occur. The total benefits value is $47.4 million or $1.7 million annually. The resulting BCR is 0.31. NPV is negative $105.8 million. EAC is $3.7 million.

This alternative is estimated to reduce annual lightering days by 130, and it results in the cost of a reduced lightering day of $41,720. This alternative has a positive effect on job creation through construction spending, and on regional job creation through annual benefits to the area. OSE effects are the same as Alternatives 4 and 5. The CE/ICA value for this alternative is 130 reduced lightering days and 21 increased subsistence vessel days.

6.3.7 Alternative 7: Dredged Channel with Trestle and / or Causeway to Dock (optimized design)

The development of Alternative 7 included a cost optimization evaluation of a combination of features that are present in Alternatives 2, 4, and 5 to minimize the cost of a pier/causeway and dredging combination. Prior to evaluation this alternative could have been a combination of all the features (e.g., pier, causeway, and dredging); however the cost optimization evaluation showed that the trestle to a dock located at depth of -12 ft MLLW approximately 1,100 ft from the shoreline was the least cost alternative assuming a dredge would extend 4,700 ft from -26 ft MLLW to a dock at - 12 ft MLLW. The new-work dredge quantity is about 707,000 CYs for this plan. In order to account for some infilling during channel stabilization, maintenance dredging was assumed to include about 300,000 CYs in years 5, 15, 25, and 45 to remove 2 ft of accumulated sedimentary material over the area of the dredged channel and basin. The general concept for the trestle and dock features are shown in Figure 20.

Figure 20. Alternative 7 - In-water LSF Concept Drawing

The present value cost for this Alternative are $99.1 million or $3.5 million annually. Maintenance dredging would occur at years 5, 15, and 25 after construction and the operations and maintenance cost is $9.7 million, or $341,640 annually. Those costs are included in the present value cost cited above. The total benefits value is $47.4 million or $1.7 million annually. The resulting BCR is 0.48. NPV is negative $51.7 million. EAC is $1.8 million.

This alternative is estimated to reduce annual lightering days by 130, and it results in the cost of a reduced lightering day of $26,990. This alternative has a positive effect on job creation through construction spending, and on regional job creation through annual benefits to the area.

Other Regional Economic Development (RED), Environmental Quality (EQ), and OSE effects are the same as Alternatives 4, 5, and 6. The CE/ICA value for Alternative 7 is 130 reduced lightering days and 21 increased subsistence vessel days.

6.3.8 Alternatives Summary

The Future with Project (FWP) condition is summarized in three tables below.

The highest BCR is associated with Alternative 7 (Table 17). As a result, a CE/ICA analysis of non-monetary benefits was conducted to determine the TSP.

Table 17. NED Summary

Alt.	NPV	EAC	BCR
1	$ -	$ -	0.0000
2	$(115,434,000)	$(4,086,000)	0.0000
3	$(127,557,000)	$(4,516,000)	0.2180
4	$(108,181,000)	$(3,830,000)	0.3047
5	$(369,515,000)	$(13,081,000)	0.1137
6	$(105,797,000)	$(3,745,000)	0.3094
7	$(51,692,000)	$(1,830,000)	0.4784

Table 18. Four Accounts Summary

Alt.	RED	Jobs	EQ	OSE
1	Neutral	Neutral	Neutral	Negative
2	Positive	Positive	Slightly Negative (temporary)	Negative
3	Positive	Positive (*)	Slightly Negative (temporary)	Slightly Positive
4	Positive	Positive	Slightly Negative (temporary)	Positive
5	Positive	Positive	Slightly Negative (temporary)	Positive
6	Positive	Positive	Slightly Negative (temporary)	Positive
7	Positive	Positive	Slightly Negative (temporary)	Positive
*Note: Alternative 3 could preserve more existing lightering jobs than other alternatives				

CE/ICA was conducted utilizing the metric of reduced lightering days and increased subsistence vessel days. The effects of reduced lightering related to the 2006 authority address benefits of the project to public health and safety, access to natural resources for subsistence, local and regional economic opportunities, welfare of local population and social and cultural values.

The highest reduction in lightering days and greatest increase in subsistence vessel days is associated with Alternatives 4 through 7. The least annual cost for this benefit level is associated with Alternative 7, as shown in Table 19.

Table 19. CE/ICA Summary

Alternative	Reduced Lightering Days	Increased Subsistence Vessel Days	Annual Cost of a Reduced Day	Incremental Cost of Day Gained (Annualized)
1	0	0	N/A	N/A
2	0	21	N/A	N/A
3	97.5	21	$59,220	N/A
4	130	21	$42,370	N/A
5	130	21	$113,530	N/A
6	130	21	$41,720	N/A
7*	130	21	$26,990	N/A

*Best Buy

6.4 Sensitivity Analysis

The results presented above were modeled with uncertainty. The results of the study are anticipated to be between the 10 percent and 90 percent reduction in lightering days shown in Table 20.

Table 20. Sensitivity Analysis Results

Alt	10% Reduced Lightering Days	90% Reduced Lightering Days	10% Annual Cost of a Reduced Lightering Day	90% Annual Cost of a Reduced Lightering Day	10% NPV	90% NPV	10% EAC	90% EAC	10% BCR	90% BCR
1	0	0	N/A	N/A	$ -	$ -	$ -	$ -	1.0000	1.0000
2	0	0	N/A	N/A	$(123,467,000)	$(70,304,000)	$(4,410,000)	$(2,512,000)	0.0000	0.0000
3	91.5	102.75	$32,000	$86,860	$(202,769,000)	$(53,187,000)	$(7,148,000)	$(1,883,000)	0.1776	0.5672
4	121	139	$23,840	$60,750	$(175,574,000)	$(40,122,000)	$(6,215,000)	$(1,420,000)	0.2067	0.5453
5	121	139	$68,890	$158,100	$(532,113,000)	$(207,974,000)	$(18,837,000)	$(7,362,000)	0.0797	0.1862
6	121	139	$23,120	$60,210	$(175,158,000)	$(35,653,000)	$(6,201,000)	$(1,262,000)	0.2029	0.5682
7	121	139	$18,780	$35,570	$(82,483,000)	$(20,738,000)	$(2,920,000)	$(734,000)	0.3473	0.7079

7 TENTATIVELY SELECTED PLAN

7.1 Description of Tentatively Selected Plan

Alternative 7 is the Tentatively Selected Plan (TSP) for this project. This alternative plan includes a developed upland that would be accessed from Kotzebue by the Kotzebue to Cape Blossom Road. This plan includes all the Upland LSF features as proposed for all the alternatives, a combination of most of the in-water LSF features shown previously, and a dredge channel and turning basin as the General Navigation Feature (GNF) at the dock. The causeway was removed and the trestle maintained as an in-water LSF for the following reasons:

- Does not impede fish and marine mammal passage
- Does not impede long-shore currents and sediment transport
- Does not impede small boat traffic
- Allows ATVs beach access under the transition section (i.e., bridge) from land to water

7.1.1 Plan Components

The TSP components are depicted in the TSP Concept Drawing (Figure 21). The TSP components can be placed in three general categories: GNF, Upland LSF, and In-Water LSF features, and the.

The GNF included in the TSP, as noted above in Sections 6.9 and 7.1, is depicted in Figure 21 and described below

- GNF:
    - Main dredge channel extending 4,700 ft from -26 ft MLLW to a turning basin at the dock at - 12 ft MLLW
    - New-work dredge quantity is about 707,000 CYs
    - Maintenance dredging was assumed to include about 300,000 CYs in years 5, 15, 25, and 45 to remove 2 ft of accumulated sedimentary material over the area of the dredged channel and turning basin.

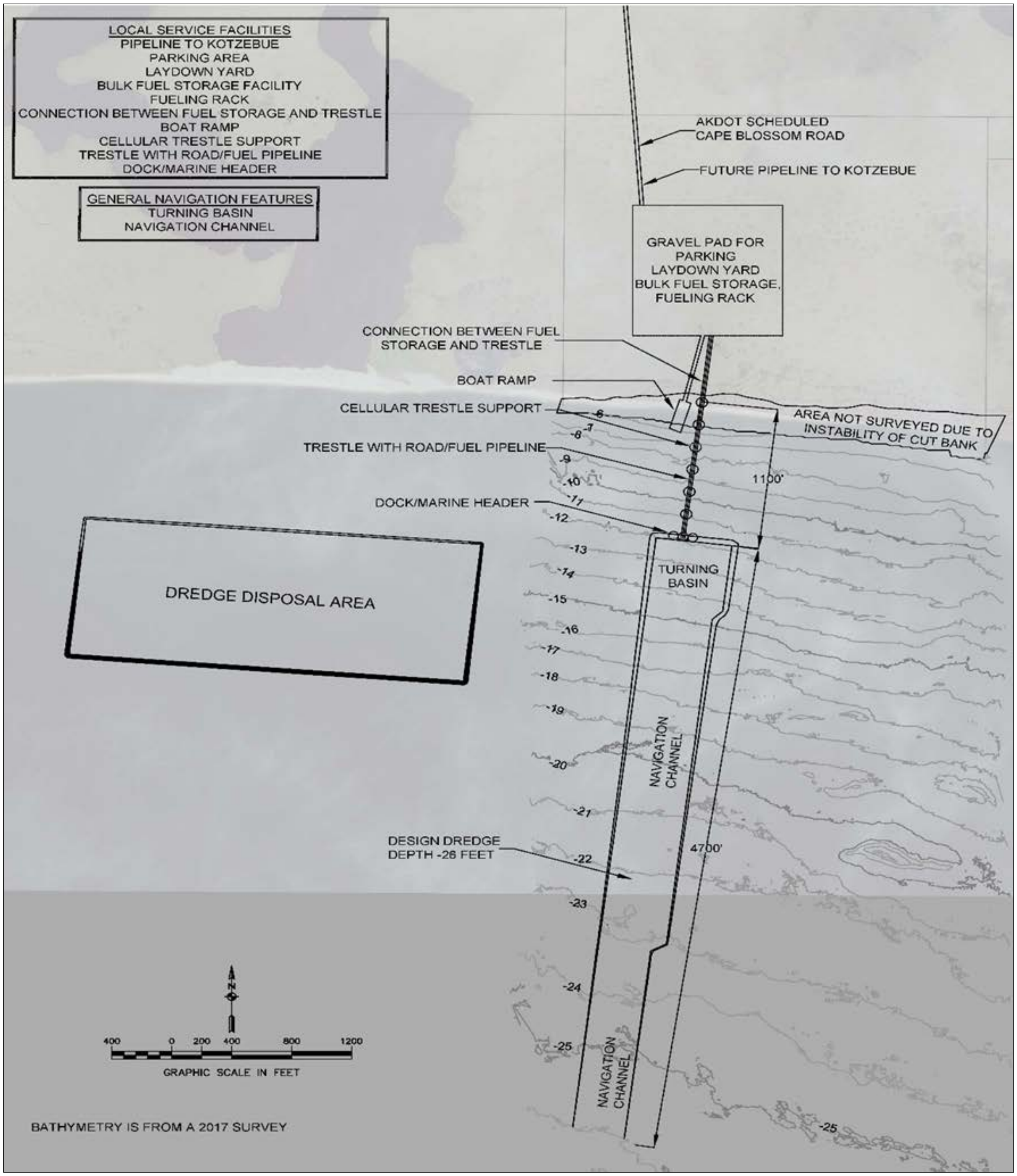


Figure 21. Alternative 7 - TSP Plan View Concept Drawing

The Upland LFS features are consistent and non-differentiating between alternatives and the ones carried forward for the TSP are listed below:

- Uplands LSF features:
  - Bulk fuel storage facility with a capacity of approximately 197,000 barrels (8,274,000 gallons)
  - Fuel transfer equipment
    - Dual fuel pipeline, 8-inch diameter extending to and from dock
    - General fuel transfer equipment – pumps etc.
    - Truck fueling rack
  - Boat ramp to support increased subsistence and marine safety
  - Gravel pad area prepared for future upland LSF features that may include:
    - Lay-down yard for incoming and outgoing cargo
    - Parking areas
    - Warehouses, maintenance shops
    - Fuel pipeline to Kotzebue

The Upland LSF features referenced above that may be developed in the future in the gravel pad area are at the discretion of the Non-Federal sponsors, and, as result, are not included in the project cost.

The In-water LSF features proposed for this TSP include a trestle to a dock. These and associated features are described below:

- In-water LSF Features
  - Bridge from uplands to a trestle that leads to a dock located at - 12 ft MLLW, approximately 1,100 ft from the shoreline
  - The bridge, trestle with a road deck are supported by gravity-filled structures (e.g., caissons)
  - Marine fueling head and associated 8-inch diameter pipeline extending to and from the bulk fuel storage facility
  - Pass-pass facilities (ship to pier)
  - Miscellaneous features such as lighting

7.1.2 Construction of Tentatively Selected Plan

The City of Kotzebue is accessible by air and water; but the project site near Cape Blossom is currently only accessible by water in the summer and snow machine in the winter. However, the project site is anticipated to have road and water access prior to construction because the ADOT&PF is scheduled to start construction of an 11-mile all-season road from Kotzebue to Cape Blossom in 2019.

The major project construction features include are an uplands parking pad for cargo transfer equipment; a dock with a fuel transfer header and supporting the transfer of fuels and dry cargo;

a dredged channel from deep water into a turning basin at the dock; a trestle and built out from the uplands pad into the shallow Kotzebue Sound with valves and pipeline from the new dock header to an uplands fuel storage pad with bulk fuel storage tanks; and associated fuel transfer equipment (pumps, filters, valves alarms, etc.). The minor project construction features at Cape Blossom are supporting utilities for the causeway/dock (water, electricity, lights); an uplands road connecting the pier/causeway to a 12 mile roadway from Cape Blossom to Kotzebue to be built by AKDOT; and a future fuel transfer pipeline from the uplands bulk storage to Kotzebue presumably following the new road. The marine construction of docks, elevated roadways, pads, and dredged channels is well understood.

The designs for bulk fuel and dry cargo storage are not developed past a preliminary stage as the Local Sponsor's needs and desires have not been refined into structural or mechanical designs of environmentally compliant fuel storage and transfer piping, and general storage space with incidental supporting facilities and utilities.

The pier/causeway/dock construction costs were based upon some general assumptions. The pier/causeway/dock could be constructed of pre-cast concrete wide-flange Tee beams with 5 ft deck width typically used for roadways. The beams would span about 100 ft and be supported on abutments consisting of driven steel piles with cast-in-place concrete pile caps. To protect the abutments from storm surge and ice flows, the supports would be enclosed by driven steel sheet pile hoops filled with gravel. The final design would be optimized during Preconstruction Engineering and Design (PED).

The project support utilities were presumed to be a fuel pipeline, power source, and roadway/area safety lighting at a minimum. A dual 8-inch diameter fuel transfer pipe from the dock header to the transfer station was presumed to aid efficient fuel transfers to/from barges at the dock, plus provide needed fuel transfer redundancy in the event of a pipe leak. Electric power source and backup would be from local diesel generators at the uplands transfer station, but the new road may support future primary power transmission from Kotzebue to Cape Blossom. Area lighting at the dock, pads and storage tanks; and roadway lighting along the pier are considered necessary for safety since the arctic site is prone to long periods of darkness and stormy weather. Water supply and to the storage area, and to the dock would be beneficial, but not presumed necessary.

Remaining construction items were presumed to cover structural/mechanical/electrical design review and inspection services; buildings and facilities to shelter equipment and personnel; miscellaneous items providing for fire protection, alarm/communication, control systems, heating, cooling, and sanitary waste disposal; and uplands stabilization including seeding and revetments.

Construction advertisement/award is expected in late 2022; and construction execution is expected in 2023 and 2024 with possible completion as late as 2025 depending on delays. Uplands construction can occur throughout most of the year. Dredging and pile driving are presumed to only occur in the approximately 100 to 120 days between ice-out and freeze-up.

Off-season work may be required, but rock revetment construction in freezing weather is not satisfactory.

7.1.3 Channel Design

The purpose of dredging the channel is to provide access to an offloading facility at a dock located at approximately - 12 ft MLLW per the TSP (see Figure 21). The length of the channel was determined by a comparison of channel construction and maintenance costs to the construction costs of the trestle linking the channel to the dock. The channel design followed the standards of Engineering Manual (EM) 1110-2-1613, "Hydraulic Design of Deep-Draft Navigation Projects," and were checked against World Association for Waterborne Transport Infrastructure (PIANC) guidance (Appendix C, Section 10). The channel design is defined by the vessels likely to use the channel. The typical tank barge and assist tug that are the design vessel for this project. The dimensions of the design vessel and tug are shown in Table 21.

Table 21. Summary of Design Vessels Dimension

	Design Barge	Design Tug
Length Overall [ft]	340	126
Beam [ft]	78	34
Loaded Draft [ft]	20	17

The channel design is a straight channel nearly perpendicular to the bathymetry contours and lines up the terminus of the Kotzebue to Cape Blossom Road (Figure 21). The shoreward end of the channel was located to prevent the channel from being impacted by cross shore sediment transport and to minimize the channels' impact on coastal processes of the foreshore beach. It maintains a constant width to accommodate the fully loaded barge until the - 23 ft contour. At this contour, the channel widens to accommodate the underkeel clearance of the barge and tug towing alongside side the barge (Figure 22).

The channel widths are shown in Figure 23. The turning is 510 ft wide; which is 1.5 times the length of the barge. This allows the barge to be turned fully loaded and still allow for a quick departure from the dock once unloading is complete or in the event that weather conditions change and make it unsafe to remain at the dock.

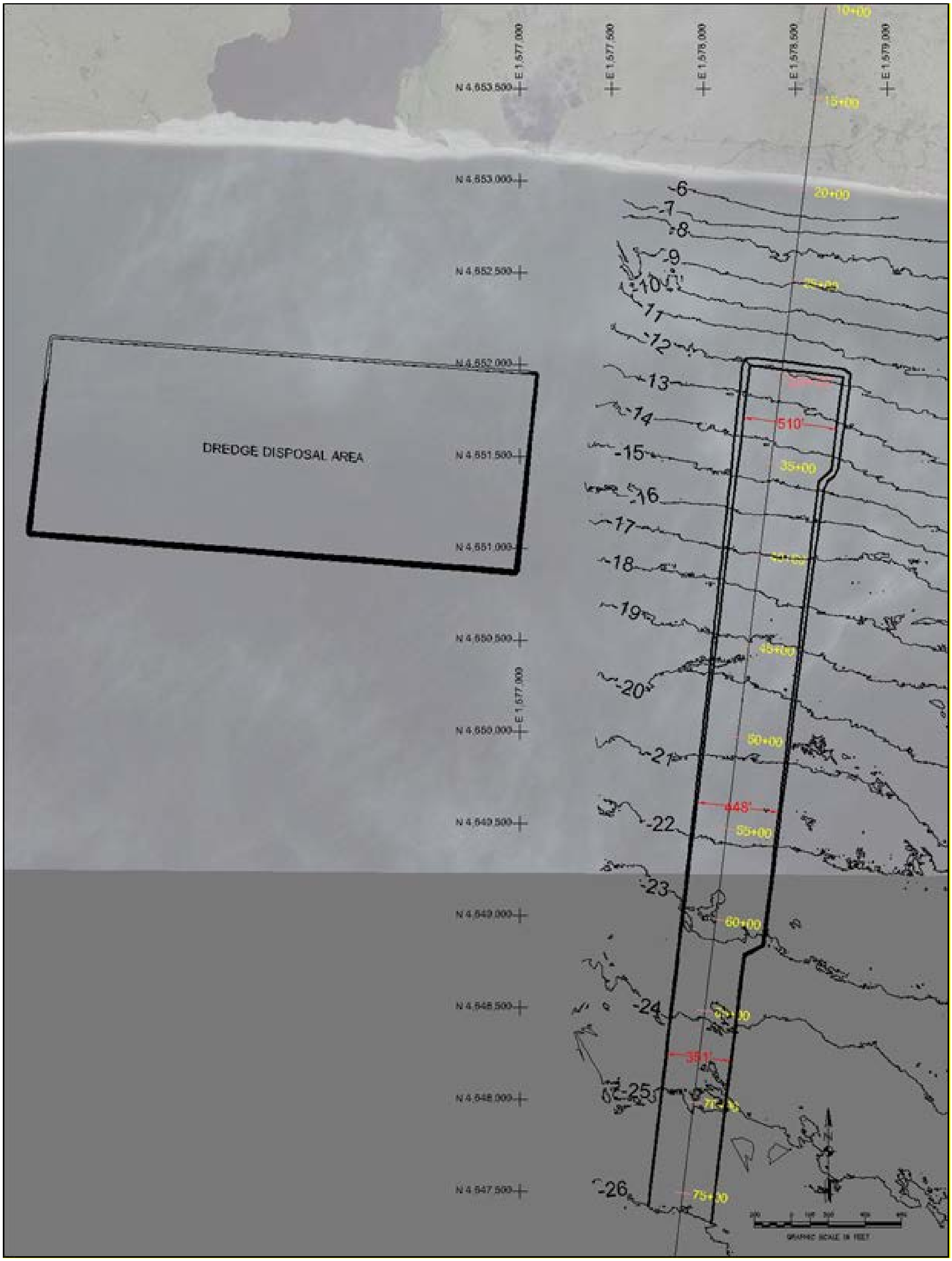


Figure 22. Dredge Channel Plan View

Vessels moving in a navigation channel must maintain clearance between their hulls and channel bottom. Navigational design parameters such as squat, safety clearance, vertical motion due to waves, and water density effects (Figure 23) were analyzed to determine the required minimum under-keel clearance (Appendix C, Section 10).

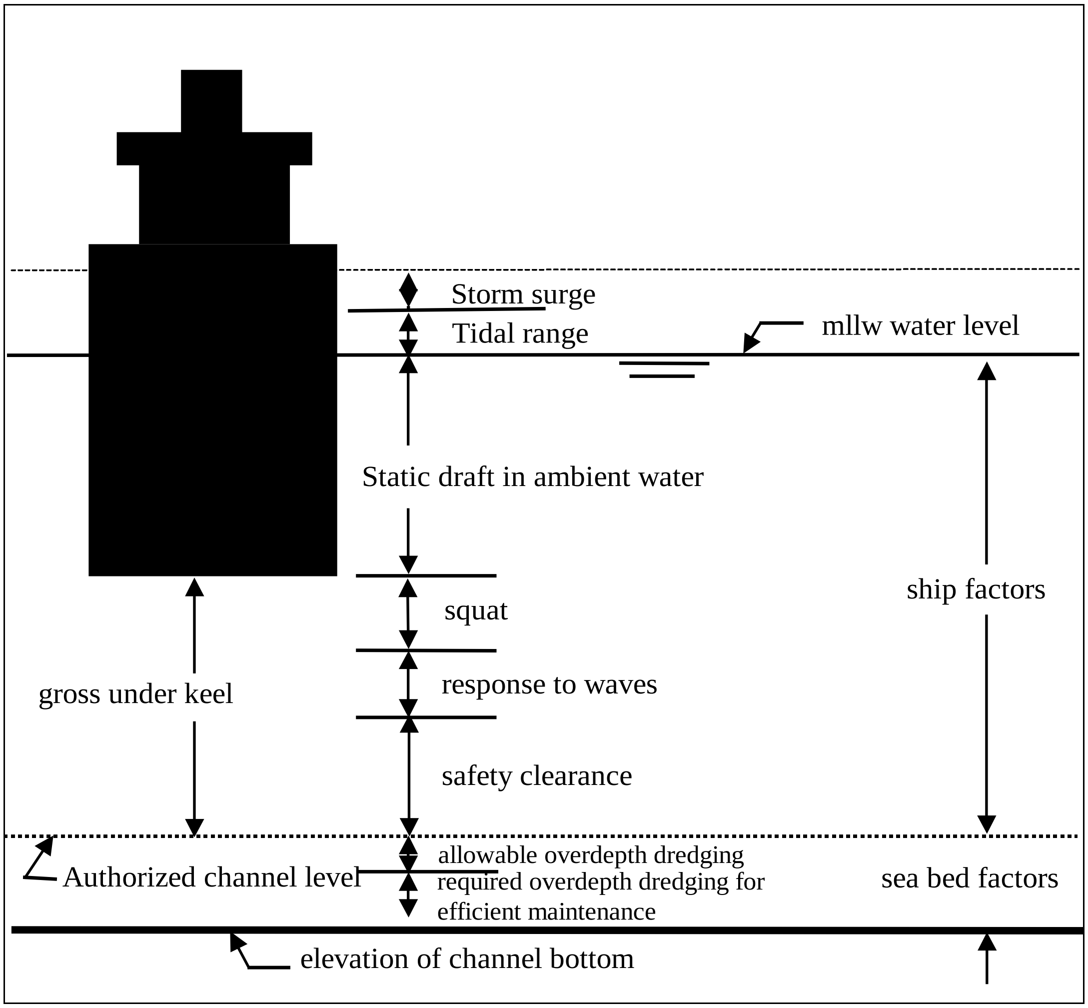


Figure 23. Channel Depth Design Parameters

The fully loaded draft of this barge is 20 ft and the loaded draft of the associated tug is 17 ft. Squat was assumed to be 0.5 ft during channel transit because the barge is assumed to be moving at a very slow speed. Assuming channel transit is limited to times when the wave height is 3 ft, the critical ship motion for transit of the channel is 3.5 ft. Based on the description of the material a safety factor of 2 ft was used for this analysis. The subtotal of squat, response to waves, and safety clearance for the channel provides a design depth of -26 ft MLLW (Table 22). The berthing area depth is kept the same as the channel depth, set down events up to 4 ft during the shipping season can be tolerated by a ship at the dock and leave a 2 foot safety clearance.

Table 22. Channel Depth Factors

Channel Factor	Depth [ft]
Loaded draft	20
Squat	.5
Ships response to waves	3.5
Safety Clearance	2
Total Depth	26

7.1.4 Dredging and Placement

The initial / new work dredging would be completed during construction using a mechanical dredge system. Dredge quantities shown in Table 23 includes 2 ft of allowable over-depth dredging outside the required depth prism to account for inaccuracies in the dredging process in an open ocean environment. This table shows various dredge quantity estimates that vary based on where the dredging starts. The TSP assumes the dredge prism would start at -12 ft MLLW.

Table 23. Initial Dredge Quantities

Dredge Start Contour [ft MLLW]	Dredge Depth [ft MLLW]	Initial Dredge Quantity [CY]
-12	-26 (required) / -28 (allowed)	707,000
-14	-26 (required) / -28 (allowed)	585,000
-16	-26 (required) / -28 (allowed)	470,000

Sediment transport modeling was performed to evaluate the location for placement of the dredge material from the initial construction dredge and subsequent maintenance. The dredge material would be placed east of the dredge channel in the nearshore environment between - 13 ft MLLW and - 18 ft MLLW up to elevation - 8 ft MLLW (see Figure 22). The material would serve as nourishment for the actively eroding nearshore environment. Locations to the east and west of the dredge channel were evaluated to ensure that the placed material does not end up back in the channel. The modeling indicated that placement of the material 1,320 ft west of the channel resulted in the least amount of sediment infilling (Appendix C, Section 10).

7.1.5 Operations & Maintenance

The long-term O&M costs are not well known because of lack of design data, however, sediment transport modeling was used to evaluate the volume and frequency of maintenance dredging required to keep the channel open. Results indicated that there would be minimal infilling of the channel with the dredge material placed on the west side of the channel (see Figure 22). In order to account for some infilling during channel stabilization, maintenance dredging was assumed to occur in years 5, 15, 25, and 45 to remove 2 ft of accumulated sedimentary material over the area of the dredged channel and basin. The volume of dredging is assumed to be 300,000 CY placed approximately 1,320 ft west of the channel as shown in Figure 22.

7.1.6 Integration of Environmental Operating Principles

The USACE Environmental Operating Principles (EOPs) were developed to ensure that USACE missions include totally integrated sustainable environmental practices. The EOPs provide direction to ensure the workforce recognizes USACE's role in, and responsibility for, sustainable use, stewardship, and restoration of natural resources across the nation and through the international reach of its support missions.

The EOPs relate to the human environment and apply to all aspects of business and operations. They apply across all USACE programs, including Civil Works, Military Programs, and Research and Development. The EOPs require a recognition and acceptance of individual responsibility from senior leaders to the newest team members. Recommitting to these principles of environmental stewardship will lead to more efficient and effective solutions, and will enable the USACE to further leverage resources through collaboration. This is essential for successful integrated resources management, restoration of the environment, and sustainable and energy efficient approaches to all USACE mission areas. It is also an essential component of the USACE's risk management approach in decision making, allowing the organization to offset uncertainty by building flexibility into the management and construction of infrastructure.

The EOPs are:

- Foster sustainability as a way of life throughout the organization.
- Proactively consider environmental consequences of all USACE activities and act accordingly.
- Create mutually supporting economic and environmentally sustainable solutions.
- Continue to meet our corporate responsibility and accountability under the law for activities undertaken by the USACE, which may impact human and natural environments.
- Consider the environment in employing a risk management and systems approach throughout the life cycles of projects and programs.
- Leverage scientific, economic, and social knowledge to understand the environmental context and effects of USACE actions in a collaborative manner.
- Employ an open, transparent process that respects views of individuals and groups interested in USACE activities.

Adherence to USACE's EOPs as they directly relate to navigational improvements for Kotzebue have facilitated open and transparent project progress dialogues with the general public, local and tribal governments, private stakeholders, and regulatory interests. These interactions serve as the foundation of a holistic approach towards environmental conservation in the project design process that is derived from the environmental consciousness of a group educated, experienced, and concerned citizens and professionals. As such, USACE's project design would endeavor to address subsistence considerations, fish and marine mammal migration requirements, impacts to the coastal sediment budget, improve risk management systems, and implement best management practices wherever and whenever possible throughout the life of the project. USACE would continue, with its partners, to strive to reduce its overall environmental footprint through coordination, planning, and the active engagement of subject matter experts and concerned citizens.

7.2 Real Estate Considerations

There are no Lands, Easements, Rights-Of-Way and Relocations (LERRs) requirements for this project. The Government's dominant right of navigation servitude would be exercised for project tidelands below the Mean High Water (MHW) line for the General Navigation Feature (GNF) portion (i.e., dredging) of the project. There are no other Federal Projects that would be affected by the project footprint. The ADOT&PF has been conveyed the easement for the Kotzebue to Cape Blossom Road through the Federal lands that include the uplands area for the project. Further information about real estate requirements for the project is available in Appendix F (Real Estate).

7.3 Risk & Uncertainty

As in any planning process, estimates made in this report have uncertainty. Elements of risk and uncertainty could affect the design and performance of the project, cost, and benefits. An ongoing effort to address risk has been made throughout the study process. The major risk elements associated with plan design and performance are summarized in Table 24.

Table 24. Residual Risks

Assumption or Estimate	Risk Comment
Economic analysis risk was fairly uniformly distributed, so downside risk can be thought of as half of that range.	Given the small sample size of shipping firms and regional organizations interviewed, modeled risk was quite high. The uncertainty range spanned roughly $62 million between the low and high estimate of the net present value at TSP.
The limited current data relied on for this study was adequate for the sediment transport modeling effort; which was used to: evaluate the infilling rate to the navigation channel and turning basin, which was estimated to be minimal, and placement location for the dredged material was determined to be located west of the dredge channel	This is a project performance risk. Sediment in filling rate could be higher than expected which could increase maintenance dredging frequency and cost. This risk is anticipated to be relatively low considering that the modeling results indicated the infilling rate would be minimal. The placement location west of the dredge channel is unlikely to change even with more current data
The impact to project design of the actively eroding slopes at Cape Blossom was assumed would be considered during the PED phase.	The erosion rate of the bluffs in the project area is unknown. The bluff erosion rate will need to be considered during design of the trestle located in the transition area from land to water to avoid the impacts of erosion.

7.4 Cost Sharing

Cost sharing is based off of "project first cost" and does not consider time preference as economics does for alternative selection. Construction of the project would be apportioned in accordance with the Water Resources Development Act of 1986, as amended. Cost sharing is based on the total investment cost. The project first cost summary cost share for each alternative plan is presented in Table 25.

Table 25. Project First Cost Summary

Alternative	GNF	LSF	LERRs
1	$0.00	$0.00	$0.00
2	$39,325,000	$50,113,000	$0.00
3	$23,405,000	$167,557,000	$0.00
4	$34,631,000	$147,683,000	$0.00
5	$11,500,000	$478,305,000	$0.00
6	$22,555,000	$156,943,000	$0.00
7	$38,927,000	$65,437,000	$0.00

The cost share information presented in Table 25 is not detailed because the actual cost share is influenced by dredge depth and other factors. A cost share summary for the TSP is more detailed in Table 26 by considering dredge depth. This analysis indicates that the Federal and non-Federal shares are $31,141,600 and $73,222,400, respectively.

Table 26. TSP Cost Sharing Summary

General Navigation Features (GNF):	**Total Cost**	**Federal Share**	**Non-Federal Share**
	<20 Ft	**90%**	**10%**
GNF Features	$ 10,185,990	$ 9,167,391	$ 1,018,599
	20<x<50 Ft	**75%**	**25%**
GNF Features	$ 28,741,010	$ 25,866,909	$ 2,874,101
NED Subtotal Construction of GNF:	**$ 38,927,000**	**$ 35,034,300**	**$ 3,892,700**
LERR Subtotal:	**$ -**	**$ -**	**$ -**
NED Total Project First Cost:	**$ 38,927,000**	**$ 35,034,300**	**$ 3,892,700**
Local Service Facilities (LSF):			
LSF Features	$ 65,437,000	$ -	$ 65,437,000
Subtotal LSF:	**$ 65,437,000**	**$ -**	**$ 65,437,000**
Aids to Navigation	$ -	$ -	$ -
Credit for LERRs	$ -	$ -	$ -
10% of GNF Non-Federal	$ -	$ (3,892,700)	$ 3,892,700
Total NED Cost Allocation:	**$ 104,364,000**	**$ 31,141,600**	**$ 73,222,400**

The sponsor is self-certifying their ability to pay at this time. The self-certification will be completed before final report submittal.

8 ENVIRONMENTAL CONSEQUENCES*

8.1 Physical Environment

8.1.1 Climate

Alternatives 1 through 7 would have no effects upon the climate within the region.

8.1.2 Wind

Alternatives 1 through 7 would have no effect on wind or its physical properties within the region.

8.1.3 Sea Ice

Alternatives 1 through 7 would have no effect on sea ice or its physical properties within the region.

8.1.4 Bathymetry

With the exception of Alternative 1, each other Alternative affects bathymetric values by either raising or lowering the elevation of the relative sea floor in the project footprint area or dredge material placement area. These impacts would be permanent, but minor. (Table 27).

Table 27. Consequences for Bathymetry

Alternative	Impacts
Alternative 1 - No Action	No effect
Alternative 2 - Dredge to Shore	Minor and Permanent
Alternative 3 - Lightering with Detached Breakwater and Dolphins	Minor and Permanent
Alternative 4 - Trestle with Gravity-filled Support Structures to Dock	Minor and Permanent
Alternative 5 - Causeway to Dock	Minor and Permanent
Alternative 6 - Trestle and Causeway Combination to Dock	Minor and Permanent
Alternative 7 - Dredge channel with Trestle and/or Causeway to Dock	Minor and Permanent

8.1.5 Geology

Alternatives 1 through 7 would have no effect upon the geology of the region.

8.1.6 Soils / Sediments

With the exception of Alternative 1, impacts to soils and sediments are expected to be minor and temporary. Marine sediments are expected to be liberated into the water column during in-water work. (Table 28).

Table 28. Consequences for Soils and Sediments

Alternative	Impacts
Alternative 1 - No Action	No effect
Alternative 2 - Dredge to Shore	Minor and Temporary
Alternative 3 - Lightering with Detached Breakwater and Dolphins	Minor and Temporary
Alternative 4 - Trestle with Gravity-filled Support Structures to Dock	Minor and Temporary
Alternative 5 - Causeway to Dock	Minor and Temporary
Alternative 6 - Trestle and Causeway Combination to Dock	Minor and Temporary
Alternative 7 - Dredge channel with Trestle and/or Causeway to Dock	Minor and Temporary

8.1.7 Tides

Alternatives 1 through 7 would have no effect upon the tides in Kotzebue Sound.

8.1.8 Currents

Alternatives 1 through 7 would have no effect upon currents in Kotzebue Sound.

8.1.9 Sea Level Rise

Alternatives 1 through 7 would have no effect upon the projected rate of sea level rise for Kotzebue Sound.

8.1.10 Water Quality

With the exception of Alternative 1, minor and temporary impacts to water quality would occur as a result of in-water work associated with each Alternative’s design (Table 29).

Table 29. Consequences for Water Quality

Alternative	Impacts
Alternative 1 - No Action	No effect
Alternative 2 - Dredge to Shore	Minor and Temporary
Alternative 3 - Lightering with Detached Breakwater and Dolphins	Minor and Temporary
Alternative 4 - Trestle with Gravity-filled Support Structures to Dock	Minor and Temporary
Alternative 5 - Causeway to Dock	Minor and Temporary
Alternative 6 - Trestle and Causeway Combination to Dock	Minor and Temporary
Alternative 7 - Dredge channel with Trestle and/or Causeway to Dock	Minor and Temporary

8.1.11 Air Quality

With the exception of Alternative 1 (no action), Alternatives 2 through 7 would have only temporary, limited impacts upon the local air quality. These impacts are best characterized as the cumulative point source emissions from machinery and support equipment emitted while constructing the project; they do not represent a significant impact to air quality at Cape Blossom. Similarly, due to insufficient air quality data to declare the area as either “attainment or non-attainment,” the appropriate category is considered “unclassifiable” according to ADEC. As a result, the area is not in a CAA “non-attainment” area, and the “conformity determination” requirements of the CAA would not apply to the proposed project at this time.

8.1.12 Noise

Alternatives 1 through 7 would have no effect upon the ambient noise occurring at Cape Blossom.

8.1.13 Visual Resources

Consequences to Visual Resources evaluated in (Table 30).

Table 30. Consequences to Visual Resources

Alternative	Impacts
Alternative 1 - No Action	No effect
Alternative 2 - Dredge to Shore	Minor and Temporary
Alternative 3 - Lightering with Detached Breakwater and Dolphins	Minor and Permanent
Alternative 4 - Trestle with Gravity-filled Support Structures to Dock	Minor and Permanent
Alternative 5 - Causeway to Dock	Minor and Permanent
Alternative 6 - Trestle and Causeway Combination to Dock	Minor and Permanent
Alternative 7 - Dredge channel with Trestle and/or Causeway to Dock	Minor and Permanent

8.2 Biological Resources

8.2.1 Terrestrial Habitat

8.2.1.1 Terrestrial Vegetation

Alternative 1 would have no impact on terrestrial vegetation. Alternatives 2 through 7 would only have a minor impact, associated with a minimal amount of habitat loss associated with the construction of upland local service facilities (LSFs) (Table 31).

Table 31. Consequences for Terrestrial Vegetation

Alternative	Impacts
Alternative 1 - No Action	No effect
Alternative 2 - Dredge to Shore	Minor
Alternative 3 - Lightering with Detached Breakwater and Dolphins	Minor
Alternative 4 - Trestle with Gravity-filled Support Structures to Dock	Minor
Alternative 5 - Causeway to Dock	Minor
Alternative 6 - Trestle and Causeway Combination to Dock	Minor
Alternative 7 - Dredge channel with Trestle and/or Causeway to Dock	Minor

8.2.1.2 Freshwater Fishes

None of the alternatives would have an impact on the freshwater fishes that live in the large unnamed lagoon outside of the project footprint (Table 32).

Table 32. Consequences for Freshwater Fishes

Alternative	Impacts
Alternative 1 - No Action	No effect
Alternative 2 - Dredge to Shore	No effect
Alternative 3 - Lightering with Detached Breakwater and Dolphins	No effect
Alternative 4 - Trestle with Gravity-filled Support Structures to Dock	No effect
Alternative 5 - Causeway to Dock	No effect
Alternative 6 - Trestle and Causeway Combination to Dock	No effect
Alternative 7 - Dredge channel with Trestle and/or Causeway to Dock	No effect

8.2.1.3 Terrestrial Mammals

Alternative 1 would have no impact on terrestrial mammals. Alternatives 2 through 7 would only have a minor impact, associated with a minimal amount of habitat loss associated with the construction of upland LSFs (Table 33).

Table 33. Consequences for Terrestrial Mammals

Alternative	Impacts
Alternative 1 - No Action	No effect
Alternative 2 - Dredge to Shore	Minor
Alternative 3 - Lightering with Detached Breakwater and Dolphins	Minor
Alternative 4 - Trestle with Gravity-filled Support Structures to Dock	Minor
Alternative 5 - Causeway to Dock	Minor
Alternative 6 - Trestle and Causeway Combination to Dock	Minor
Alternative 7 - Dredge channel with Trestle and/or Causeway to Dock	Minor

8.2.1.4 Birds

Alternative 1 would have no impact on birds, while Alternatives 2 through 7 would only have a minor impact (Table 34). The minor impacts associated with Alternatives 2 and 3 would be due to a periodic increase of vessel traffic in the nearshore marine habitat. The minor impacts associated with Alternatives 4, 5, 6, and 7 would be caused by the structures (trestle, causeway, or dock) representing a potential strike hazard. It is important to note here that Alternative 7 would have less of an impact than the others, as the structures in Alternative 7 do not extend out as far seaward.

Table 34. Consequences for Birds

Alternative	Impacts
Alternative 1 - No Action	No effect
Alternative 2 - Dredge to Shore	Minor
Alternative 3 - Lightering with Detached Breakwater and Dolphins	Minor
Alternative 4 - Trestle with Gravity-filled Support Structures to Dock	Minor
Alternative 5 - Causeway to Dock	Minor
Alternative 6 - Trestle and Causeway Combination to Dock	Minor
Alternative 7 - Dredge channel with Trestle and/or Causeway to Dock	Minor

8.2.2 Marine Habitat

8.2.2.1 Marine Vegetation

Alternative 1 would have no impact on marine vegetation, while Alternatives 2 through 7 would only have minor impacts, primarily associated with the physical removal of vegetation during dredging and construction (Table 35). Temporary indirect effects could also occur due to increased turbidity, decreased water quality, and burial of vegetation during dredged materials placement.

Table 35. Consequences for Marine Vegetation

Alternative	Impacts
Alternative 1 - No Action	No effect
Alternative 2 - Dredge to Shore	Minor and Temporary
Alternative 3 - Lightering with Detached Breakwater and Dolphins	Minor and Temporary
Alternative 4 - Trestle with Gravity-filled Support Structures to Dock	Minor and Temporary
Alternative 5 - Causeway to Dock	Minor and Temporary
Alternative 6 - Trestle and Causeway Combination to Dock	Minor and Temporary
Alternative 7 - Dredge channel with Trestle and/or Causeway to Dock	Minor and Temporary

8.2.2.2 Marine Mammals

Alternative 1 would have no impact on marine mammals, while Alternatives 2, 3, 4, 6, and 7 would only have only minor impacts, primarily temporary, associated with dredging and construction actions (Table 36). Alternative 5 would have a moderate impact on marine mammals utilizing nearshore habitat in Kotzebue Sound as it represents an impediment to long-shore migration. The designs of other structural alternatives were inclusive of the nearshore marine environment's importance as a corridor for migration. Marine mammals and their prey base could be affected by noise and turbidity generated by dredging and construction activities associated with project implementation. Potential impacts would be limited both temporally and spatially. However, because these impacts have the inherent potential to inadvertently harass marine mammals, USACE would apply to NMFS for an IHA. NMFS Protected Resources Division has been an integral planning partner during this feasibility process, encouraging minimally invasive design criteria from the planning stage.

Table 36. Consequences for Marine Mammals

Alternative	Impacts
Alternative 1 - No Action	No effect
Alternative 2 - Dredge to Shore	Minor and Temporary
Alternative 3 - Lightering with Detached Breakwater and Dolphins	Minor and Temporary
Alternative 4 - Trestle with Gravity-filled Support Structures to Dock	Minor and Temporary
Alternative 5 - Causeway to Dock	Moderate and Permanent
Alternative 6 - Trestle and Causeway Combination to Dock	Minor and Temporary
Alternative 7 - Dredge channel with Trestle and/or Causeway to Dock	Minor and Temporary

8.2.2.3 Marine Fishes

Alternative 1 would have no impact on marine fishes, while Alternatives 2, 3, 4, 6, and 7 would only have minor impacts, primarily temporary, associated with the physical alteration of the ocean floor during dredging and construction (Table 37). As fishes are mobile, they would be able to avoid the project footprint during these events with little consequence; however, preferred prey species may also relocate due to substrate disturbance. Temporary impacts on marine fishes in the form of sediment suspension, increased turbidity, and noise could also occur during dredging and construction activities. Alternative 5 would have a permanent moderate impact on fishes in the nearshore habitat, as it represents a significant impediment to long-shore migration. Another potential impact of all but the first alternative could be the relocation of preferred prey species to outside of the project footprint.

Table 37. Consequences for Marine Fishes.

Alternative	Impacts
Alternative 1 - No Action	No effect
Alternative 2 - Dredge to Shore	Minor and Temporary
Alternative 3 - Lightering with Detached Breakwater and Dolphins	Minor and Temporary
Alternative 4 - Trestle with Gravity-filled Support Structures to Dock	Minor and Temporary
Alternative 5 - Causeway to Dock	Moderate and Permanent
Alternative 6 - Trestle and Causeway Combination to Dock	Minor and Temporary
Alternative 7 - Dredge channel with Trestle and/or Causeway to Dock	Minor and Temporary

8.2.2.4 Marine Invertebrates & Associated Habitat

Alternative 1 would have no impact on marine invertebrates, while Alternatives 2 through 7 would only have temporary, minor impacts associated with the physical alteration of the ocean floor during dredging (Table 38). Alternative 2 would have the greatest impact due to its increased dredging footprint. Any substrate disturbances during dredging or construction would be largely temporary and allow for recolonization of species after completion. Marine invertebrates within the project footprint are regularly subjected to similar substrate disruption from scouring of season sea ice.

Table 38. Consequences for Marine Invertebrates.

Alternative	Impacts
Alternative 1 - No Action	No effect
Alternative 2 - Dredge to Shore	Minor and Temporary
Alternative 3 - Lightering with Detached Breakwater and Dolphins	Minor and Temporary
Alternative 4 - Trestle with Gravity-filled Support Structures to Dock	Minor and Temporary
Alternative 5 - Causeway to Dock	Minor and Temporary
Alternative 6 - Trestle and Causeway Combination to Dock	Minor and Temporary
Alternative 7 - Dredge channel with Trestle and/or Causeway to Dock	Minor and Temporary

8.2.3 Federal & State Threatened & Endangered Species

The only listed and protected species within the project area are marine mammals. Alternative 1 would have no impact on marine mammals, while Alternatives 2, 3, 4, 6, and 7 would only have temporary minor impacts, primarily associated with dredging and construction actions (see Table 36). As marine mammals are mobile, they would be able to avoid the sediment suspension, increased turbidity, and noise that would occur during these events. Additionally, work shut-down radii as recommended by NMFS and USFWS would be observed. Alternative 5 would have a permanent moderate impact, as it would impede nearshore migration.

8.2.4 Essential Fish Habitat

Nearshore waters within the project area are designated as EFH under the Fishery Management Plan for Fish Resources of the Arctic Management Area and the Fishery Management Plan for the Salmon Fisheries of the Exclusive Economic Zone off Alaska. The EFH species within Kotzebue Sound include Arctic cod, saffron cod, chum salmon, and snow crab. Alternative 1 would have no impact on these species, while Alternatives 2, 3, 4, 6, and 7 would only have temporary minor impacts, primarily associated with the physical alteration of the ocean floor during dredging and construction (see Table 37). For these alternatives, female snow crabs and their eggs are of the most concern; however, their mobility along with best management practices would reduce possible impacts. Alternative 5 would have a permanent moderate impact, as it would block nearshore migration. This alternative would be of most concern for Arctic cod, saffron cod, and chum salmon. USACE has prepared a preliminary EFH analysis, Appendix H, which concludes that there would not be any adverse effects upon species with designated EFH as a result of project implementation.

8.3 Cultural Resources

The area of potential effect (APE) is located east of Cape Blossom, next to a large unnamed lagoon which empties into Kotzebue Sound. There are no known cultural resources within the APE. Alternative 1, no action, would have no effect on any known cultural resources. Alternatives 2 through 7 would have the same non-effect on known cultural resources. The proposed tentatively selected plan, Alternative 7, which involves dredging directly south of the shoreline, would not impact any known marine cultural resources. The proposed in-water dredging disposal area also has no known marine cultural resources within its vicinity. It is expected that construction of the proposed navigation improvements would prompt the construction of upland and in-water LSFs along the shore and a road connecting the port facilities to Kotzebue by non-Federal entities.

The 2012 NLURA survey along the potential road right-of-way did not identify any previously known or newly discovered sites (Blanchard 2013). The 2016 USACE survey also concluded that there were no cultural resources present along the shoreline within the vicinity of the proposed navigation improvements. No historic properties are expected to be impacted by any of the proposed alternatives for this project. On March 17, 2017, the USACE determined that the proposed dredging and in-water disposal would result in no historic properties affected [36 CFR § 800.4(d)(1)], and on April 26, 2017, the Alaska State Historic Preservation Officer concurred with that assessment (see Appendix G).

8.4 Environmental Justice and Protection of Children

Executive Order 12898 directs Federal agencies to identify and address the disproportionately high and adverse human health or environmental effects of their actions on minority and low-income populations, to the greatest extent practicable and permitted by law. In the Northwest Arctic Borough, 26.3 percent of persons are living in poverty, and for Kotzebue, the population is approximately 74 percent Alaska Native, 16 percent white, and 8 percent of the population consists of two or more races in combination. Implementation of USACE's preferred alternative does not disproportionately negatively affect minority or low-income populations of Kotzebue or the Northwest Arctic Borough. Rather, the project, as proposed, seeks to reduce inefficiencies inherent to the existing fuel and durable goods supply infrastructure, whose implementation would necessarily reduce costs to end users. Some residents who utilize Cape Blossom and its immediately adjacent lands and waters for the procurement of subsistence resources may be affected by temporary construction activity and localized increases in nearshore turbidity. Similarly, longer-term interruptions to resource availability might be recognized in the areas immediately adjacent to permanent elements of the project, but these are not expected to be significant.

Executive Order 13045 directs Federal agencies to identify and address any potential environmental health or safety risk that may disproportionately affect children. USACE believes that its preferred alternative, if implemented, would not disproportionately negatively impact children. The project, as proposed, is located a considerable distance from Kotzebue (12 miles), and as such, does not expect to impact Kotzebue's existing air and water quality. Alternately, children, as part of the community as a whole, are expected to benefit from the expected lowered cost of goods, fuel, and services resulting from the implementation of USACE's project.

8.5 Unavoidable Adverse Impacts

All of the alternatives with the exception of Alternative 1 (no action) would have unavoidable adverse impacts. These include temporary disturbances of water quality during dredging and dredged materials placement, temporary in-water noise associated with construction activities, and the conversion of intact tundra habitat to fuel storage and logistical support facilities (Table 39). Alternative 5 could also cause an impediment to marine fish and mammal migration, and long-shore sediment drift.

Table 39. Unavoidable Adverse Impacts Summary

Alternative	Unavoidable Adverse Impacts
Alternative 1 - No action	No reasonable unavoidable adverse impacts expected from the implementation of this alternative.
Alternative 2 - Dredge to shore (no dock)	- Temporary disturbance to water quality vicinity of the active dredge channel and at the material placement site. - In-water noise associated with dredging and material placement actions would be unavoidable. - Conversion of intact tundra habitat to fuel storage and logistical support facility. - Periodic increase of vessel traffic in the nearshore marine habitat.
Alternative 3 - Lightering with detached breakwater and mooring dolphins	- Temporary disturbance of water quality in the vicinity of the detached breakwater during construction activities. - In-water noise associated with the construction of the detached breakwater (barging and placement of core rock and armor stone) would be unavoidable. - Conversion of intact tundra habitat to fuel storage and logistical support facility. - Periodic increase of vessel traffic in the nearshore marine habitat.
Alternative 4 - Trestle to dock (no dredging)	- Temporary disturbance to water quality in the vicinity of active in-water construction. - In-water noise associated with pile driving, filling, and dock construction activities would be unavoidable. - Conversion of intact tundra habitat to fuel storage and logistical support facility.
Alternative 5 - Causeway to dock (no dredging)	- Temporary impacts to water quality in the vicinity of the material placement sites during construction of the causeway and dock structures. - In-water noise associated with material placement and dock construction would be unavoidable. - Probable impediment to long-shore coastal sediment processes. - If causeway is continuous, long-shore fish and marine mammal migration is inhibited. - Conversion of intact tundra habitat to fuel storage and logistical support facility.
Alternative 6 - Combination No. 1, trestle with causeway to dock in deep water (no dredging)	- Temporary disturbance to water quality in the vicinity of material placement sites and pile driving locations. - In-water noise associated with pile driving, filling and placement of materials during construction would be unavoidable. - Conversion of intact tundra habitat to fuel storage and logistical support facility.
Alternative 7 - Combination No. 2, trestle/causeway/dock with dredging	- Temporary impacts to water quality in the vicinity of the active dredging area, material placement site, and at pile driving locations. - In-water noise associated with dredging, material placement, pile driving, and dock construction activities would be unavoidable. - Conversion of intact tundra habitat to fuel storage and logistical support facility.

8.6 Cumulative & Long-term Impacts

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

Navigational inefficiencies associated with the shallow seas surrounding the Baldwin Peninsula have been exacerbated by the region's demand for durable goods and fuel. Transportation costs associated with these commodities are historically born by the end user, and, as such, a navigational project at Cape Blossom has been envisioned for nearly 40 years as a mechanism for reducing these costs. However, Cape Blossom is about 12 miles from the population and infrastructure center that it is being designed to service. Efficiencies gained from navigational improvements at Cape Blossom would not be tangible without the simultaneous construction of a road from Kotzebue to Cape Blossom to facilitate transfer of commodities. Currently, construction of such a road is underway, and the assumption of its completion shall be inferred as cumulative impacts to the natural and cultural environment are considered below. DOTPF conducted an Environmental Assessment that evaluated environmental effects that might result from the implementation of their project and concluded that there would be no negative impacts associated with its road construction. As such, USACE concludes that the implementation of its project would not alter this previous determination in any way.

Ultimately, the long-term objective of enacting navigational efficiencies at Cape Blossom is to increase the capacity for ship- and barge-borne commerce to access communities of the Northwest Arctic Borough. In turn, this is expected to lower costs to the end user. If successful, it is expected that lowering costs would increase local capacity to purchase more fuel and freight. Although the existing state of barge traffic servicing Kotzebue and its surrounding communities is quite limited, this may change in the future, and additional barges may be required to meet communities' demand for fuel and freight.

From an environmental perspective, initial construction and implementation of the preferred alternative is likely to have the greatest impact. A number of physical impacts to baseline environmental conditions are projected to occur: increased turbidity in the waters associated with the dredging and material placement activities, permanent submerged aquatic habitat type alteration and conversion, and permanent structure emplacement in the nearshore waters of Kotzebue Sound. Some of the temporary, but more pervasive, environmental degradation would be associated with the underwater noise propagated by dredging and pile driving activities. Construction and implementation actions are likely to deter marine mammals, marine fishes, and marine invertebrates from behaving naturally in the project footprint and immediately adjacent areas. Longer-term behavioral impacts to these marine species are more difficult to discern, and may include aversion or attraction to permanent structures, aversion to barge-generated noise, reduced foraging efforts in the immediate project area, or disuse of the area entirely.

Because of sea ice conditions within Kotzebue Sound, construction timelines are not necessarily guaranteed; dredging, material placement, and construction activities could extend past their envisioned timelines requiring additional seasons of effort, impromptu effects analyses, and further resource agency coordination. Similarly, longer ice-free periods could facilitate timeline conditions in the opposite direction. Sea ice conditions in Kotzebue Sound also dictate navigational access to the sound itself.

Although it is reasonable to expect an increase in large cargo and fuel barges, these numbers may not be significant from an environmental perspective. Increasing the number of offloading barges at Cape Blossom from two to three per year may only incur the additional inherent danger posed by operating a single barge in the north Bering Sea that currently exists. Still, some risk to the region must be assumed. The Bering Sea has claimed many vessels, and should a barge loaded with fuel be critically damaged or sunk, it could wreak havoc on the maritime Arctic ecosystem.

More local and long-term impacts may occur at the individual subsistence level. Once completed, the project would facilitate over-land transportation and launch and recovery of subsistence vessels to resource areas that may not be as thoroughly exploited as those closer to Kotzebue. Incremental depletions of marine mammals and fisheries resources may occur if enough people participate in this increased access.

Currently, there are no subordinate, concurrent, or future Federal projects associated with navigation improvements in Kotzebue Sound. Feasibility investigations concerning potential navigational improvements to the harbor structures in Nome are currently underway; however, Nome is approximately 300 miles south of Cape Blossom by ship and may be developed with different objectives driving its necessity.

8.7 Summary of Mitigation Measures

Formal mitigation measures have yet to be identified and developed for the preferred alternative, as currently proposed. However, the existing suite of alternatives (with the exception of Alternative 5) were developed in parallel with guidance from the NMFS' Protected Resources and Fish Habitat Divisions guidance that permanent structures, emplaced perpendicular to the shoreline, shall make provisions for fish and marine mammal passage. Similarly, USACE expects that marine mammal monitors with the independent authority to halt project activity should be on site during all phases of in-water work associated with the implementation of the project.

8.8 Comparison of the Effects of the Project Alternatives

None of the proposed alternatives would have any impact on cultural resources or freshwater fishes. Alternative 1 (no action) is the only alternative that would have no effect on any other biological resources; however, no alternatives are expected to have *significant* impacts. Alternatives 2 through 7 would have minor impacts on terrestrial biological resources, in association with a minimal amount of habitat loss due to construction of upland LSFs.

Alternatives 2 through 7 would have minor impacts on birds: the periodic increase of vessel traffic associated with Alternatives 2 and 3 could impact the nearshore marine habitat used by shorebirds and seabirds, while the structures associated with Alternatives 4 through 7 could represent potential strike hazards.

Alternatives 2, 3, 4, 6, and 7 would have temporary minor impacts on marine biological resources. These potential effects are primarily associated with construction and dredging activities, which could cause substrate disturbances, increase turbidity, and produce underwater noise. Alternative 5 would have a permanent minor impact on marine fishes and mammals, as it would impede their nearshore migration. It would also impede long-shore sediment drift. These potential effects would be mitigated by observing the work shut-down radii recommended by NMFS and USFWS during construction efforts, and considering the necessity of nearshore passage during the design of the preferred alternative (as described in Section 7 above).

9 COORDINATION - PUBLIC AND AGENCY INVOLVEMENT*

9.1 Public / Scoping Meetings

From 11 to 12 January 2016, officials from the non-Federal sponsors (Native Village of Kotzebue and City of Kotzebue), Kikiktagruk Inupiat Corporation, Nana Regional Corporation, Northwest Arctic Borough, USFWS, National Park Service, and USACE personnel from the Alaska District, Pacific Ocean Division, and Headquarters participated in a charette that was held in Kotzebue.

From 25 to 29 January 2016, available members of the PDT, vertical team, and other charette participants conducted an After Action Review of the charette held in Kotzebue. During 2017, focus group interviews were held by telephone in January and in person in Kotzebue in August that included stakeholders identified by USACE and the non-Federal Sponsors. The businesses in the groups' respective categories included: shipping companies and construction firms, and regional organizations, representing remote and subsistence interests. The stakeholders also included representatives from the Kikiktagruk Inupiat Corporation, Nana Regional Corporation, and the University of Alaska.

Further coordination will be ongoing between the non-Federal sponsors, USACE, State and Federal resource agencies, and residents in the area after the draft report is available for review. The report is scheduled for released to the public concurrently with Agency Technical and Headquarters reviews in January 2019. The draft report will also be posted on the Alaska District website to provide public access for review. The USACE and the non-Federal Sponsors will coordinate to ensure interested parties were aware the report was available for review. A public meeting is tentatively scheduled in Kotzebue for January 2019 in an ongoing effort to fulfill the NEPA public review process.

9.2 Government to Government

One of the non-Federal sponsors for this study is the Native Village of Kotzebue, a Federally-recognized tribe. In April 2016, the following Federally-recognized tribes in the Kotzebue region were notified of the proposed project under the USACE Tribal Coordination and Government-to-Government Procedures (CEPOA-7.1-14):

- Native Village of Ambler
- Native Village of Buckland
- Native Village Deering
- Native Village of Kiana
- Native Village of Kivalina
- Native Village of Kobuk
- Native Village of Kotzebue
- Native Village of Noatak
- Noorvik Native Community
- Native Village of Selawik
- Native Village of Shungnak

No requests for Government-to-Government consultation have been received.

9.3 Federal & State Agency Coordination

Planning Charrette – January 2016:

- NMFS – Habitat
- USFWS – Selawik National Wildlife Refuge, Fairbanks Regional Office.
- ADEC Water Quality

While in project development:

- Selawik NWR, Fairbanks Regional Office - Fish and Wildlife Survey Design – February–May 2016
- Determination of "no historic properties affected" [36 CFR § 800.4(d)(1)] – March 2017
- SHPO concurred with determination of "no historic properties affected" – April 2017
- USEPA Anchorage (discussions of intricacies of Section 103 designation, ultimately arrived at the conclusion that sediments were suitable for unconfined disposal) – January–June 2017
- ADEC Water Quality (telephone coordination concerning project elements at Cape Blossom) 2-3 times March 2016 – September 2017.
- NOAA Sediment Data Managers, Colorado (request for raw sediment data corresponding to NOAA bathymetry surveys for Cape Blossom) – February 2017
- USFWS Fairbanks Regional Office (via telephone, request for FWCA support deferred due to lack of staff and incomplete project description) – September 2017

- USFWS – FWCA Request (via telephone, USFWS unable to support due to staff shortages and developing project description) – February 2018
- NMFS (Protected Resource Division and FHD) TSP Presentation – August 2018

9.4 Status of Environmental Compliance

Five of the fourteen actions required under Federal environmental compliance are complete, while nine are partially complete (Table 40).

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Table 40. Environmental Compliance Status Summary

Federal Statutory Authority	Compliance Status	Compliance Date / Comment
Clean Air Act	Fully Complete (FC)	This project is not reasonably expected to negatively impact air quality, nor is it in a non-attainment area
Clean Water Act	Partially Complete (PC)	Upon receipt of 401 certification. 404(b)(1) analysis is being developed for ADEC Review.
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 § 930, subpart C.
Endangered Species Act	PC	Requires NMFS IHA in-hand to complete Section 7 coordination for endangered marine mammals.
Marine Mammal Protection Act	PC	IHA required as conservation measure for potential impacts to marine mammals as a result of construction activities and their duration. NMFS has been engaged in discussion with regard to this subject matter.
Magnuson-Stevens Fishery Conservation and Management Act	PC	Pending EFH effects determination – not yet submitted. No significant impacts anticipated.
Fish and Wildlife Coordination Act	PC	Coordination request currently in progress. USFWS would not review project elements without TSP.
Marine Protection, Research, and Sanctuaries Act	FC	Project would not dispose of dredged materials outside the territorial sea.
Migratory Bird Treaty Act	PC	Pending conservation measures from FWCA coordination.
National Historic Preservation Act	FC	On March 17, 2017, USACE determined that the proposed dredging and in-water disposal would result in no historic properties affected [36 CFR § 800.4(d)(1)], and on April 26, 2017, the Alaska SHPO concurred with that assessment.
National Environmental Policy Act	PC	Pending completion of the EA/Feasibility Report/signed FONSI
Executive Order 11990: Protection of Wetlands	PC	Conservation measures designed in the PED phase would endeavor to protect the wetlands immediately west of the project location.
Executive Order 12898: Environmental Justice	FC	Project would not disproportionately affect minority or low-income populations.
Executive Order 13045: Protection of Children from Environmental Health Risks and Safety Risks	FC	Project would not disproportionately affect the health or well-being of children.
Executive Order 13186: Protection of Migratory Birds	PC	Pending conservation measures from FWCA coordination.

9.5 Views of the Sponsor

The sponsors, Native Village of Kotzebue and City of Kotzebue have fully funded the study and have been active participants in study. Other stakeholders have provided support for the study include the Northwest Arctic Borough, NANA Regional Corporation and Kikiktagruk Inupiat Corporation. It is noted that the project is of high priority for the community and region to facilitate efficient transportation of goods, fuel, equipment and materials. The project would increase economic, community development, social and cultural benefits in Kotzebue and the region.

Up to date Letters of Intent/Interest from sponsors have been requested, and will be added to Appendix G (Correspondence) when received. Updated letters of intent and statements of financial capability will be included in the final report that note the sponsors' ability to comply with cost sharing and financial policies during design and construction.

10 PREPARERS OF THE ENVIRONMENTAL ASSESSMENT

The Environmental Assessment was prepared by members of the USACE Alaska District Environmental Resources Section, Hydraulics & Hydrology Section, and Civil Works Branch (Table 41).

Table 41. Preparers of the Environmental Assessment

Name	Title	Degree	Responsibilities:
Jenipher Cate	Project Manager	Marine Ecology (Ph.D.)	Marine Mammals, Climate Change
Jan Deick	Planner	Hydrology (M.S.)	Document management; Bathymetry, Ice Conditions, Geology, Soils, Sea Level Rise
Kelly Eldridge	Archaeologist	Anthropology (M.A.)	Document management; Cultural Resources, Threatened & Endangered Species, Special Aquatic Sites, Future Projections Biological Resources
Deirdre Ginter	Hydrological Engineer	Civil Engineering (B.S.)	Ice Conditions, Tides, Currents, Sea Level Rise, Wind
Christopher Hoffman	Biologist	Biology (B.A.)	Birds, Freshwater Fishes, Terrestrial Mammals
Michael Rouse	Biologist	Environmental Population & Organismic Biology (B.A.)	EA management; Climate, Wind, Geology, Water and Air Quality, Noise, Visual Resources, Marine Mammals, Unavoidable Adverse Impacts, Cumulative & Long-term Impacts, Environmental Justice & Protection of Children, 404(b)(1) analysis

Michael Salyer	Chief of ER	Biology (M.S.)	Oversight and guidance of EA development; independent review of EA for accuracy and compliance with CEQ regulations
Dylan Snyder	Biology Intern	Wildlife & Fisheries Biology (B.S.)	Essential Fish Habitat, Marine Vegetation, Marine Fishes, 404(b)(1) analysis
Joseph Sparaga	Archaeologist	Anthropology (M.A.)	Cultural Resources, Subsistence

11 CONCLUSIONS & RECOMMENDATIONS

11.1 Conclusions

No NED Plan was identified during this study, as a result the TSP was identified based on the CE/ICA results. The CE/ICA was differentiating between alternatives and resulted in a best buy plan. The TSP is Alternative 7 which is an alternative plan that is optimized by combining various measures to minimize project cost and still meeting the identified objectives and avoiding constraints.

The proposed construction of the TSP as discussed in this document would have short-term environmental impacts during construction that would be largely minimized by observing work shut-down radii as recommended by NMFS and USFWS. In the long-term, impacts would be minor or minimized with the potential fish and marine mammal passage as discussed in this report. This assessment supports the conclusion that the proposed project does not constitute a major Federal action significantly affecting the quality of the human environment. Therefore, a Finding of No Significant Impact (FONSI) has been prepared. The Alaska District Office of Counsel has reviewed this document and has issued a certification of legal sufficiency.

11.2 Recommendations

I recommend that the navigational improvements at Kotzebue, Alaska, be constructed generally in accordance with the plan herein, and with such modifications thereof as in the discretion of the Chief of Engineers may be advisable at an estimated total Federal cost of $31,141,600 provided that prior to construction the local sponsor agrees to the following:

a. Provide, during the periods of design and construction, funds necessary to make its total contribution for commercial navigation equal to:
(1) 10 percent of the cost of design and construction of the general navigation features attributable to dredging to a depth not in excess of -20 ft mean lower low water (MLLW), plus
(2) 25 percent of the cost of design and construction of the general navigation features attributable to dredging to a depth in excess of -20 ft MLLW but not in excess of -50 ft MLLW, plus

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

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

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

d. Provide 50 percent of the excess cost of operation and maintenance of the project over that cost which the Secretary determines would be incurred for operation and maintenance if the project had a depth of 50 ft;

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

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

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

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

i. Keep, and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the project, for a minimum of 3 years after completion of the accounting for which such books, records, documents, and other evidence are required, to the extent and in such detail as will properly reflect total cost of the project, and in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and local governments at 32 CFR, Section 33.20;

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

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

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

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

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

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

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

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

The recommendations for implementation of navigation improvements at Kotzebue, Alaska reflect the policies governing formulation of individual projects and the information available at this time. They do not necessarily reflect the program and budgeting priorities inherent in the local and State programs or the formulation of a national civil works water resources program. Consequently, the recommendations may be changed at higher review levels of the executive branch outside Alaska before they are used to support funding.

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PHILLIP J. BORDERS Date

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