US Army Corps of Engineers
-Alaska District

Preliminary Draft Feasibility Report

St. George Navigation Improvements
St. George, Alaska

September 17, 2018

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Prepared by
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PERTINENT DATA

Tentatively Selected Plan	
Project Component	
Entrance Channel and Mooring Basin (See Figure 9)	
Entrance Channel Depth	-25 ft Mean Lower Low Water
Mooring Basin Depth	-20 ft Mean Lower Low Water
Dredge Volume	430,000 cubic yards (CY)
Uplands Fill	45,000 CY
Length of Mooring Basin	550 Feet
Width of Mooring Basin	450 Feet

Project Component	
North Breakwater (See Figure 9)	
Length	1,731 Feet
Armor Stone (10 ton)	85,000 CY
B Rock	54,000 CY
Core Rock	80,000 CY
Stub Breakwater (See Figure 9)	
Length	250 Feet
Armor Stone (10 ton)	9,000 CY
B Rock	6,500 CY
Core Rock	5,000 CY

Economics*	
Item	**Present Value (FY18 Dollars)**
Benefit/Cost Ratio	0.24
Annual National Economic Development (NED) Cost	$3,572,000
Annual Operation, Maintenance, Repair, Replacement, and Rehabilitation	$484,000
Annual NED Benefit	$1,037,000
Net Annual NED Benefits	-$2,535,000
The selected plan resulted in an increase of 179 safe access and moorage days for all vessel classes. This Cost Effectiveness/Incremental Cost Analysis (CE/ICA) metric is further described below.	
CE/ICA, Cost of Day Gained	$19,934

*Project is justified pursuant to Section 2006 of WRDA, 2007, *Remote and Subsistence Harbors,* which allows recommending a project without demonstrating that the improvements are justified solely by NED benefits

Initial Project Costs (Present Value FY18 Dollars)			
Item	**Federal ($)**	**Non-Federal ($)**	**Total ($)**
Initial Cost			$78,085,000
General Navigation Features (Including Aids to Navigation)			$68,417,000
Local Services Costs			$9,669,000
Interest Cost During Construction			$2,605,000

Future Project Costs (Present Value FY18 Dollars)			
Item	**Federal ($)**	**Non-Federal ($)**	**Total ($)**
Maintenance and Operations Costs			$13,066,000

Total Project Costs (Present Value FY18 Dollars)			
Item	**Federal ($)**	**Non-Federal ($)**	**Total ($)**
Total Cost			$100,684,000

EXECUTIVE SUMMARY

This General Investigations study is being conducted under authority granted by Section 4010 of the Water Resources Development Act (WRDA) of 2007. The study evaluates Federal interest in and the feasibility of constructing deep draft navigation improvements, and proposes a Tentatively Selected Plan (TSP) to improve access and moorage to St. George, Alaska.

The City of St. George is on the north shore of St. George Island, one of the five islands in the Pribilofs located in the Bering Sea. It lies 49 miles south of St. Paul Island, the only other inhabited island of the Pribilofs. St. George is a mixed, subsistence-cash economy. While the residents hunt and fish for much of their protein needs, there is a need for a cash economy for power, heat, fuel, construction goods, utilities, transportation resources, as well as public use facilities.

In 1973, after 110 years of using Alaska Aleut Natives on St. George Island to harvest, cure, and skin fur seals and their pelts for profit, the Federal Government, acting through the Department of Commerce, National Marine Fisheries Service (NMFS), stopped commercial fur sealing on St. George Island. This left the indigenous peoples limited to no other means of economic activity. A goal of harbor construction has long been to transform the local economy to a self-sustaining economy that could benefit from the abundant marine resources of the Bering Sea. The commitments of the Federal Government to construct a harbor at St. George were included in the Fur Seal Act Amendments of 1983, P.L. 98-129.

Design of a harbor in Zapadni Bay on the south shore of St. George Island was undertaken by the State of Alaska in the early 1980s. By 1988, the City had Construction of the harbor was completed by the City of St. George by 1988. The current conditions in the harbor are such that navigation to, from, and within the harbor are unsafe due to: wave climate in the harbor entrance; seiche conditions within the inner basin; and degradation and overtopping of the existing breakwaters. The harbor and breakwaters are frequently damaged by storms in the Bering Sea such that the Federal Emergency Management Agency provided funds on multiple occasions for repairs. Additionally, the inability and inefficiencies related to delivering goods and fuel to the island directly impacts the cost of living at St. George.

While initial efforts of this study focused upon improvements to be made to the existing harbor in Zapadni Bay, numerical modeling results indicated that there are minimal opportunities to improve upon the dangerous conditions. Based upon these results, the study scope was adjusted to consider development of a new harbor facility on the north side of St. George Island adjacent to the village.

This study meets the criteria for economic justification under Section 2006, *Remote and Subsistence Harbors*, of 2007 WRDA, as modified by Section 2104 of the Water Resources Reform and Development Act of 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 benefits.

The TSP is for a new harbor located on the north side of the island adjacent to the City of St. George. The TSP consists of a 450-foot-wide by 550-foot-long mooring basin dredged to -20 feet Mean Lower Low Water (MLLW) protected by a 1,731-foot-long north breakwater and a 250-foot-long stub breakwater at the west edge of the basin. Primary armor stone on the north breakwater has a median weight of 10 tons. The basin connects to the Bering Sea with a 250-foot-wide navigation channel dredged to -25 feet MLLW. Inner harbor facilities include 2.6 acres of uplands area filled to +10 feet MLLW with a 300-foot-long pile supported dock and a concrete boat launch ramp to -5 feet MLLW for full tide launching access. The TSP is designed to support the subsistence vessel fleet; the fuel barge fleet; lash vessels and other cargo carrying vessels; as well as approximately 85% of the existing crabber fleet.

This study evaluates a number of alternatives in accordance with the goals and procedures for water resource planning as contained in Engineer Regulation (ER) 1105-2-100, “Planning Guidance Notebook” and ER 200-2-2, “Procedures for Implementing NEPA” which direct the contents of environmental assessments and environmental impact statements. As such, environmental analyses completed to date are presented in this draft document, and they inform the discussions throughout. An environmental assessment is currently being prepared and is scheduled to be released as part of a revised Integrated Feasibility Report and Environmental Assessment for public review in early 2019. U.S. Army Corps of Engineers, Alaska District, biologists still require field survey time at St. George Island to properly categorize biological diversity and existing underwater habitat conditions within the envisioned TSP footprint, as well as to confer with local, sentinel program marine mammal monitors regarding seasonal trends in abundance and habitat utilization. Additional regulatory agency coordination is required for this TSP as it moves forward towards realization. An Incidental Harassment Authorization that assesses and authorizes potential impacts to marine mammals as a function of underwater noise generated by the project in all of its particular facets must be obtained from the NMFS. Pursuant to Section 103 of the Marine Protection, Research, and Sanctuaries Act, the District Commander is required to select an “Alternate Site” for offshore dredge material disposal for this project prior to the commencement of dredge material placement activities.

LIST OF ACRONYMS AND ABBREVIATIONS

ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
AKDOT&PF	Alaska Department of Transportation & Public Facilities
APE	Area of Potential Effect
APICDA	Aleutian Pribilof Islands Community Development Association
CE/ICA	Cost Effectiveness/Incremental Cost Analysis
CDQ	Community Development Quota
CFR	Code of Federal Regulations
Corps	U.S. Army Corps of Engineers
CWA	Clean Water Act
CY	Cubic Yards
DPS	Distinct Population Segment
EFH	Essential Fish Habitat
EA	Environmental Assessment
EIS	Environmental Impact Statement
ER	Engineer Regulation
FMP	Fishery Management Plan
FWCA	Fish and Wildlife Coordination Act
IDC	Interest During Construction
IFQ	Individual Fishing Quota
IHA	Incidental Harassment Authorizations
IWR	Institute for Water Resources
LSF	Local Service Facilities
MLLW	Mean Lower Low Water
NED	National Economic Development
NEPA	National Environmental Policy Act
NHL	National Historic Landmark
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
PED	Preconstruction Engineering and Design
ROV	Remote Operated Vehicle
SHPO	State Historic Preservation Officer
SIOH	Supervision, Inspection, and Overhead
TSP	Tentatively Selected Plan
USEPA	Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
WRDA	Water Resources Development Act
WRRDA	Water Resources Reform and Development Act

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1 INTRODUCTION

Project & Study Authority

This General Investigations study is being conducted under authority granted by Section 4010 of the Water Resources Development Act (WRDA) of 2007, Public Law 110-114 which authorizes a study to determine the feasibility of providing navigation improvements at St. George, Alaska.

Additionally, Section 1322 of the WRDA of 2016, (b)(2) *Expedited Completion of Feasibility Studies,* authorizes the Secretary to move directly into preconstruction engineering and design (PED) if the project is justified. Implementation guidance was published 12 February 2018.

> *EXPEDITED COMPLETION OF FEASIBILITY STUDIES. The Secretary shall give priority funding and expedite completion of the reports for the following projects, and, if the Secretary determines that the project is justified in the completed report, proceed directly to project preconstruction, engineering, and design in accordance with section 910 Of the Water Resources Development Act of 1986 (33 U.S.C. · 2287):*
>
> *(A) The project for navigation, St. George Harbor, Alaska*

Additional Study Guidelines

The project is 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. 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:

   The project is in 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

Based upon their weight, commodities transported in the future with-project condition were analyzed to determine that more than 80 percent of the goods transported through the harbor would be consumed within the region. The region served by the navigation improvements was determined to be the island of St. George and the immediately surrounding marine area (about a 25-mile radius).

To provide economic opportunities for the community, consistent with the authority, alternatives supporting fish and crab product exports from the island are considered. However, these exports were projected to weigh less than 20% of the total weight going through the harbor when considering market and institutional factors such as Community Development Quotas (CDQ) and prices. Total imports minus total exports was used in the projection. Imports included the weight of fuel, the weight of freight and construction materials, and the weight of raw fish. Exports included the weight of processed fish products leaving the island. Exports are estimated to make up 14.1% of harbor throughput on average, with a high estimate of 18.7%, and low estimate of 11.3%.

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.

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. Rural economies in Alaska, including that which exists on St. George, 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. Without a safe and functioning harbor, economic opportunities in the community would continue to be hindered and the costs of basic essential goods required

to support a subsistence lifestyle would remain prohibitively high, contributing to continued out-migration from St. George. When subsistence communities are forced to disband due to high costs of essential goods, including fuel, tribal identities and cultural communities are endangered. Reductions in costs of such basic essential goods are essential to community viability. In addition, a safe and functioning harbor would provide opportunities for development of a local economy based upon the marine resources of the region. Such economic opportunities are essential for supporting the mixed, subsistence-cash economies common throughout rural Alaska, combating out-migration, and helping to ensure the viability of the community of St. George.

While determining whether to recommend a project under the criteria above, the Secretary will consider the benefits of the project to 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.

As indicated above, navigation improvements at St. George meet all the above criteria to recommend a project. Compliance with the criteria of the authority were confirmed by the USACE Vertical Team during an In-Progress Review conducted on January 23, 2018.

Scope

This study evaluates Federal interest in and the feasibility of providing navigation improvements at St. George, Alaska. Previous efforts considered modifications and/or realignments of the breakwaters, entrance channel, and inner harbor basin intended to reduce shoaling, wave overtopping, damage to the breakwaters, and adverse wave and seiche conditions in the harbor. Previous efforts have also looked at removing the pinnacles in the entrance channel to achieve intended project depths. These approaches, as well as construction of additional features to the current harbor and construction of a new harbor facility, have been considered as part of this study.

This study was conducted and the report prepared in accordance with the goals and procedures for water resource planning as contained in Engineer Regulation (ER) 1105-2-100, "*Planning Guidance Notebook,*" and Institute for Water Resources (IWR) Report 10-R-4, "*Deep Draft Navigation*".

Studies of this nature consider a wide range of alternatives and the environmental consequences of those alternatives. The evaluation of potential environmental impacts of the proposed action is underway. This preliminary draft feasibility report presents the environmental resource information developed to-date, and provides a preliminary discussion of potential environmental impacts and mitigation. However, the Corps' data-gathering and coordination with environmental resource agencies is ongoing, and has not yet reached a level that will allow for the completion of a legally compliant draft Environmental Assessment (EA). The draft EA and Finding of No Significant Impact are in preparation, with the environmental analyses completed for most resource categories. Once sufficient information has been collected and analyzed, and the appropriate coordination with resource agencies has been accomplished, the resultant draft EA will be released for public review as part of a revised Integrated Feasibility Report and Environmental Assessment.

Study Location/Congressional District

The City of St. George is on the northeast shore of St. George Island, the southern-most of five islands in the Pribilofs located in the Bering Sea (Figure 1). It lies 49 miles south of St. Paul Island, 750 air miles southwest of Anchorage, and 250 miles northwest of Unalaska. The 2017 population of St. George is 72 according to the Alaska Department of Commerce, Community, and Economic Development. St. George is accessible only by water and air. St. George is also the name of the federally-recognized tribe on St. George Island. Subsistence activities are vital to this Alaska community and to many long-term non-Native residents, as well.

The non-Federal sponsor for this study is the City of St. George, Alaska.

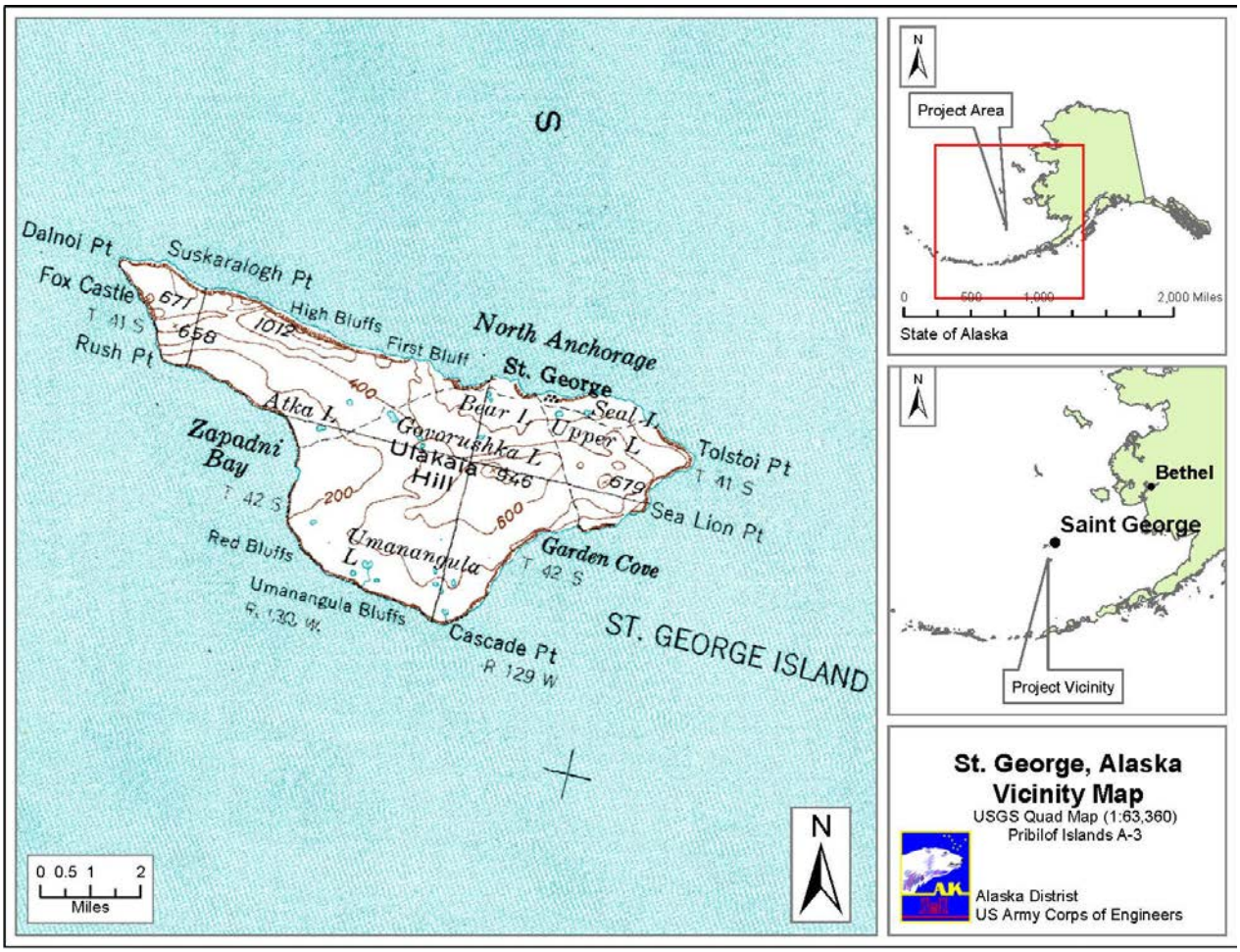

Figure 1: Vicinity Map, St. George, Alaska

The Pribolof Islands are ecologically significant and are colloquially referred to as “the Galapagos of the north” due to their rich fisheries, abundance of colonial seabirds, and Steller sea lion and northern fur seal rookeries. The area around the Pribilof Islands supports some of the most important commercial fisheries in the United States, including Pacific halibut, mackerel, cod, snow crab, red king crab, and the Alaska walleye pollock fishery, which is the nation’s largest by tonnage and value. According to a recent analysis by the Aleutian Pribolof Island Community Development Association (APICDA), St. George is located right in the middle of an area with an annual harvest quota for groundfish of two million metric tons (the equivalent of 4.4 billion pounds), in addition to shellfish or crab fisheries that harvest tens of millions of pounds.[1]
The study area is in the Alaska Congressional District which has the following representation:

[1] APICDA white paper, The Long-Term Viability of St. George: To Be, Or Not To Be. page 2 (N.B. The paper contains a typo that inaccurately equates 2 million mt with 4.4 *million* pounds, when the correct amount is 4.4 billion pounds).

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

Related Reports & Studies

Navigation Improvements Limited Reevaluation Report, Saint George, Alaska, July, 2004. The U.S. Army Corps of Engineers, Alaska District found that there was no Federal interest in removing pinnacles in the entrance channel without addressing other issues with the existing harbor.

Section 905(b) (WRDA 86) Analysis Navigation Improvements, Saint George, Alaska, October 2002. The U.S. Army Corps of Engineers, Alaska District report recommended further research into providing harbor improvements at St. George. The feasibility phase of the study has not been initiated due to the lack of matching funds from the local sponsor.

Limited Reevaluation Report St. George Harbor Entrance Channel, August, 1993. The U.S. Army Corps of Engineers, Alaska District Limited Reevaluation Report (LRR) updating the 1988 Final Detailed Project Report (DPR) and EA on the project. The report examined changes in economic conditions and described the cost and design features of the project.

Harbor Dredging Draft Detailed Project Report and Environmental Assessment, St. George, Alaska, May, 1988. The U.S. Army Corps of Engineers, Alaska District assessment was in response to a letter request from the City of St. George that provided cost-sharing funds to initiate this detailed study in November 1987.

Harbor Dredging Section 107 Reconnaissance Report, August, 1987, the Alaska District, U.S. Army Corps of Engineers in response to a letter from the City of St. George that requested assistance for navigation improvements pursuant to Section 107 of the 1960 River and Harbor Act, as amended.

St. George Harbor, Supplemental Dredging and Sedimentation Analysis, March, 1985. The U.S. Army Corps of Engineers, Alaska District conducted a dredging and sedimentation analysis.

Review of St. George Breakwater Design, August, 1984. The Waterways Experiment Station, Coastal Engineering Research Center (Dennis Markle, W.C. Seabergh, Paul Farrar) concluded that wave hindcasting appeared to be acceptable but that advance techniques were not used to account for wave-wave interactions.

The harbor layout design was found to appear satisfactory. Several concerns were documented regarding the berm breakwater design, which the Corps had no prior experience with. Scale effects may have been such that damage results from the physical model tests are questionable. Testing at various wave directions were not conclusive in demonstrating breakwater stability under the worst potential conditions. Wave heights were not measured appropriately as they included incident and refracted components.

St. George Island, Alaska, Section 107 Appraisal Report was prepared in 1979 under authority of Section 107 of the River and Harbor Act of 1960, as amended.

2 PLANNING CRITERIA, PURPOSE & NEED FOR PROPOSED ACTION

Problem Statement, Purpose and Need

The purpose of the project is to increase the safe accessibility of marine navigation to the community of St. George, Alaska. The need for the project is to reduce hazards to better provide safe navigation of subsistence vessels, fuel barges, cargo vessels, and a limited commercial fleet; all of which are critical to the long term viability of the mixed subsistence-cash economy of St. George.

Dangerous wave and seiche conditions at the existing harbor prevent safe access and moorage to the current fleet. This limits subsistence opportunities and impacts delivery of goods to the community and imperils the long-term viability of the community. Since crab rationalization established individual fishing and harvesting quotas (enacted circa 2000 with full implementation by the 2005/2006 season), commercial fishing vessels all but abandoned St. George as an option to deliver catch due to it being cost prohibitive compared with the risk of damages and delays. The community is legally entitled to a percentage of the CDQ from APICDA for crab; however, without a safe harbor, St. George is unable to realize that revenue benefit and the crab is delivered to neighboring St. Paul. The cost of fuel is exorbitant (>$7/gallon on St. George vs. ~$3/gallon on St. Paul[2]) because of the necessary inclusion of anticipated delays and operating costs associated with delivering to St. George. Due to vessel delays and the risk of damages consumables are flown into the community at a cost $1.58 more per pound than ocean going vessels could deliver.

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. Rural economies in Alaska, including that which exists on St.

[2] Colt, Steve, *City of Saint George, Alaska Economic and Fiscal Profile and Recent Trends,* May 10, 2018.

George, 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. Without a safe and functioning harbor, economic opportunities in the community would continue to be hindered and the costs of basic essential goods required to support a subsistence lifestyle would remain prohibitively high, contributing to continued out-migration from St. George. This has already resulted in closure of the school following the 2016/2017 school year when enrollment fell below minimum thresholds for State funding.

Problems & Opportunities

In 1973, after 110 years of using Alaska Aleut Natives on St. George Island to harvest, cure, and skin fur seals and their pelts for profit, the Federal Government, acting through the Department of Commerce, National Marine Fisheries Service (NMFS), stopped commercial fur sealing on St. George Island. This was done as a matter of Federal wildlife conservation policy. In the early 1980s, the Department of Commerce proposed that Congress change the Fur Seal Act and permit NMFS to withdraw from property ownership and municipal management of St. George Island. Congress, the State of Alaska, and all concerned parties recognized that, without a boat harbor, this Federal phase out would cause an effective “termination” of the Native community. Lacking harbor infrastructure to support commercial fishing, indigenous peoples would need to resume commercial fur sealing, contrary to Federal policy. Therefore, a goal of harbor construction has long been to transform the local economy from being dependent upon the government managed seal harvest to a self-sustaining economy that could benefit from the abundant marine resources of the Bering Sea. The commitments of the Federal Government to construct a harbor at St. George were included in the Fur Seal Act Amendments of 1983, P.L. 98-129.

Figure 2 is an aerial photograph of the existing harbor at Zapadni Bay which was constructed with the intent to meet the goal of transforming the modest local economy to a marine based economy. Largely due to problems experienced with the harbor as constructed, the residents of St. George have not attained a stable and sustainable marine resource economy sufficient to support their mixed, subsistence-cash economy. The survival of the community is dependent upon a more accessible harbor as there can be no viable long-term economy on St. George without it.

Figure 2: Aerial Image of Existing Harbor

The following problem statements and opportunities were identified in the initial planning meeting with the sponsor and stakeholders conducted in Anchorage on January 13-15, 2016 and refined in the subsequent steps and iterations of the planning process:

Problem Statements

Navigation to/from and within the existing harbor at St. George is unsafe due to:

- Wave climate in the harbor entrance
- Project depths not being met/maintained in the navigation channel and inner harbor
- Seiche conditions in the inner harbor
- Degradation/overtopping of the existing breakwaters
- Inadequate navigation beacons
- Degradation of dock facilities

Barge operators have difficulty delivering fuel and supplies to the community as the harbor is currently configured.

The commercial fishing fleet is unable to effectively utilize the harbor as it is presently configured.

Opportunities

Potential opportunities to be realized by improving navigation to/from St. George include the following:

- Support community viability
- Provide more affordable access to goods, services, and marine resources. This could include improved freight and barge services and a water taxi service to St. Paul.
- Improve access to subsistence resources resulting in improved food security
- Reduce fuel costs
- Expand economic opportunities
- Replace the former sealing economy with a self-sustaining marine resource based economy
- Reduce the costs of living
- Increase response capacity to environmental hazards (i.e. oil spills, ship wrecks)
- Increase the availability of dock space
- Promote increased commercial and subsistence harvests by reducing potential vessel insurance company restrictions upon using the existing harbor
- Provide harbor of refuge in the central Bering Sea
- Provide support to the local and regional mixed, subsistence-cash economy of St. George and the Pribilof Islands, similar to that which is provided by the harbor at St. Paul, Alaska

National Objectives

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

Study Objectives

The overall goal of the project is to increase the safe accessibility of marine navigation to the community via meeting as many of the following objectives as practical:

- Improve wave and seiche conditions from what occurs in the existing entrance channel and harbor
- Provide for the safe maneuverability and protected mooring of the existing and anticipated fleet
- Increase the percentage of time that harbor facilities can be safely accessed

Study Constraints

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

- Minimize negative impacts to upland infrastructure, community, historic buildings, etc.
- Avoid or minimize negative impacts to existing airport
- Avoid or minimize negative impacts to subsistence activities

National Evaluation Criteria

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

For the NED analysis, average annual benefits are compared to average annual costs expected to be derived from each alternative evaluated. Applying an appropriate discount rate and period of analysis makes costs and benefits comparable on the equivalent time value of money. For this analysis, all costs were calculated using Fiscal Year (FY) 2018 (October 2017) price levels and then converted to Average Annual Equivalent values using the FY 2018 Federal discount rate of 2.750 percent, assuming a 50-year period of analysis.

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

Study Specific Evaluation Criteria

The project is utilizing the authority of Section 2006 of WRDA 2007, *Remote and Subsistence Harbors*, as modified by Section 2104 of the WRRDA of 2014 and further modified by Section 1105 of WRDA 2016. According to the Corps' Implementation

Guidance for Section 1105 of WRDA 2016 issued on July 6, 2017, an NED analysis and identification of the NED Plan, if any, is required in conjunction with analyzing the criteria detailed in Section 1.2 as related to the navigation improvements project. If there is no NED Plan and/or selection of a plan other than the NED Plan is based in part or whole on non-monetary units, then the selection will be supported by a Cost Effectiveness/Incremental Cost Analysis (CE/ICA) consistent with ecosystem restoration evaluation procedures.

The specific CE/ICA metric utilized for this study is increased vessel opportunity days for safe access and moorage. As detailed in this report, no NED Plan has been identified, hence CE/ICA has been utilized to identify a TSP.

3 BASELINE CONDITIONS/AFFECTED ENVIRONMENT

Physical Environment

St. George Island is the southernmost, and second largest of a group of five historically volcanic islands that compose the Pribilof Archipelago, located approximately 760 miles west of Anchorage and 220 miles north by northwest of Unalaska Island in the southern Bering Sea. St. George's position at the western margin of Alaska's continental shelf puts it in close proximity to the much deeper waters of the Bering Sea's abyssal plain. The abrupt change in seafloor elevation occurring at the continental slope facilitates natural upwelling processes; as a result, surface waters in the region are some of the most productive on the planet.

While St. George Island and its slightly larger northern neighbor, St. Paul Island, are currently inhabited, Otter, Walrus, and Sea Lion Rock Islands are not. As a group, as well as singularly, the islands are ecologically significant, and are colloquially referred to as "the Galapagos of the north" due to their rich fisheries, abundance of colonial seabirds, and Steller sea lion and northern fur seal rookeries.

St. George Island falls within the overarching boundary of the Alaska Maritime National Wildlife Refuge; portions of its surface landmass are owned and managed by the U.S. Fish and Wildlife Service for the purpose of conservation, protection, and the overall enhancement of fish, wildlife, plants, and their habitats for the continuing benefit of the American people. St. George Island is difficult to access by airplane or boat due to the wave, wind, and fog climate of the central Bering Sea.

3.1.1 Climate

According to weatherbase.com 2017, the climate at St. George Island is considered to be Continental Subarctic; St. George Island receives 29.5 inches of precipitation per year, and the average annual temperature is 36.3˚F. The warmest month is August, with

an average temperature of 48.7°F, and the coldest month is January, when the average temperature 26.8°F.

3.1.2 Geology/Topography

While some pyroclastic tuffaceous and glacial materials are surficially evident, St. George Island is primarily composed of lava flows and sills of basaltic olivine (Barth 1956). St George's land mass consists of interspersed hills and valleys of varying steepness reaching a maximum elevation of 1,200 feet above sea level, relatively few planal areas, and is nearly circumscribed by steep oceanic cliffs, areas of gradual, beach-like shoreline to upland transition are uncommon.

3.1.3 Seismicity

Although they are not located along the Aleutian subduction zone, one of the most seismically active areas in the world, the Pribilof Islands are prone to seismic activity. St. George was struck by a 6.7 magnitude quake in 1991, and then again by a swarm of small >5.0 magnitude quakes in 2015. Davies (1981), predicts an 8.0 magnitude earthquake for the region based upon physical characteristics of the underlying geology and known seismic event history.

3.1.4 Bathymetry

St George Island occurs at the western margin of Alaska's continental shelf where maximum depths do not regularly exceed 70 fathoms. However, some 75 miles to the west-southwest, water depth is greater than 3,000 fathoms. National Oceanic and Atmospheric Administration's (NOAA) Chart 16380 describes the physical characteristics of St. George Island's nearshore areas as rocky, and gradually increasing in depth from the shoreline to 25 to 45 fathoms 3 miles from the shore.

3.1.5 Ice Conditions

St. George Island is located far enough south that it remains sea ice free in all but the harshest winters. However, during the winter of 2012, sea ice was observed at St. George Island for at least 79 days (National Weather Service 2012).

3.1.6 Sediments

Sediments within the footprint of the Tentatively Selected Plan (TSP) are believed to be entirely rocky, presumably basaltic bedrock overlain by sands, gravels, cobbles, and boulders. Currently, no geotechnical information exists for the North Anchorage, location of the TSP.

3.1.7 Water Quality/Surface Water

Although naturally occurring freshwater lakes are scattered throughout the landmass of St. George Island, the community of St. George obtains freshwater through shallow well groundwater extraction. Due to its recent history of volcanic activity, there has been very little development of surface drainages (United States Geological Survey, 1976), and there are no anadromous fish-supporting streams on St. George Island. Ocean waters surrounding St. George Island are considered to be of very high quality, primarily due to their inhospitable location and great distance from any potential anthropogenic source of pollution. Similarly, nearshore currents generated by the Alaskan Stream's (offshore current) interaction with the Aleutian Arc, continental shelf, and Pribilof Canyon continuously cycle and upwell nutrients into St. George's nearshore waters, making them the foundation for the sheer biomass and biological diversity observed in such a small area (Stabeno et al. 1999).

3.1.8 Tides/Currents

Water level data is not recorded at St. George Island. The nearest tidal station is located at Village Cove on St. Paul Island, approximately 50 miles away. Due to the similarity of the sites, tidal data from Saint Paul was used for this study (Table 1).

Table 1. Published tidal data for Village Cove, St. Paul Island, Alaska. Values in feet, Mean Lower Low Water.

Published tidal data for St. Paul, Alaska (ft)

Highest Observed Water Level (12/08/06)…..	+5.26
Highest Astronomical Tide (HAT)	+4.09
Mean Higher High Water (MHHW).....	+3.30
Mean High Water (MHW).....	+3.08
Mean Tide Level (MTL).....	+2.03
Mean Tide Level (MSL).....	+1.96
Mean Low Water (MLW).....	+0.97
Mean Lower Low Water (MLLW).....	0.00 (datum)
Lowest Astronomical Tide (LAT).....	-1.50
Lowest Observed Water Level (12/06/10).....	-2.10

Source: NOAA NOS, Tidal Epoch 1983-2001, published 12/12/11.

From the above data, the mean tide level (arithmetic average of the MHW and the MLW) is +2.03 foot. The mean tide range (the difference between MHW and MLW) is 2.11 feet.

3.1.9 Air Quality

Air quality on St. George Island is also to be considered very good. Atmospheric convection is quite rigorous due to relative location and inherent topographical characteristics, while anthropogenic influence is negligible. Furthermore, the North

Anchorage is not in or near a “non-attainment”, “maintenance”, or Class I area (as defined by the Clean Air Act).

3.1.10 Noise

At the North Anchorage, there is relatively no anthropogenic generated noise. During the nesting season, the cacophony of thousands of colonial nesting seabirds and breaking waves compete with the attenuating effect of the constant wind for dominance. However, after the birds have departed for the winter, wave action and wind are the prevailing and most attenuating sources of noise in the area.

Biological Resources

3.1.11 Marine Species and Habitat

The sheer biomass and biodiversity observed at the “Galapagos of the north” is primarily a function of habitat. Submarine canyons to the west and southwest of the Pribilof Islands upwell nutrient rich waters that work in conjunction with the length of the spring and summer day in the northern latitudes to drive primary production. Phytoplankton blooms beget zooplankton blooms and serve as the basis of the Bering food web (Figure 3). Marine mammals, colonial sea birds, and fishes of all variety time seasonal migrations to correspond with this observed increase in productivity.

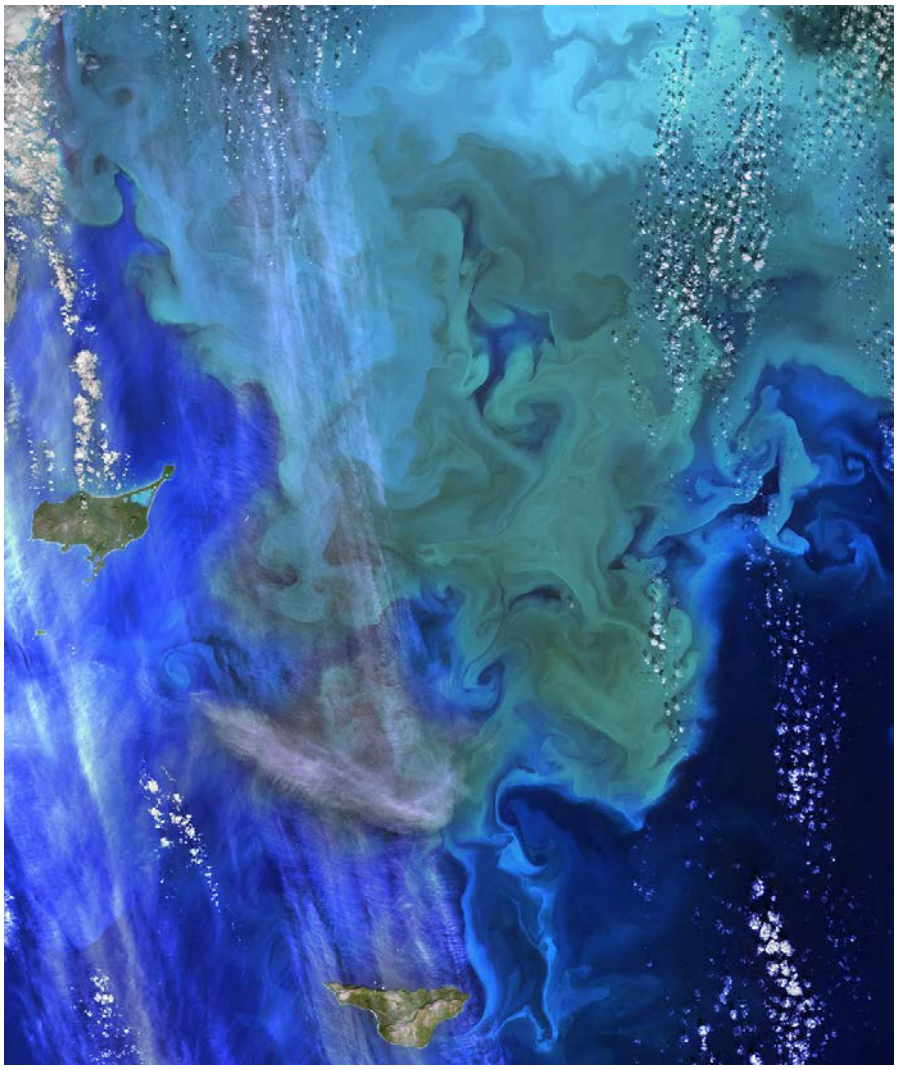

Figure 3: Phytoplankton Blooming North of St. George Island. Image Credit: NASA Landsat 8

3.2.1.1 Birds

St. George Island's volcanic cliffs are home to some of the most extensive breeding seabird colonies in the northern hemisphere. Horned puffins (*Fratercula corniculata*), tufted puffins (*Fratercula cirrhata*), common murres (*Uria aalge*), thick-billed murres (*Uria lomvia*), red-legged kittiwakes (*Rissa brevirostris*), black-legged kittiwakes (*Rissa tridactyla*), red-faced cormorants (*Phalacrocorax urile*), least auklets (*Aethia Pusilla*), and parakeet auklets (*Aethia psittacula*) make their nests en masse along the island's sheer cliff faces. Collectively, there are reportedly over 300 species of bird that have been observed on Pribilof Islands (Avibase 2017). Red and black legged kittiwakes and thick billed and common murres are commonly observed within the TSP's footprint at the North Anchorage, the cliff faces abutting the project area's southern extent serve as nesting habitat during the summer months when the birds are present.

3.2.1.2 Submerged Aquatic Vegetation

Kelp was observed in the nearshore areas of the North Anchorage during a June 2017 site visit, but was not identified to family or species. However, this occurred prior to the selection of this site as the TSP location. No other submerged aquatic vegetation was noted at the time, nor was it intentionally being sought after. At the time of writing of this preliminary draft feasibility report, no existing survey data was located that provided a more detailed baseline of submerged aquatic vegetation in the footprint of the TSP.

3.2.1.3 Marine Fish

Marine fish diversity in the nearshore waters of St. George Island is assumed to be relatively high based upon the essential fish habitat (EFH) designation for such a wide array of species. Whether or not focused nearshore fish and invertebrate community surveys have been conducted at the North Anchorage is unknown at this time. This uncertainty will be refined as the study progresses.

3.2.1.4 Marine Invertebrates & Associated Habitat

Whether or not focused nearshore fish and invertebrate surveys have been conducted at the North Anchorage is unknown at this time. Based upon preliminary conversations with NMFS Fish Habitat Division, nearshore rocky habitat at St. George Island may include preferential habitat for juvenile blue king crab. This uncertainty will be refined as the study progresses.

3.2.1.5 Marine Mammals

All marine mammals, whether listed under the Endangered Species Act or not, receive special conservation status and Federal protection under the Marine Mammal Protection Act. From the perspective of marine mammal diversity and occurrence, St. George Island's offshore waters are a relative microcosm of the overall Bering Sea's great abundance and diversity. Harbor seals (*Phoca vitulina*), ribbon seals (*Histriophoca fasciata*), spotted seals (*Phoca largha*), beluga whales (*Delphinapterus leucas*), Dall's porpoise (*Phocoenoides dalli*), gray whales (*Eschrichtius robustus*), killer whales (*Orcinus orca*), minke whales (*Balaenoptera acutorostrata*), Pacific white sided dolphins (*Lagenorhynchus obliquidens*), and Stejneger's beaked whales (*Mesoplodon stejnegeri*) are known to occur in all offshore waters of the Pribilof Islands.

During summer months, northern fur seals (*Callorhinus ursinus*) are observed in great numbers within the nearshore waters of St. George Island. They frolic in the surf zone as they depart and return from offshore foraging trips. Rookeries occur at beach areas where cliff faces do not preclude access to the gently sloping, grass covered upland

areas. A northern fur seal rookery occurs approximately 5,000 feet to the west of the North Anchorage.

3.2.1.6 Terrestrial Mammals

Arctic fox (*Vulpes lagopus* sp.) is both prevalent and conspicuous on St. George Island. Other than humans, foxes are the local birds' only land predator. They have acquainted themselves with the steep terrain of the coastal cliffs and are expert at leaping from craggy rock ledge to craggy rock ledge, often with an unbroken egg in their mouth. Domestic reindeer (*Rangifer tarandus tarandus*) were introduced in 1911 as a supplemental source of milk, meat, hides, and as potential pack animals, they were reintroduced to St George Island in 1980 and are managed through hunting. Lemmings (*Lemmus* spp.), too, are endemic to St. George Island.

3.1.12 Threatened & Endangered Species

Federally-threatened or endangered pinnipeds that are known to occur within and adjacent to the waters of the North Anchorage include the threatened bearded seal (*Erignathus barbatus*) and endangered Steller sea lion (*Eumetopias jubatus*) Western Distinct Population Segment (DPS), the latter of whose designated critical habitat includes all of the marine waters surrounding St. George Island.

Federally-endangered cetaceans commonly occur in St. George's offshore waters and include fin whale (*Balenoptera physalus*), humpback whale (*Megaptera novaeangliae*) Mexico DPS, north Pacific right whale (*Eubalaena japonica*), sperm whale (*Physeter macrocephalus*), and western north Pacific gray whale (*Eschrichtius robustus*).

Federally-endangered Steller sea lion western DPS once came ashore at St. George Island to breed and whelp in the thousands. They were systematically extirpated from breeding grounds by local hunters who valued their skins and meat, and also later by Federal policies aimed at reducing competition to the fur seals. Although no pups have been recorded on St. George since 1916 (NMFS 2008), locations of the historic rookeries are known.

3.1.13 Special Aquatic Sites

40 CFR 230.3 (q-1) defines Special Aquatic Sites as geographic areas, large or small, possessing special ecological characteristics of productivity, habitat, wildlife protection, or other important and easily disrupted ecological values. 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. Although not specifically designated as such, the nearshore waters of St. George Island are ecologically significant because of the seasonal biodiversity that they support.

3.1.14 Essential Fish Habitat

St. George Island does not exhibit any anadromous waters or streams that would traditionally be associated with salmonids and their allies, as would be defined under AS 16.05.871(a). However, the marine waters surrounding St. George Island, from the shoreline outward, are designated as EFH for blue king crab, tanner crab, rex sole, walleye pollock, snow crab, Alaska plaice, Greenland turbot, arrowtooth flounder, rock sole, flathead sole, sculpin, Pacific cod, Skate, chum salmon, pink salmon, coho salmon, sockeye salmon, and king salmon.

EFH is defined by the Magnuson-Stevens Fishery Conservation and Management Act as those waters and substrates necessary to fish for spawning, breeding, feeding or growth to maturity. Section 305(b)(2) of the Magnuson-Stevens Act requires Federal action agencies to consult with NOAA's NMFS on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH.

Socio-Economic Conditions

3.1.15 Population & Demographics

The 2017 population of St. George was 72. Census data shows a varying population over time; however, decadal assessments since 1970 show a declining population after the halting of fur seal harvest. There was also an isolated instance of population increase in 2000, correlated to when SnoPac Seafoods had a floating crab processor moored inside St. George Harbor. More detailed population information is contained in Appendix C, *Economics*.

3.1.16 Employment & Income

The City of St. George is an employer for residents; however, the local tax base is not sufficient to sustain employee pay or the City's expenses. The Tanaq Corporation (an Alaska Native Claims Settlement Act village corporation), and St. George Tribal Council (Tribe) are other employers in the community. There were 14 halibut permit holders in 2016, but only 6 permit holders fished. That accounted for a little more than 50,000 lbs. of halibut caught. An estimated eleven residents live below the poverty line. This number has held steady while the overall population has declined; therefore, the percentage of residents below the poverty line has increased (from 7.9% in 2000 to 17.2% in 2010, and the Alaska Department of Commerce, Community, and Economic Development estimated 24.2% in 2014). More detailed employment & income information is contained in Appendix C, *Economics*.

3.1.17 Existing Infrastructure & Facilities

The city-constructed St. George Harbor (Figure 4) is St. George's current boat harbor. It is a 3-acre boat basin enclosed by two rubble mound breakwaters. A third inner breakwater protects the inner harbor. The entrance channel is 280 feet wide at the water line. In its existing condition, the depth of the entrance channel varies from -26 to -18 feet MLLW with shallow areas consisting of rock pinnacles.

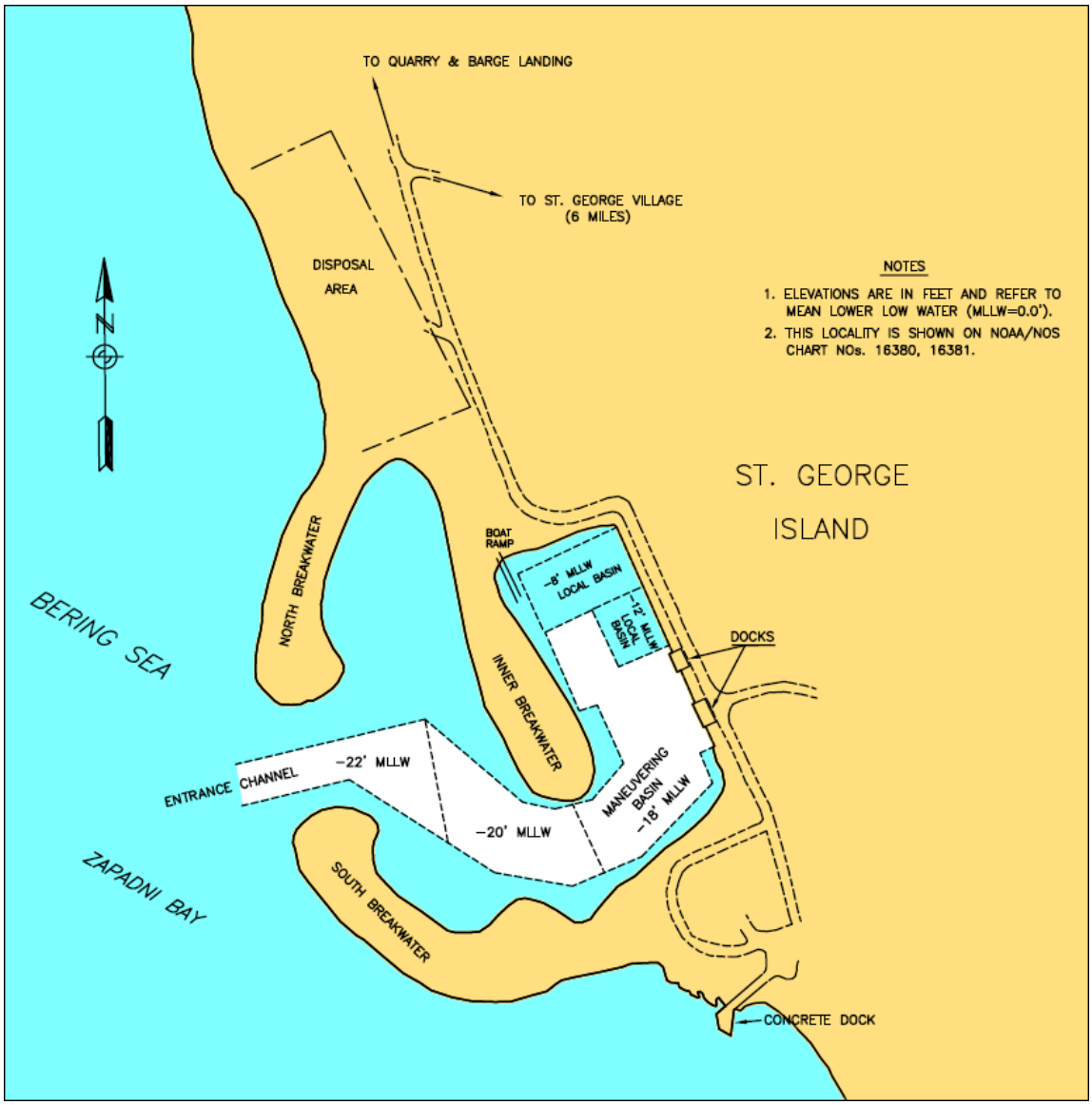

Figure 4: St. George Harbor Federally-maintained Portion in White (suspended), Locally-maintained Portion in Blue

Design of the harbor utilizing conventional breakwaters was initiated by Alaska Department of Transportation & Public Facilities (AKDOT&PF) at the Danish Hydraulic Institute in the early 1980s. Physical model testing of harbor designs consisting of

conventional breakwaters were completed at the Danish Hydraulic Institute and Oregon State University's coastal engineering lab. Due to lack of sufficient state funding for construction, the project was put on hold. The City felt that the harbor could be constructed for less by utilizing a recently developed breakwater technology known as berm breakwater design. Final design of the harbor incorporating the berm breakwater design was completed by the City pursuant to a Transfer of Responsibility Agreement from the State of Alaska. The City awarded a construction contract in September 1984. The contractor was unable to complete the terms of the contract by 1986. The City completed the project by mining local armor rock in 1986 and 1987 and constructing the north, south, and inner breakwaters and utilizing the excavated quarry as the harbor basin. The harbor ultimately constructed by the City differed markedly from the original design physically modeled in that it utilized a berm breakwater design placed further inland in shallower water (Figure 5).

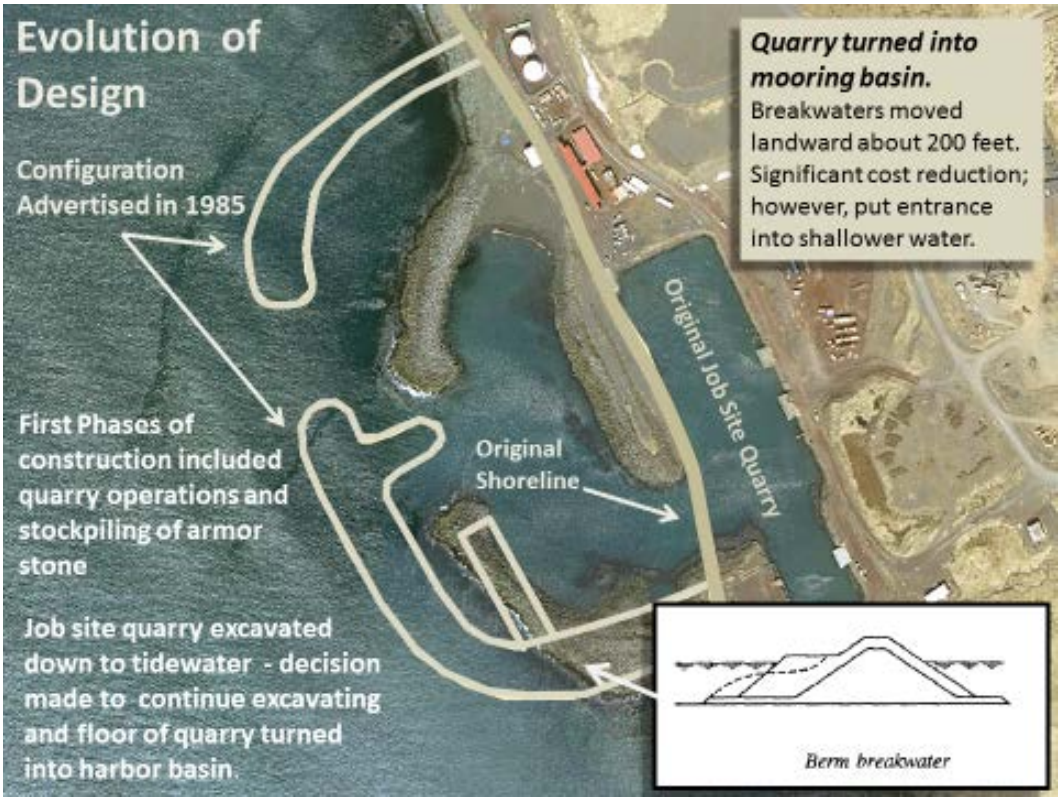

Figure 5: Comparison of Constructed Harbor to Original Design (courtesy DOT&PF)

In 1988, the City entered into a Section 107 Agreement for the Corps to deepen the St. George Harbor and entrance channel to design depth. Dredging of the Federal project, consisting of a 3-acre boat basin and 2 feet of advance maintenance dredging was initiated in April 1989. Dredging efforts were completed the following summer. Federal project channel depths, ranging from -22 feet MLLW to -18 feet MLLW, were achieved in most areas; however, due to difficulties encountered, the contractor failed to achieve

contract depth in some areas, leaving several rock pinnacles within the entrance channel. Further attempts to attain project depth throughout the project in 1995 were unsuccessful. Since the City was unable to enter into a cost-sharing agreement to complete the dredging project, Federal maintenance obligations were suspended in 1996. The Federal portion of the project is indicated in white in Figure 4.

In 2004, the south breakwater was damaged, and displaced rock was deposited in the entrance channel limiting the use of the harbor. The Federal Emergency Management Agency provided $8 million for repairs, which included placing 15,000 CY of armor rock in 2006 and removing 12,000 CY of material from the entrance channel in 2008.

From 2011 to 2015, the City-AKDOT&PF Feasibility Study was completed at a cost of $2 million. The study included hydrographic and topographic surveys, geotechnical studies, wave modeling, and sedimentation analysis. In cooperation with the users, over 15 alternatives plans were developed, evaluated, and compared. All alternatives considered were constrained to an estimated maximum construction cost of $30 million due to financial limitations. This constraint limited the identification of an alternative addressing all the problems experienced in the harbor, and some issues, such as inner harbor seiche and fuel barge navigation, were not addressed with these concepts. The City selected a preferred plan based on the numerous meetings, technical studies, and evaluation of a wide array of viable alternatives. The Corps has utilized work completed as part of these efforts to the greatest extent possible.

Shortly after initiation of this study in December 2015, the south breakwater of the existing harbor suffered damage again from storm generated waves (Figures 6 and 7). The damage is evident in the following before-and-after photos. As a result of this damage, the City obtained state and Federal disaster funding to repair the south breakwater. The Federal Emergency Management Agency program under which repair funds were obtained only allows repairs to restore existing structures to their pre-damaged state. Repairs included adding 6- to 10-ton stone to the breakwater trunk in 2016 to return the breakwater crest to its design elevation and adding a 50-foot rock berm in 2017 to the seaward face of the south breakwater. The problem of navigation to and within the harbor or problems with harbor resonance discussed in this report will not be improved by these repair efforts since disaster funding is only available to restore the breakwater to its pre-storm condition as opposed to improving the ability of boats, barges, and other water craft to safely navigate into the harbor.

Figure 6: View of South Breakwater Prior to December 2015 Storms

Figure 7: View of Same Portion of South Breakwater from a Different Angle. Material missing from the breakwater is evident.

3.1.18 Subsistence Activities

A subsistence lifestyle continues to be crucial to the residents of St. George Island, for maintaining food security and an essential part in culture and traditions. Important food sources harvested include fur seal, stellar sea lion, bird eggs, berries, halibut, and other fish species; other important food resources include seagrass for vitamin C and mollusks for iron and other minerals. Recent subsistence reports from 2009-2011 report approximately one seal is harvest per resident per year, and that the harvesting of stellar sea lions is only a few a year total. A reindeer population has been managed by the Tribe since the 1980s and is an important meat source. Halibut is desired for both subsistence and commercial purposes. By-products from the subsistence such as furs, pelts, skins, and bones are used in the manufacture of artwork and other crafted objects. The subsistence resources are considered fundamental to the community and heritage.

Cultural Resources

St. George Island is part of the Pribilof Island group located in the Bering Sea, approximately 250 miles north of the Islands of Four Mountains in the Aleutian archipelago and 300 miles west of the mainland of Alaska. Russian fur-hunting crews had actively sought these islands since at least 1768, as they knew that the northern fur seals (*Callorhinus ursinus*) they had observed and hunted in the passes of the eastern Aleutians must have breeding grounds somewhere to the north. On June 25, 1786, St. George Island was discovered by the crew of *Sv. Georgii Pobedonosets* (*St. George the Victorious*), commanded by Gavriil Loginovich Pribylov of the Lebedev-Lastochkin Company. Upon finding no safe harbor, Pribylov left a party of 40 men to winter there and returned to Unalaska Island for supplies. While the crew was on St. George, they spotted another island to the northwest. Once Pribylov returned the following summer, they sailed to this new island and named it St. Peter and St. Paul Island, for the Saints' day on which they landed. This island's name has since been shortened to St. Paul Island (Eldridge 2016).

Although the Pribilof Islands were uninhabited when the *St. George the Victorious* arrived, Unangan oral history holds that they had known of these island for some time before their documentation by the Russians (Black 2004; Elliott 1882; Jochelson 2003; Osgood et al. 1915; Torrey 1980; Veniaminov 1984). In 1787, rival Russian fur-hunting companies quickly established seasonal sealing camps around the coasts of both St. George and St. Paul Islands to harvest the valuable northern fur seal pelts. Unangan from Unalaska, Umnak, and Atka Islands were brought to the islands to provide labor for the Russians (Eldridge 2016). They constructed traditional semi-subterranean barabaras on the southern shore and a permanent village on the north of St. George Island (Etnier 2004). After the Treaty of Cession in 1867, a transitional period followed during which the Alaska Commercial Company destroyed most of the Russian

structures built on the island and replaced them with new wood-frame buildings (Faulkner *et al*. 1987).

After the Alaska Commercial Company razed the Russian village, they built a number of new buildings on the north side of the island. This included the Great Martyr Orthodox Church, completed in 1936 (HABS No. AK-50), as well as the old administrative core building with staff housing overlooking the old Russian-era dock. Six rows of houses spread out southeast of the church, including a community center. Down near the old dock is the commercial district comprised of fourteen buildings. Some of the commercial buildings were destroyed in a fire along the waterfront in 1950 (Faulkner 1986; Faulkner *et al*. 1987).

The Fur Seal Rookeries National Historic Landmark (NHL; XPI-002) is made up of three non-contiguous units located on both St. Paul and St. George Islands: St. George Village, St. Paul Village, and Northeast Point on St. Paul Island. These units were found to be eligible for the National Register of Historic Places in 1962 and nominated for formal listing on the NRHP in 1986 (Faulkner 1986). On St. George Island the NHL encompasses the village of St. George. Across both islands, the NHL includes 106 buildings, two structures, 12 rookeries, and nine archaeological sites [Alaska Heritage Resources Survey (AHRS 2018)]. Both Russian and American buildings and structures within the NHL continued to be associated with northern fur seal processing into the late 19th and early 20th centuries (Torrey 1980). Many of these buildings and structures are formally considered to be contributing features of the NHL, however, other buildings and structures within the NHL boundaries have not yet been formally evaluated (AHRS 2018; Figure 8). All contributing features to the NHL have specific historical significance for the time period 1786–1959, with unique themes related to industry, conservation, and ethnic heritage (Faulkner 1986; Faulkner *et al.* 1987).

Figure 8. Overview of the NHL (pink polygon below) at St. George Village and Approximate Locations of Sites within the NHL (pink dots above) (AHRS 2018)

A search of the NOAA'S Wrecks and Obstructions Database shows no known shipwrecks in the vicinity of St. George Island (NOAA 2018). The Bureau of Ocean Energy Management's (BOEM) Shipwreck Database lists a single shipwreck, a steamer known as the *Laurada*, which sunk off Zapadni Point in 1899 (BOEM 2011). However,

the BOEM database appears to be incorrect; Zapadni Point is on St. Paul Island, not St. George Island. It is likely that the *Laurada* is located off of St. George Island.

A single known archaeological site is located on the southern shore of St. George Island in the vicinity of the current harbor at Zapadni Bay (Figure 9). The Zapadni Bay site (XPI-012) consists of at least three barabara house depressions and two large rectangular depressions. Since the site's identification, the area has been heavily disturbed; the site was reportedly destroyed during harbor construction in 1985 (AHRS 2018).

Figure 9. Approximate Location of XPI-012 (pink dot) Near the Current Harbor (AHRS 2018)

Existing Navigation Conditions

Under current conditions, adverse wave and seiche conditions limit vessel access to the existing harbor as well as safe moorage within the harbor. Figure 10 portrays the current harbor configuration through FUNWAVE numerical modeling, demonstrating conditions at the entrance, within the harbor channel, and within the inner basin. Offshore wave climate conditions from the ongoing Wave Information Study of Alaska, published by the Engineering Research and Development Center's Coastal Hydraulics Laboratory indicate that offshore waves producing unmoorable conditions at the fuel dock in the harbor occur or are exceeded 9.2% of the time over the crabbing season, or 17 days out of 182 days. Waves producing unsafe entrance channel condition are slightly more common at 13% annually, or 49 days. Access for barges is most restricted, with unsafe conditions occurring 52% annually, or 190 days. According to community members, such conditions limit harbor use to roughly 1.5 months of a year.

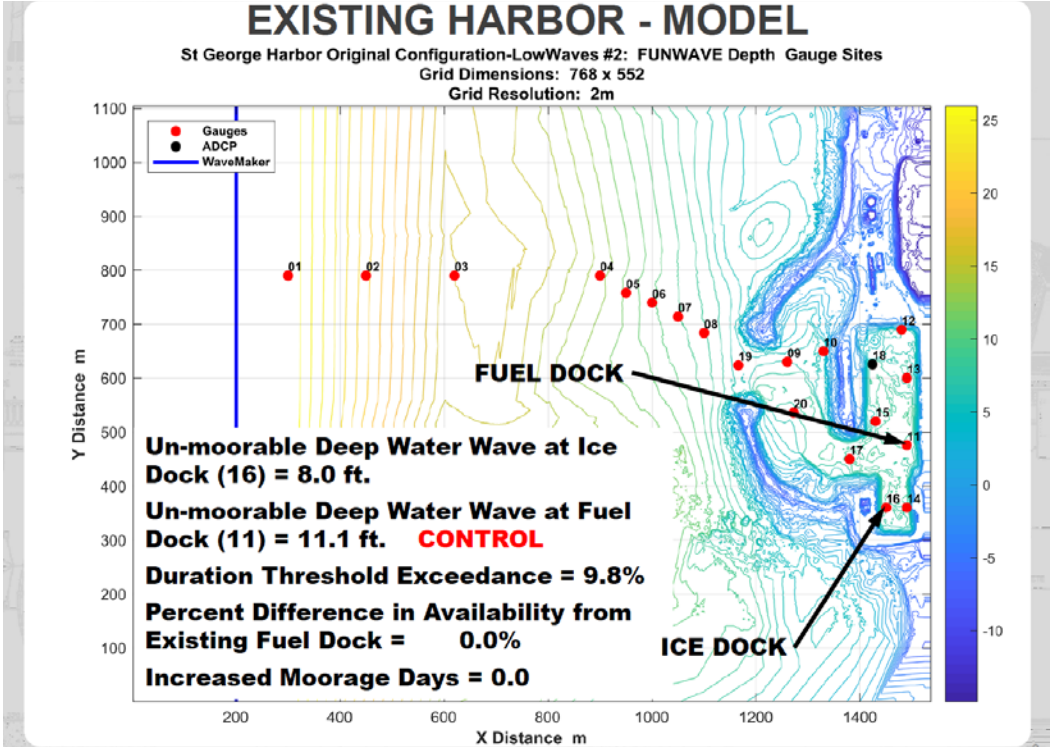

Figure 10: Existing Harbor Schematic and Modeling Results

Under certain conditions, vessels within the harbor may not be able to safely moor or offload cargo due to the seiche affect inside the harbor basin. Vessels maneuvering through the harbor are further challenged due to shallow pinnacles. Further constraints include weather, such as times of high wind or heavy seas where southwesterly storms close both St. George Harbor and St. Paul Harbor to the north. Vessels are forced to seek refuge anchored off the north side of St. George Island as depicted in Figures 11

and 12 from a February 13, 2018, storm where the St. George Harbor was being battered and vessels sought refuge off the north side of the island.

Figure 11: St. George Harbor South Breakwater, February 13, 2018, Southwesterly Storm

Figure 12: Three Crab Vessels Anchored at St. George North Anchorage, February 13, 2018

Crabbing vessels no longer call on St. George due to the dangerous conditions within the harbor. Instead, all of the St. George CDQ catch of crab is delivered to and processed at St. Paul. St. George loses out on revenue with the catch being delivered to and processed at St. Paul.

Fuel barges deliver to St. George at a higher cost ($7/gal) due to anticipated delays and increased operating costs associated with delivering to the community. According to Delta Western Fuels, delays could be up to 20 days waiting for conditions safe enough to deliver to St. George Harbor. Cargo vessels which include those vessels delivering construction materials to the islands often wait on the north side of the island until conditions in Zapadni Bay are safe to deliver cargo. On one occasion in June 2017, a Bryce barge delivering rock to repair the South Breakwater of the St. George Harbor was forced to sit off the north shore of the island for two weeks.

The St. George subsistence fleet consisting mainly of small craft drafting approximately 4 feet, are limited in ability to launch from the existing boat ramp in the St. George Harbor. They are limited due to the location of the harbor on the opposite side of the island and additionally by the dangerous conditions often occurring within the harbor. Often the subsistence fleet opts to launch from an unimproved concrete boat launch by the village increasing risks of vessel damage.

4 FUTURE WITHOUT PROJECT CONDITIONS

The expected without-project conditions form the basis of evaluation against which with-project conditions are compared.

Sea Level Change

USACE requires that planning studies and engineering designs consider alternatives that are formulated and evaluated for the entire range of possible future rates of sea level change. For details of this analysis, please consult the Hydraulic Design Appendix.

Economic Conditions

4.1.1 Marine Resource Assessment

In the Pribilofs, there is a subsistence fishery, a commercial crab and fish industry, and potentially a small sport/tourism fishery. Fisheries are managed such that subsistence needs are prioritized followed by commercial participation and sport.

4.1.1.1 Subsistence

Fishing activities can be year-round under subsistence rights. For St. George, halibut, cod, sablefish, salmon, snails and urchins are essential to community livelihood. These species, together with fur seal, provide about 40% of the dietary needs for the community. Other subsistence foods are also traded with other Aleutian communities. Local knowledge adds value to the subsistence harvest in many ways, such as understanding species diversification. The harvest, stock, and community demand of all of these species vary from year-to-year and from family-to-family. The supply of subsistence seafood resources generally exceeds demand; however, accessing marine resources is still costly, both in monetary terms and in terms of required effort. Since periods of safe access and moorage conditions in St. George Harbor is limited, there is additional demand for fishing activity that's not being met. Subsistence vessels need a wave 4 feet or less in the entrance channel and 1.6 feet at the boat launch to haul out.

4.1.1.2 Commercial

In the Bering Sea the annual harvest quota for groundfish (consisting of pollock, Pacific cod, flatfish Atka mackerel, Pacific Ocean Perch, and other species) is two million metric tons. St. George is located right in the middle of these fisheries. In addition to groundfish, there are also shellfish or crab fisheries that harvest tens of millions of pounds of king, snow, and bairdi crab every year.

Most fisheries in the Bering Sea are rationalized, which means one of several management systems is in place to manage over-capitalization and eliminate the race to fish. These generally consist of an Individual Fishing Quota (IFQ) issued to an individual or a corporation, usually coupled with an Individual Processing Quota (IPQ) issued to a processing company, or harvest and/or catch rights issued to a cooperative. Transfers of both IFQ and IPQ are allowed, meaning they can be sold from one harvester or processor to another, or leased. Either system results in the same outcome: the harvester, whether an individual or a corporation, and the processor each have a defined about of the species' quota they can harvest and/or process each year. When the programs were designed and implemented, each participant in a fishery about to be rationalized was given credit for their historical catching or processing history, which is then converted into a percentage of all future quota available for harvesting and processing. These are generically referred to as catch share systems. The three catch share systems most germane to St. George are the crab IFQ/IPQ program, the Pacific cod Freezer Longline Cooperative, and the halibut IFQ program.

In the crab IFQ/IPQ program, 100 percent of the quota available for harvest is issued to crab harvesters to catch, and 90 percent of the quota is issued to crab processors to purchase from the crab harvesters and process and market. The 10 percent difference

allows the crab harvesters to sell that crab to any processing company they wish, thus encouraging competition. The prices paid to crab harvesters are determined ultimately by a formula agreed to by both the harvesters and the processors, with disputes settled by binding arbitration.

The crab fleet consists of large vessels general longer than 100 feet. The crab fisheries in the Bering Sea begin in October with red king crab, followed immediately by St. Matthew's blue king crab (when there is a season), and then by snow crab and bairdi generally beginning in January. The length of each season is primarily dependent upon the size of the quota, although weather and ice have resulted in lengthy delays in the past.

The Freezer Longline Cooperative is a different catch share system that the IFQ/IPQ program. Freezer longline vessels are large vessels (generally 100 to 160 feet long) that fish with longlines baited with hooks on the bottom. Some vessels are capable of fishing 60,000 or more hooks per day. The vessels are also equipped with factories on board, so they are also referred to as "catcher-processing vessels." They produce the finest quality of cod in the world. The amount of Pacific cod allocated to the Freezer Longline Coalition in 2018 is 89,000 metric tons.

About 28 vessels belong to the Freezer Longline Coalition, which manages the cooperative. Each company is allocated a percentage of the annual quota and a percentage of the prohibited species (halibut – which must be immediately returned to see when taken as bycatch) allocated to the cooperative. The percentage is based upon each company's historical harvest during a defined number of years prior to the cooperative's creation. As with crab, cooperative percentages may be traded among companies.

The last of the catch share programs of importance to St. George is the halibut IFQ program. This program was the first IFQ program implemented in Alaska, going into effect in 1995. This is a simply IFQ plan where individual harvesters received an initial IFQ based upon their historical landings or subsequently bought in to the program. There is no associated IPQ allocation; IFQ holders can deliver where they wish.

There are approximately 12,000 pounds of IFQ owned by residents of St. George. There is significantly more owned by residents of St. Paul, possibly in excess of 200,000 pounds. The APICDA also owns halibut IFQ in the area around the Pribilof Islands – around 30,000 pounds. For many years, the halibut harvested by St. George fishermen is transported to St. Paul for processing at the Trident Seafoods processing plant.

4.1.1.3 Sport

St. George does not have any known charter or lodge businesses, however, the opportunity to sell Bering Sea experiences to tourists is possible and would be better served with a fully functioning harbor. While there is an abundant opportunity for sport fishing and crabbing, the expense of travel and the difficulty of access limits participation.

Community Development Quota Program

The CDQ program was designed to provide a means for economically distressed communities in the Bering Sea/Aleutian Islands to generate capital that would, in turn, allow them to invest in Alaska's seafood industry to generate jobs and financial resources to build local economies. There are 67 communities (some 27,000 residents) that participate in the program; those communities formed six CDQ groups, more or less along geographical lines (St. Paul is the only single-community CDQ group).

The APICDA receives a CDQ allocation of roughly 31,000 metric tons of groundfish and 315,000 pounds of crab to help support the communities of Akutan, Atka, False Pass, Nelson Lagoon, Nikolski, and St. George. These allocations generate over $12 million a year in royalties to the APICDA. By quantity, the largest allocation is of pollock (19,400 metric tons). The APICDA's pollock allocation is harvested 100% by trawl catcher processors.

The second most important species to APICDA is Pacific cod, for which they receive an allocation of slightly more than 3,000 metric tons. APICDA's Pacific cod allocation has nearly always been harvested by longline catcher processors. APICDA does retain the right to harvest Pacific cod using vessels other than longline catcher processors in order to meet community needs.

Planned Development

With construction of a safe and functioning harbor at St. George, the APICDA has expressed their intended support for the following additional development.

1. Construction of a lodge concurrent with harbor construction ($4 million APICDA investment – estimated 10 new jobs)
2. Expansion of seafood processing to process cod, halibut, and sea urchins concurrent with harbor construction (additional $10 million APICDA investment to the $4 million already invested – estimated 100 new jobs)
3. Private/public sector seasonal ferry between St. George and St. Paul ($1 million APICDA investment – estimated 4 new jobs)
4. New small businesses to serve fishing and tourism develop (estimated 20 new jobs)

Navigation Conditions

The future without-project conditions mirror those under the Existing Conditions. Dangerous wave and seiche conditions at St. George Harbor will continue without harbor improvements. Harbor inaccessibility and days when the safe moorage threshold are exceeded will remain the same as the existing condition for all vessel classes. Freight and fuel delivery costs are expected to continue to be expensive due to the limitations upon barge operations imposed by the dangerous conditions. Cargo intended for St. George will continue to be delivered to St. Paul Island and require additional arrangements and expenses to be transported to St. George. Wave overtopping and damage to the main breakwater will continue to limit the usability of the harbor. Damage to the breakwaters similar to what occurred in 2004 and December 2015 can be expected to periodically occur throughout the remaining lifetime of the existing harbor. Damages to vessels entering St. George Harbor will continue at current rates. A CDQ crab quota allocated to the APICDA and intended to support St. George of $383,804 annually,[3] will continue to be transferred to St. Paul for processing. There will continue to be unmet demand for tourism and water taxi service.

All these conditions will continue to limit the community's ability to develop a stable and sustainable local marine resource economy sufficient to support their mixed, subsistence-cash economy.

Biological Environment

While there is no possible way of knowing what the future condition of the ecological baseline at the North Anchorage will be, the reasonable continuation of its observed, existing processes, to be confirmed with described field work, will help guide these assumptions.

Despite the tendency to emphasize worst-case scenarios while future-casting a project of this nature, it is also entirely plausible that the future without project conditions could remain stable, and that there would be little to no observable shift in the ecological baseline over the course of the theoretical timeline. However, nearshore ecological surveys in the TSP site are not comprehensive, and generally focus upon either bird or marine mammal productivity. Coastal and subtidal habitats at the North Anchorage are dynamic, and as such, are continually in a state of change.

[3] Variability over the last 10 years is known, but the proportion St. George gets from APICDA will be verified between ATR and ADM.

Summary of the Without Project Condition

Without a more accessible harbor to provide development of a stable and sustainable local marine resource economy sufficient to support their mixed, subsistence-cash economy, St. George residents will increasingly choose to relocate to other communities. This has already resulted in closure of the school following the 2016/2017 school year when enrollment fell below minimum thresholds for State funding. The City unconditionally believes that improved harbor conditions are essential to ensure the economic and cultural survival of the community of St. George.

5 FORMULATION & EVALUATION OF ALTERNATIVE PLANS

Plan Formulation Rationale

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

Plan Formulation Criteria

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

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

In addition to these criteria used for all potential USACE water resource development projects, a study-specific CE/ICA metric of increased vessel opportunity days for safe access and moorage has been identified.

Individual Project Components Considered

5.1.1 Site Selection

Zapadni Bay; North Anchorage; Garden Cove (Figure 1) on St. George Island were considered for development of navigation improvements.

Zapadni Bay. The city-constructed St. George Harbor is St. George's current boat harbor. It is a 3-acre boat basin enclosed by two rubble mound breakwaters. An inner breakwater arm protects the inner harbor. The entrance channel is 280 feet wide at the water line. In its existing condition, the depth of the entrance channel varies from –26 to –18 feet MLLW with shallow areas consisting of rock pinnacles.

North Anchorage. A harbor site located near the existing village on the north shore of St. George Island within a bay locally referred to as Village Cove would require the development of suitable access and any required support facilities, as none currently exist there. Additionally, access to this site may occasionally be limited due to sea ice.

The cost of constructing facilities to support processing of the CDQ (fish plant, water supply, roads, wastewater treatment plant, etc.) were initially estimated to be in the magnitude of $50 million in addition to the cost of constructing the actual harbor. This site appeared to be infeasible due to these additional local costs and was initially eliminated from further consideration. Additional analysis of the support facilities required to realize project benefits is ongoing.

However, numerical modeling runs performed after the Alternatives Milestone indicated that there are minimal opportunities to improve conditions at the St. George Harbor. The numerical model used for the study is still being refined and researched by the district at this time and all results are subject to change as the study progresses. Physical modelling, which would provide more definite results, was delayed until the PED phase of the project to meet the timeline of the study. Preliminary estimates indicate that harbors costing approximately $100 million to $400 million would provide no additional safe access days, based upon hindcast conditions within the entrance channel, and limited additional safe moorage days based upon modeled conditions within the harbor. While safe moorage provides some opportunities for additional harbor activity, it alone does not meet project goals of increased access.

Based upon these results, the North Anchorage site was reconsidered and ultimately carried forward for consideration in new harbor development. This decision received concurrence from the USACE Vertical Team during an In-Progress Review conducted on January 23, 2018. Additionally, the St. George City Council agreed to the expansion of the study scope to include potential facilities at the North Anchorage site on

December 5, 2017. A letter from the sponsor expressing support of this decision is included as Appendix G.

Figure 13 illustrates the location of the North Anchorage site as well as the existing St. George Harbor.

***Garden Cove*.** This location, located on the southeastern shore of the island (Figure 1), lacks road access, is composed of sea cliffs with little to no accessible uplands, is adjacent to a maritime refuge, and is not well protected from waves. This does not appear to be a suitable location for development of a harbor and is eliminated from further consideration.

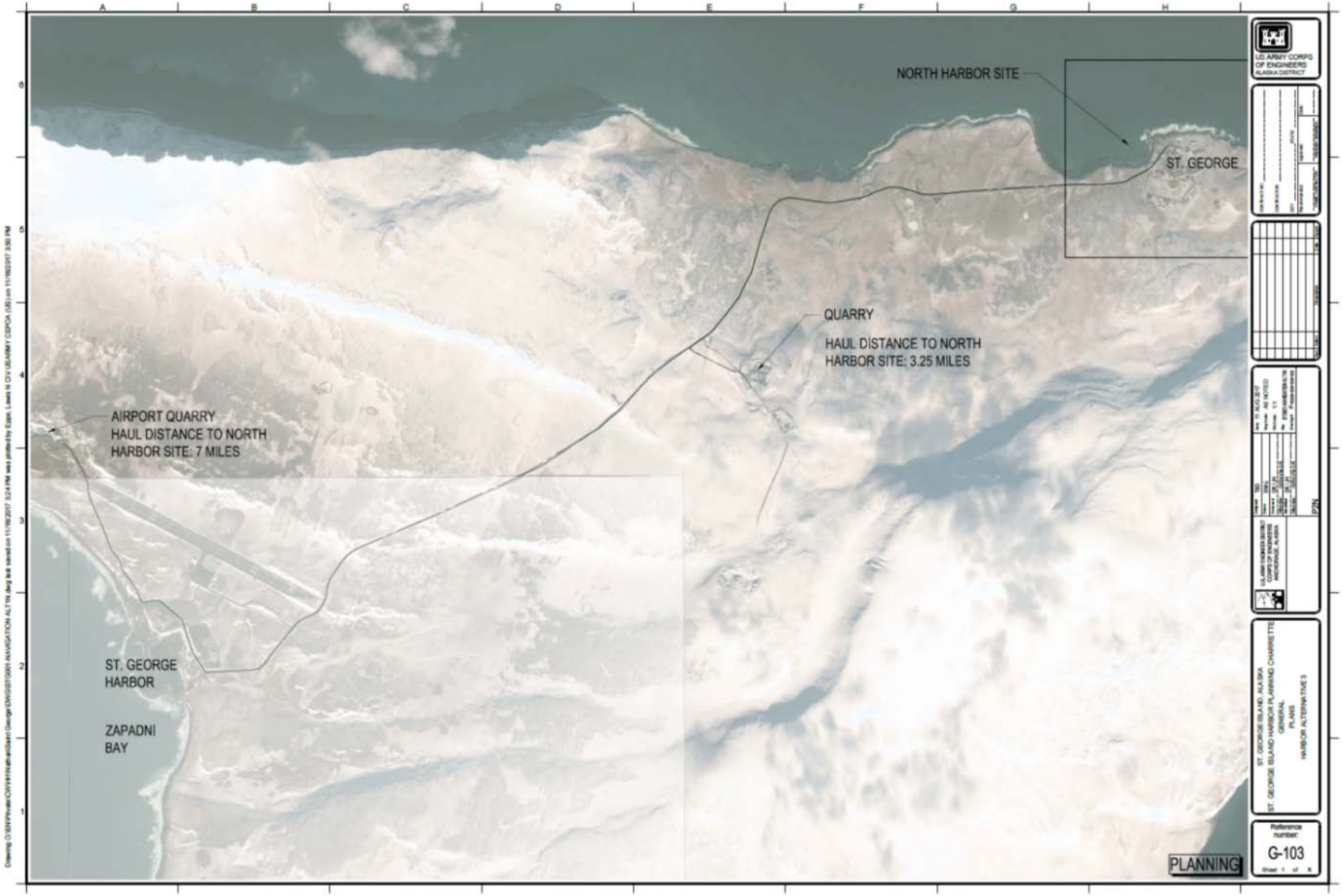

Figure 13: North Anchorage and Existing St. George Harbor Location

5.1.2 Management Measures

The following management measures (Table 2) were developed during the planning meeting conducted in Anchorage January 13–15, 2016. Each identified management measure was screened on the basis of the plan formulation criteria described previously. The screening exercise resulted in the following measures (Table 3) being carried forward for further consideration as portions of alternative plans.

Table 2. Management Measures

Dredging	Breakwaters	Docks
Marine navigational aids	Moorage basin	Jetties
Spending beach; energy dissipation features	Modify geometry of inner basin	Uplands facilities, staging, etc.
Offshore reef	Maneuvering area	Barge landing
Boat launch	Approach/entrance channel	Relocations
Subsidies to reduce cost of living	Improved emergency response for humans and the environment	Intermodal connectivity (road) between harbor & airport
Vessel haul-out facility	Vessel dry dock	Air freight operational change
Air navigation aids	Improved utilities	Sediment control structure
Fuel storage	Harbor lighting	Dredged material disposal site
Offshore anchorage area	Improved tele-medicine	Inter-island access
Rodent control	Real-time monitoring features/local knowledge	

Table 3. Screened Measures

Dredging (and dredged material disposal site)	Offshore reef
Breakwaters	Moorage basin
Jetties	Barge landing
Approach/entrance channel	Boat launch
Docks	Offshore anchorage area
Energy dissipation feature	Sediment control structure
Modify geometry of inner basin	Upland facilities
Marine navigation aids	Vessel haul-out facility
Maneuvering area	Real-time monitoring features

Preliminary Alternative Plans

5.1.3 No Action

Without navigation improvements at St. George, adverse wave and seiche conditions will continue within the existing harbor. Freight delivery costs will continue to be expensive and a majority of cargo intended for St. George will continue to be delivered

to St. Paul Island and require additional arrangements and expenses to be transported to St. George or be flown in via air freight service. Periodic damage to the breakwaters will continue. The existing conditions will limit the ability to safely operate an onshore fish processing facility at the harbor or a floating facility within the harbor. Without safe access to such facilities, fishing boats, fish processors, and other vessels will continue to avoid utilizing the harbor facilities at St. George.

According to community members, such conditions limit harbor use to roughly 1.5 months of a year. Offshore wave climate conditions from the ongoing Wave Information Study of Alaska published by the Engineering Research and Development Center's Coastal Hydraulics Laboratory indicate that offshore waves producing unmoorable conditions in the harbor occur or are exceeded 9.2% of the time over the crabbing season, or 17 days out of 182 days. Waves producing unsafe entrance channel condition are slightly more common at 13% annually, or 49 days. Access for barges is most restricted, with unsafe conditions occurring 52% annually, or 190 days.

Without a safe harbor to support a viable marine resource economy to support the local mixed, subsistence-cash economy, St. George residents will increasingly choose to relocate to other communities, threatening the very existence of the community. Improved harbor conditions are essential to ensure the economic and cultural survival of the community of St. George.

5.1.4 Zapadni Bay Alternatives

Means to redesign the existing harbor in ways to meet the objectives of the project were investigated as part of this study. Offshore wave climate representing harbor access conditions were extracted from the ongoing Wave Information Study of Alaska. The existing harbor response to incident waves was studied with the FUNWAVE numerical model to simulate existing conditions in the harbor and develop baseline conditions for comparison with proposed alternatives. The FUNWAVE model of the existing harbor was compared to wave data collected by the State of Alaska in October and November of 2013 and found to adequately reproduce conditions in the existing harbor for comparison purposes.

A total of six alternatives, including an adaptation of the AKDOT&PF design, were numerically modeled using the FUNWAVE model. All alternatives were assessed for their ability to meet the criteria of waves no more than 1.6 feet in height at the existing docks or proposed new docks within the harbor. One of the initial findings of studying these alternatives is that navigation improvements at Zapadni Bay do not significantly improve the ability for vessels to enter or exit the harbor.

While these navigation improvements can change the conditions inside the harbor, the occurrence of wave conditions outside the harbor is unaffected by these changes. Figures 14 through 20 are schematics illustrating preliminary modeling results. Information contained in the schematics include percentage and numerical increases or decreases in safe moorage days, ocean wave height that results in unsafe moorage conditions, duration threshold exceedance of unsafe wave, and preliminary range of magnitude (ROM) construction cost estimates. ROM costs were further refined as the study progressed.

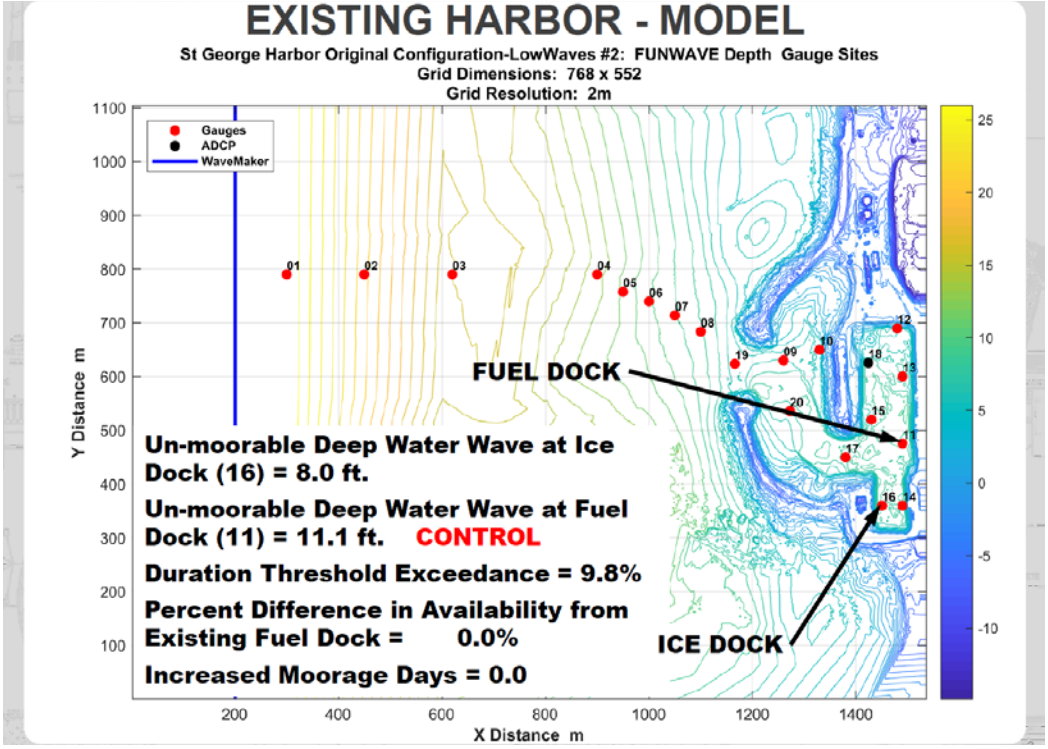

Figure 14: Existing Harbor Schematic and Modeling Results

Alternative Z-1. Alternative Z-1 includes constructing an 800 foot long extension to the existing south breakwater with a crest elevation of +35 feet MLLW, a 500 foot jetty off the existing north breakwater with a crest elevation of +10 feet MLLW, three 1,000 foot long submerged reefs with crest elevations of -12 feet MLLW, a new inner breakwater with a crest elevation of +20 feet MLLW with a spending beach sloped at 10H:1V and a new navigation channel with a depth of -22 feet MLLW and a new turning basin with a depth of -20 feet MLLW. This alternative re-routes vessel traffic to the north end of the harbor in an attempt to reduce the occurrence of storm waves entering the harbor from the southwest direction.

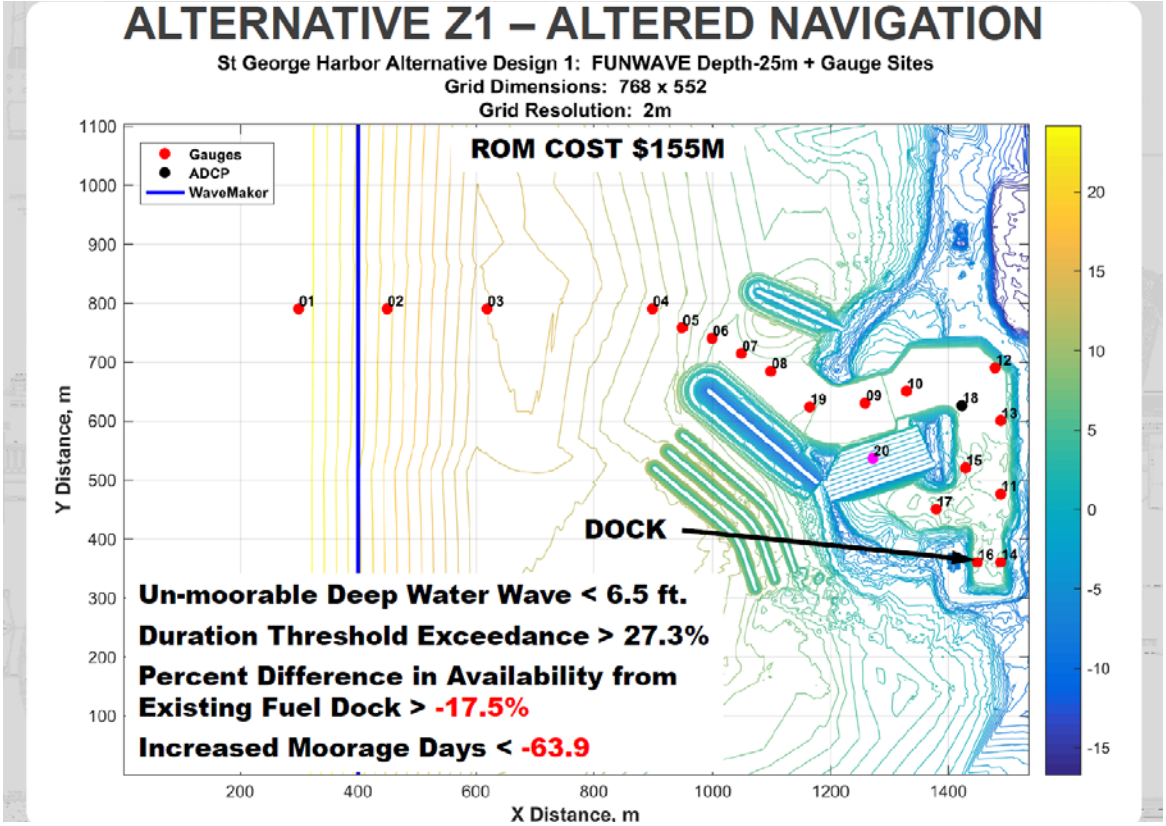

Figure 15: Alternative Z-1 Schematic and Modeling Results

Alternative Z-2. Alternative Z-2 includes constructing a 1,050 foot long cap and extension to the existing south breakwater with a crest elevation of +35 feet MLLW, a 400 foot jetty north of the new breakwater with a crest elevation of +10 feet MLLW and a new navigation channel with a depth of -22 feet MLLW and a new turning basin with a depth of -20 feet MLLW. The existing north breakwater would be demolished to allow vessels to pass through this area. The construction provides a breakwater overlap of the inner harbor facilities in an attempt to provide improved protection for the existing docks.

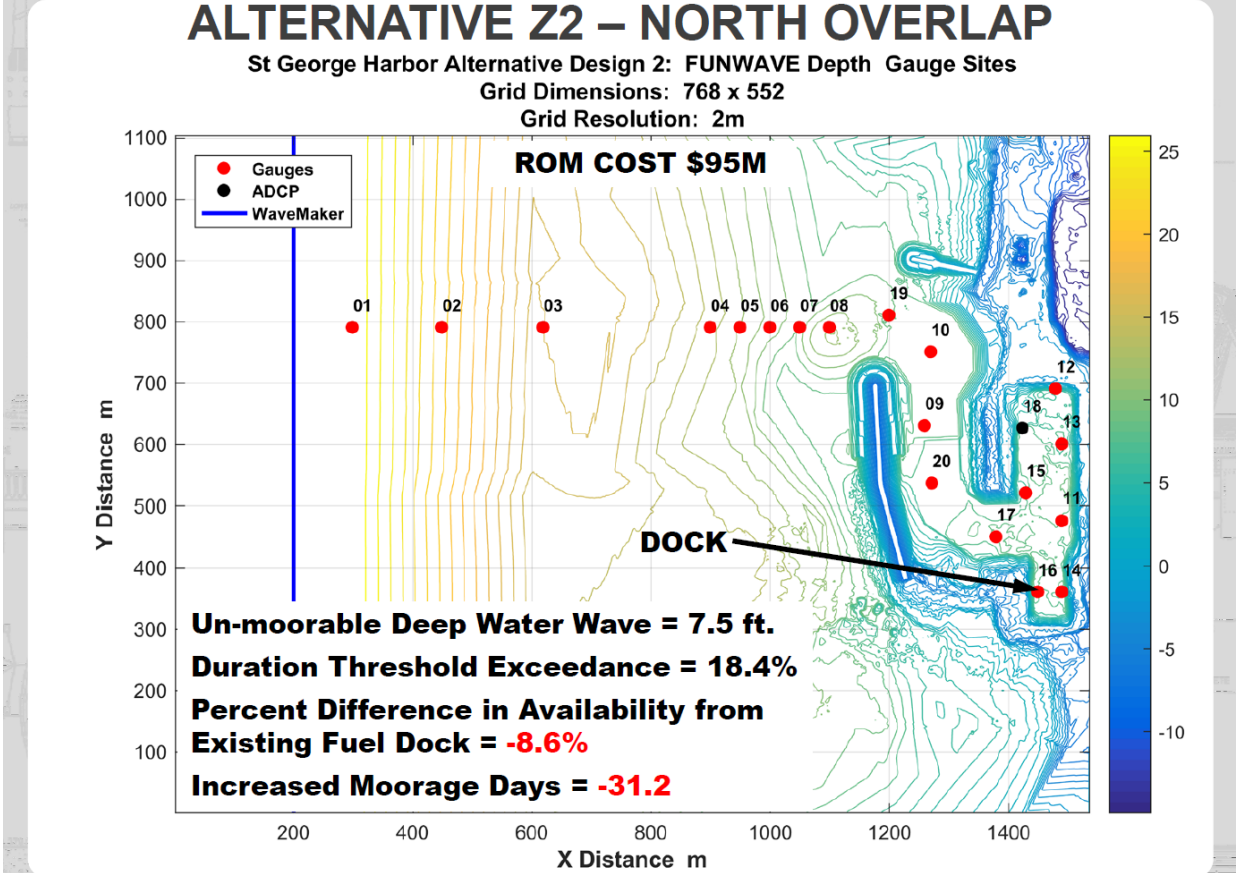

Figure 16: Alternative Z-2 Schematic and Modeling Results

Alternative Z-3. Alternative Z-3 includes constructing a new 700 foot long by 500 foot wide mooring basin to the northeast of the existing harbor. The new basin would be connected to the existing harbor by a 200 foot wide navigation channel. Excavation of the new mooring basin included excavation to construct a road around its perimeter to allow vehicles to traverse the perimeter of the harbor. The north end of the existing inner basin and the new inner basin would be sloped at 5H:1V to reduce wave reflection within the mooring basins. Excavation quantities for this alternative are approximately 2 million cubic yards of material. The existing harbor breakwaters would remain in their existing condition and the existing channel would be widened to a minimum of 200 feet at the head of the inner breakwater and dredged to a depth of -22 feet MLLW.

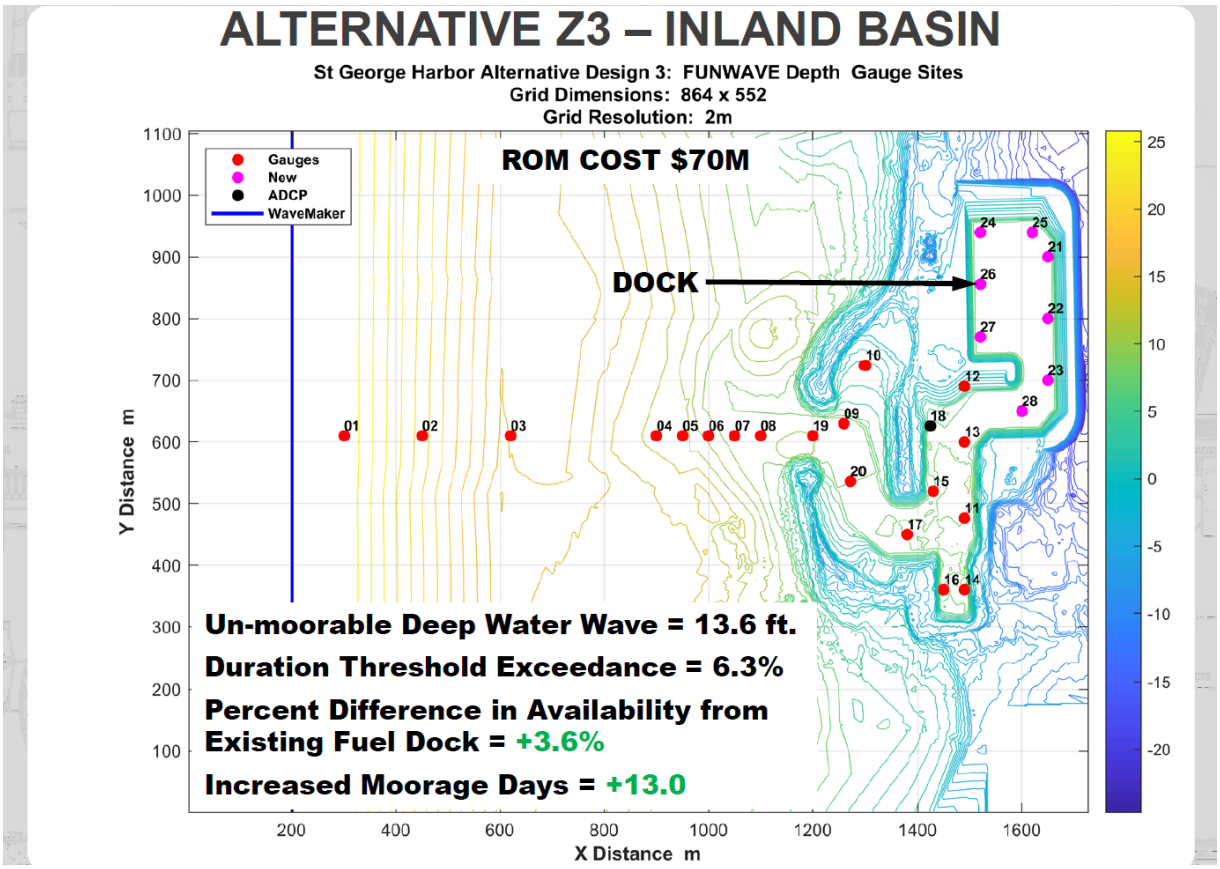

Figure 17: Alternative Z-3 Schematic and Modeling Results

Alternative Z-4. Alternative Z-4 was adapted from an Overall Harbor Concept plan developed by AKDOT&PF and HDR Inc. prior to initiation of the USACE feasibility study effort. The AKDOT&PF plan was modified to meet navigation requirements for the fuel barge to enter the harbor, however the parallel jetties would still pose an impediment for the barge to clear the outer breakwaters. This alternative includes constructing a 400 foot long jetties at the ends of the north and south breakwaters with a crest elevation of +35 feet MLLW, a 500 foot inner north breakwater with a crest elevation of +20 feet MLLW and a north mooring basin with a depth of -10 feet MLLW.

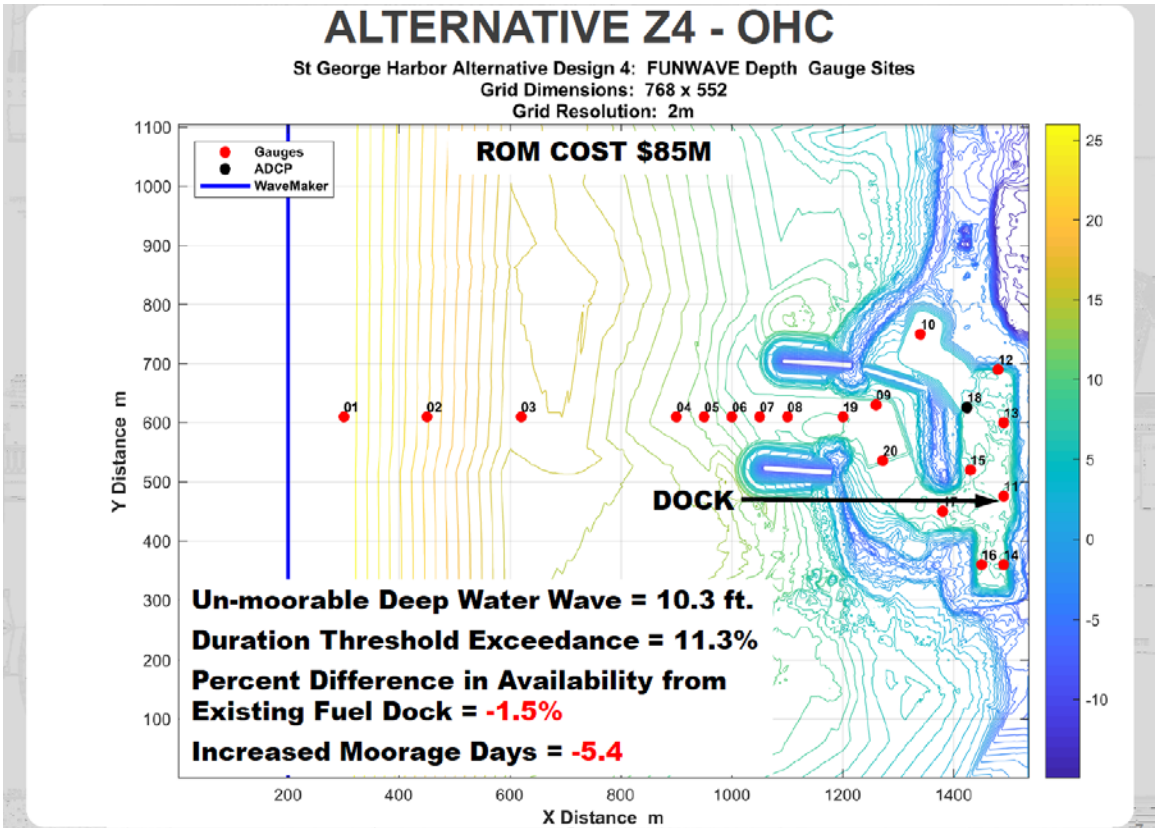

Figure 18: Alternative Z-4 Schematic and Modeling Results

Alternative Z-5. Alternative Z-5 includes demolishing the existing south breakwater and constructing an 3,000 foot long breakwater from the ice plant to an overlap position seaward of the existing north breakwater with a crest elevation of +35 feet MLLW. A 300 foot long extension of the north breakwater would be constructed with a crest elevation of +20 feet MLLW perpendicular to the new breakwater to define the mooring basin behind the new breakwater. New docks would be constructed on the inside of the new main breakwater with the entire basin enclosed by the new breakwaters being dredged to -22 feet MLLW. The back slope of the existing inner harbor would be filled at a 10H:1V slope to provide a spending beach in the new mooring basin.

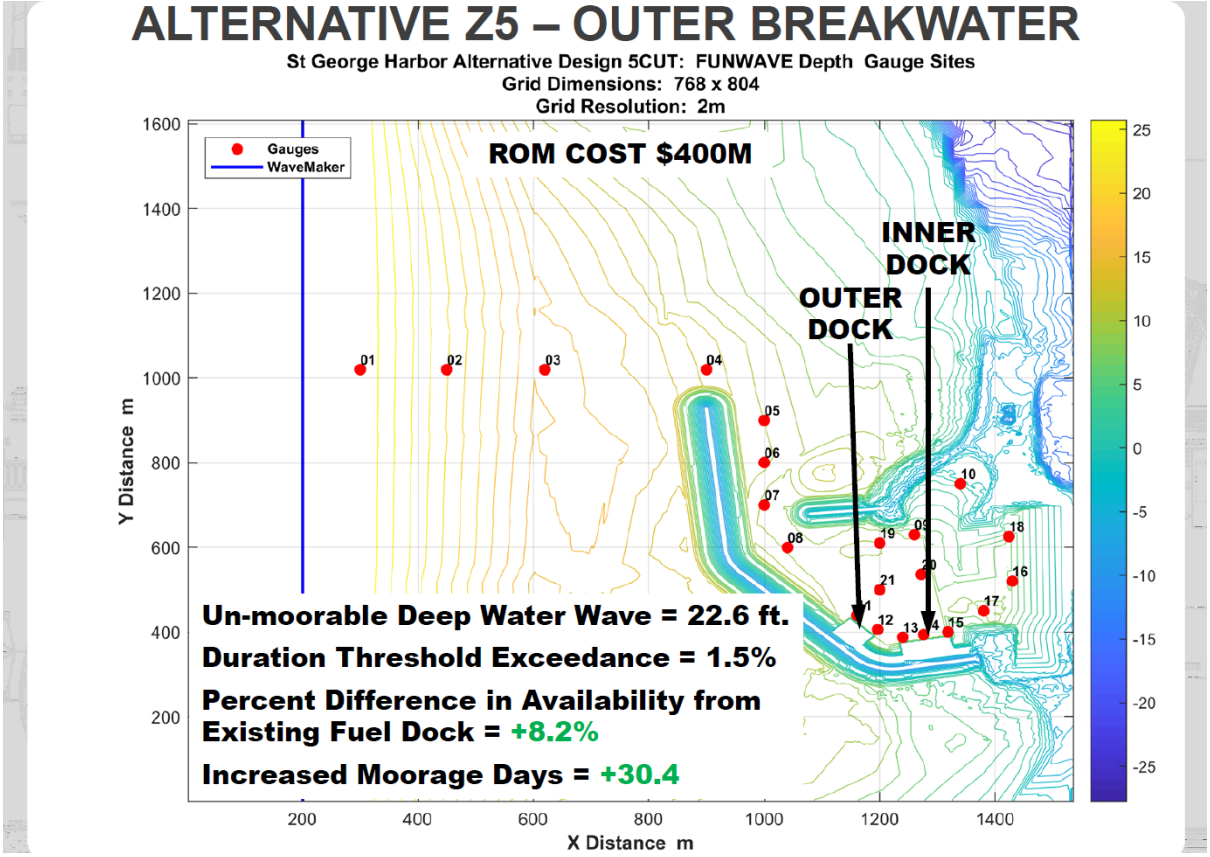

Figure 19: Alternative Z-5 Schematic and Modeling Results

*** Note: there are 30.4 increased moorage days at the inner dock, and 19.1 at the outer dock.**

Alternative Z-7. Alternative Z-7 includes constructing a new 900 foot radius semi-circular mooring basin into the eastern edge of the existing inner harbor. The side slope of the new basin would be 10H:1V to reduce reflection in the mooring area. Excavation of the new mooring basin included excavation to construct a road around its perimeter to allow vehicles to traverse the perimeter of the harbor. Excavation quantities for this alternative are approximately 6 million CYs of material. The existing harbor breakwaters would remain in their existing condition and the existing channel would be widened to a minimum of 200 feet at the head of the inner breakwater and dredged to a depth of -22 feet MLLW.

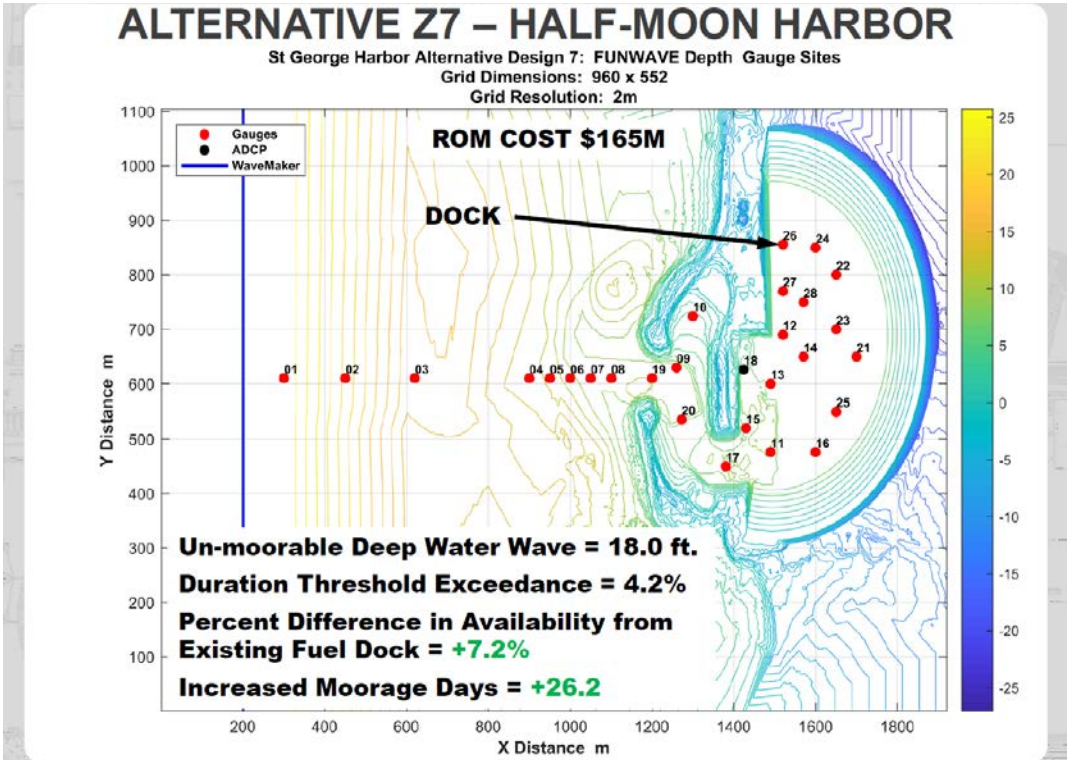

Figure 20: Alternative Z-7 Schematic and Modeling Results

5.1.5 North Anchorage Alternatives

Moving the harbor to the north side of the island provides immediate offshore condition improvements by shielding the harbor site from the long period storm waves originating from the southwest. As illustrated in Figure 21, the more sheltered wave environment on the north side of the island allows 10-ton stone to be used for breakwater construction as opposed to 30-ton stone at the existing Zapadni Bay site. Also, due to smaller wave heights at the proposed harbor site, the breakwater crest elevation can be 10 feet lower than at Zapadni Bay while providing protection from overtopping. These two changes in design parameters significantly reduce the cost of breakwater construction.

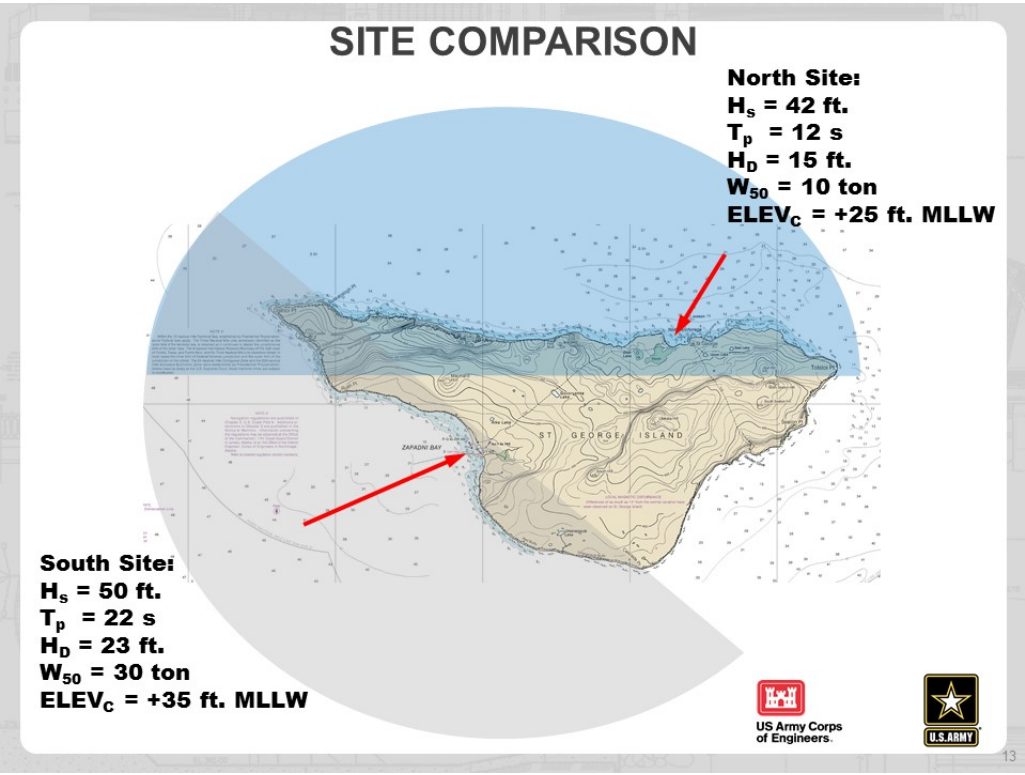

Figure 21: Differences in Site Conditions

H_s	Significant wave height of the design storm hindcast in deep water offshore. *The design storm has a 2% annual exceedance probability with a nominal return period of 50 years.*
T_p	Peak wave spectra period for the design storm.
H_D	Design wave height at the breakwater
W_{50}	Median breakwater armor stone weight
$ELEV_C$	Breakwater crest height

Moving the harbor to the north side of the island creates a regional benefit in conjunction with St. Paul Harbor. Both St. Paul Harbor and St. George Harbor are subject to storms from the southwest. A storm that would produce unsafe entrance

conditions at St. George Harbor would also affect St. Paul Harbor and both harbors would be shut down for the same storm events. By constructing a harbor on the north side of St. George Island, conditions would exist where storms would cause waves outside of St. Paul Harbor to be too high for vessels to enter, but at St. George, the island would shelter the harbor from the storm waves and vessels would still be able to navigate to the dock.

The photos in Figure 22 emphasize the difference in wave climate between Zapadni Bay and the North Anchorage site during a storm occurring on February 13, 2018. Moving the harbor to the north side of the island also improves vessel access by 9 days annually for the fishing fleet, 29 days annually for the subsistence fleet, and 36 days annually for the fuel barge.

Figure 22: Differences in Wave Conditions During February 13, 2018 Storm
Existing St. George Harbor is shown in top photo. View of North Anchorage site is in bottom photo. Lights from vessels hiding from storm can be seen in photo on the bottom.

Three alternatives were considered at the North Anchorage site. Each alternative is designed with different project depths as well as entrance and maneuvering channel alignments to accommodate differing portions of the vessel fleet anticipated to utilize the harbor. Alternative N-1 accommodates the local subsistence fleet of skiffs. In addition to providing access for the local subsistence fleet, Alternative N-2 provides the additional benefit of providing safe access and mooring for freight and fuel barges and an estimated 25% of the crabbing fleet. In addition to providing access for the local subsistence fleet and freight and fuel barges, Alternative N-3 also provides safe access and moorage to an estimated 85% of the crabbing fleet, giving the community increased opportunity to realize their CDQ allocated crab. ROM cost estimates for Alternatives N-1, N-2, and N-3 are $34 million, $92 million, and $101 million, respectively. Schematics of each of these alternatives follow in Figures 23, 24, and 25.

Alternative N-1. Alternative N-1 is a subsistence vessel launch harbor with a 775-foot long breakwater, a 700-foot long entrance channel dredged to -10 feet MLLW with a launch zone dredged to -8 feet MLLW. Dredging the channel for this alternative requires removal of approximately 10,000 cubic yards of material. Subsistence vessels access the harbor through concrete launch ramp to -5 feet MLLW providing full tide access for launching. Approximately 1.6 acres of uplands support vessel preparation and launching operations.

Figure 23: Alternative N-1 Schematic

Alternative N-2. Alternative N-2 consists of a 450-foot wide by 550-foot-long mooring basin dredged to -16 feet MLLW protected by a 1,731-foot-long north breakwater and a 250-foot-long stub breakwater at the west edge of the basin. The basin connects to the Bering Sea with a 250-foot wide navigation channel dredged to -18 feet MLLW. Dredging the channel and basin for this alternative requires removal of approximately 230,000 cubic yards of material. Inner harbor facilities include 2.6 acres of uplands area filled to +10 feet MLLW with a 300-foot-long pile supported dock and a concrete boat launch ramp to -5 feet MLLW for full tide launching access.
This alternative provides access for the subsistence fleet, the fuel barge and approximately 25% of the commercial fishing fleet.

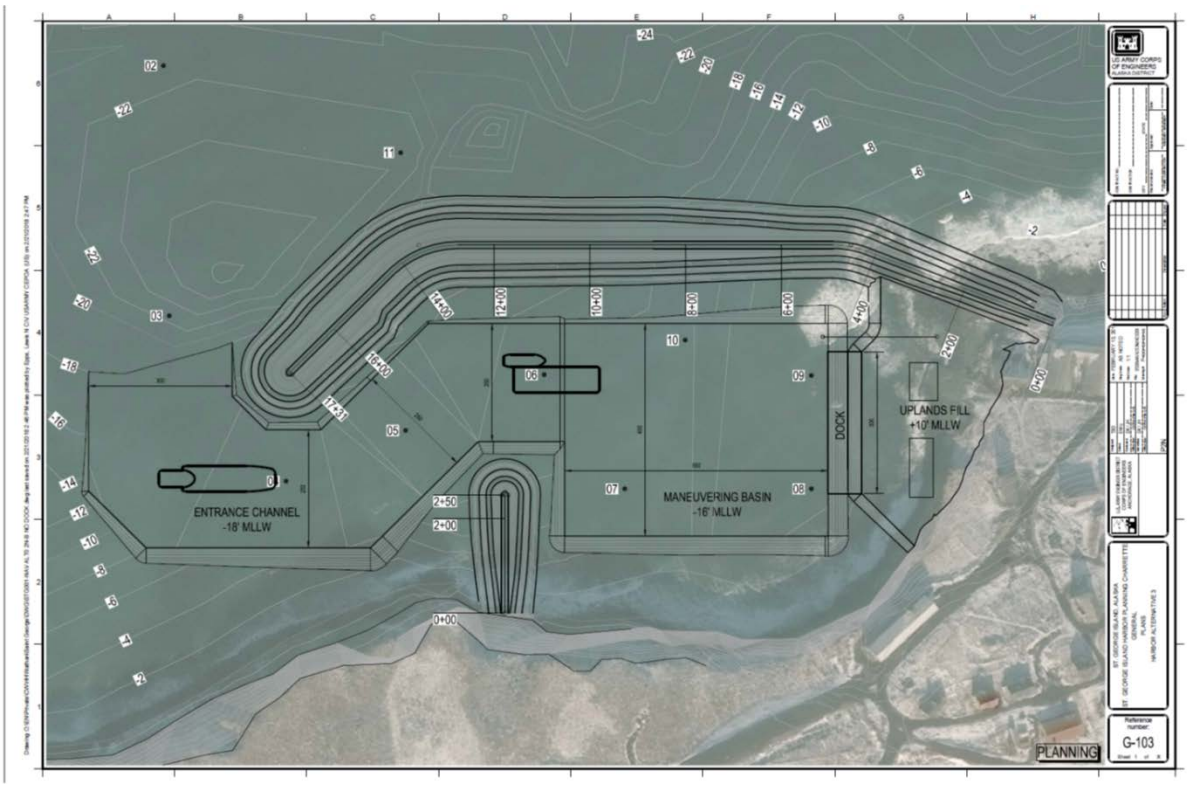

Figure 24: Alternative N-2 Schematic

Alternative N-3. Alternative N-3 consists of a 450-foot wide by 550-foot-long mooring basin dredged to -20 feet MLLW protected by a 1,731-foot-long north breakwater and a 250-foot-long stub breakwater at the west edge of the basin. The basin connects to the Bering Sea with a 250-foot wide navigation channel dredged to -25 feet MLLW. Dredging the channel and basin for this alternative requires removal of approximately 430,000 cubic yards of material. Inner harbor facilities include 2.6 acres of uplands area filled to +10 feet MLLW with a 300-foot-long pile supported dock and a concrete boat launch ramp to -5 feet MLLW for full tide launching access. This

alternative provides access for the subsistence fleet, the fuel barge and approximately 85% of the commercial fishing fleet.

Figure 25: Alternative N-3 Schematic

5.5 Alternatives Carried Forward

Table 4 summarizes the modeling results of the ten alternatives investigated. As can be seen, several of the Zapadni Bay alternatives actually exacerbated the dangerous conditions within the harbor. Those alternatives that did improve mooring conditions did so only marginally and at ROM construction costs between $70 million (2 additional safe moorage days) and $400 million (13 additional safe moorage days).

Due to the minimal increases in safe access and moorage days and negligible change in harbor access realized for large expenditures, further consideration of Alternatives Z-1, Z-2, and Z-4 was suspended. Alternatives Z-3, Z-5, Z-7, N-1, N-2, N-3 are carried forward for further consideration.

Table 4. Numerical Modeling Results Comparison – Navigation Improvements to Existing Harbor

Location	Wavemaker Wave To Induce Threshold (m)	Duration Threshold Exceeded	Percent Duration Difference from Existing Fuel Dock	Number of Increased Moorable Days
Original Harbor				
Ice Dock	2.44	17.77%	-7.96%	-29.1
Fuel Dock	3.37	9.81%	0.00%	0.0
Alternative Z-1 - Altered Navigation - $160 M				
Ice Dock	Less than 2 m	Greater than 27.32%	< -17.5%	< - 63.9
Fuel Dock	Less than 2 m	Greater than 27.32%	< -17.5%	< - 63.9
Alternative Z-2 - North Overlap - $100 M				
Ice Dock	2.39	18.37%	-8.56%	-31.2
Fuel Dock	Less than 2 m	Greater than 27.32%	< -17.5%	< - 63.9
Alternative Z-3 - Inland Basin - $70 M				
Ice Dock	2.71	14.54%	-4.73%	-17.3
Fuel Dock	3.28	10.38%	-0.57%	-2.1
Fishery Dock (NEW)	4.14	6.26%	3.55%	13.0
Alternative Z-4 - OHC - $85 M				
Ice Dock	2.44	17.77%	-7.96%	-29.1
Fuel Dock	3.14	11.28%	-1.47%	-5.4
Alternative Z-5 - Outer Breakwater - $400 M				
Outer Dock (NEW)	4.59	4.57%	5.24%	19.1
Inner Dock (NEW)	6.90	1.49%	8.32%	30.4
Alternative Z-7 - Half Moon Harbor - $170 M				
Fishery Dock (NEW)	5.49	2.63%	7.18%	26.2
Alternative N-1 Subsistence Fleet Launch - $25M				
Launch (NEW)	NO MODEL RESULTS			
Alternative N-2 North Barge Access - $85 M				
Dock (NEW)	3.41	7.43%	2.38%	8.7
Alternative N-3 North Fishing Fleet Access - $95 M				
Dock (NEW)	Same as N-2			

6 COMPARISON & SELECTION OF PLANS

Consistent with the Implementation Guidance detailed in Section 2.7 of this report, 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 CE/ICA.

CE/ICA was utilized to select a TSP. Hydraulic modeling separately predicted safe access at the harbor entrance for each alternative and safe moorage conditions at the design dock locations. These two parameters were combined into a single CE/ICA metric (or output measure): increased vessel opportunity days for safe access and moorage. The metric quantifies the increase or net gain over the existing (and future without-project) condition for each anticipated vessel class (given those classes access and moorage requirements). The culminating increase for each alternative should not be thought of as calendar days, but rather, as total vessel opportunity to access the harbor. Through the analysis, gains are then compared to costs.

NED Analysis

Plan formulation was performed for this study with a focus on contributing to NED with consideration of all effects, beneficial or adverse, to each of the four evaluation accounts identified in the Principal and Guidelines. An NED analysis sufficient to determine that no NED Plan is attainable has been completed and is included in Appendix C, *Economics*. The study team received USACE Vertical Team agreement and subsequent concurrence from the Technical Director of the Deep Draft Navigation Planning Center of Expertise that no NED Plan is attainable during an In-Progress Review conducted on September 22, 2017 and again during subsequent meetings with the Technical Director. A summary of the remaining evaluation accounts (Regional Economic Development, Environmental Quality, and Other Social Effects) is also included in Appendix C, *Economics*.

Cost Effectiveness/Incremental Cost Analysis (CE/ICA)

6.1.1 CE/ICA Metric Description

Increased vessel opportunity days for safe access and moorage allows for vessel class specific evaluation of improved wave and seiche conditions in comparison to the existing entrance channel and inner harbor. It also allows for the evaluation of vessel class specific safe maneuverability and mooring of the anticipated fleet and the percentage of time (in days) that harbor facilities can be safely accessed. Therefore, this metric directly addresses the study's objectives.

As the output of the CE/ICA, increased vessel opportunity days for safe access and moorage are significant for non-monetary benefits in terms of the output's institutional,

public, and technical significance, as defined in ER 1105-2-100, *Planning Guidance Notebook*, Appendix E.

By analyzing harbor designs that crabbers and fishing vessels can access as part of the anticipated fleet, the metric brings institutional significance to the study—specifically, crab quota regulations intended to support community development, and life, health, and safety laws that help protect mariners.

Increased vessel opportunity days for safe access and moorage is publically 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.

Last, the metric is technically significant in that without increased vessel opportunity days for safe access and moorage, out-migration from St. George is likely to continue. This has consequences that include sociological, psychological, health effects, and anthropological effects that are tied to the cultural identity associated with a narrow geographic range (i.e. St. George Island). In addition, providing additional vessel opportunity days for safe access and moorage to the community supports the initial intent of the Federal government to convert the island to a marine-based economy.

6.1.2 CE/ICA Evaluation

Based on the anticipated fleet and the wave criteria for safe access and moorage shown in Tables 4 and 5, a CE/ICA was conducted to support selection of the TSP.

Table 5. Future With Project Anticipated Fleet

Vessel Class	Vessel Draft (ft)
Fuel Barge & Tug	10 (Light Loaded)
Freight Barge & Tug	10
Subsistence Vessels	4
Crabbing Vessels (x2)	14
Water Taxi	14

Table 6. Wave Criteria for Anticipated Fleet

Wave Location	Fuel Barge	Freight Barge	Subsistence Vessel	Crabber	Water Taxi
Entrance and Outside Harbor Wave Height (Feet)	3.3	3.3	3.9	9.8	9.8
Dock Wave Height (Feet)	1.6	1.6	1.6	1.6	1.6

Figure 26 shows the IWR Planning Suite output for the cost effectiveness analysis. This analysis yielded four cost effective plans, two of which are best buy plans (Alternatives N-3 and Z-5). The best buy plans were further evaluated through incremental cost analysis, as shown in Figure 27.

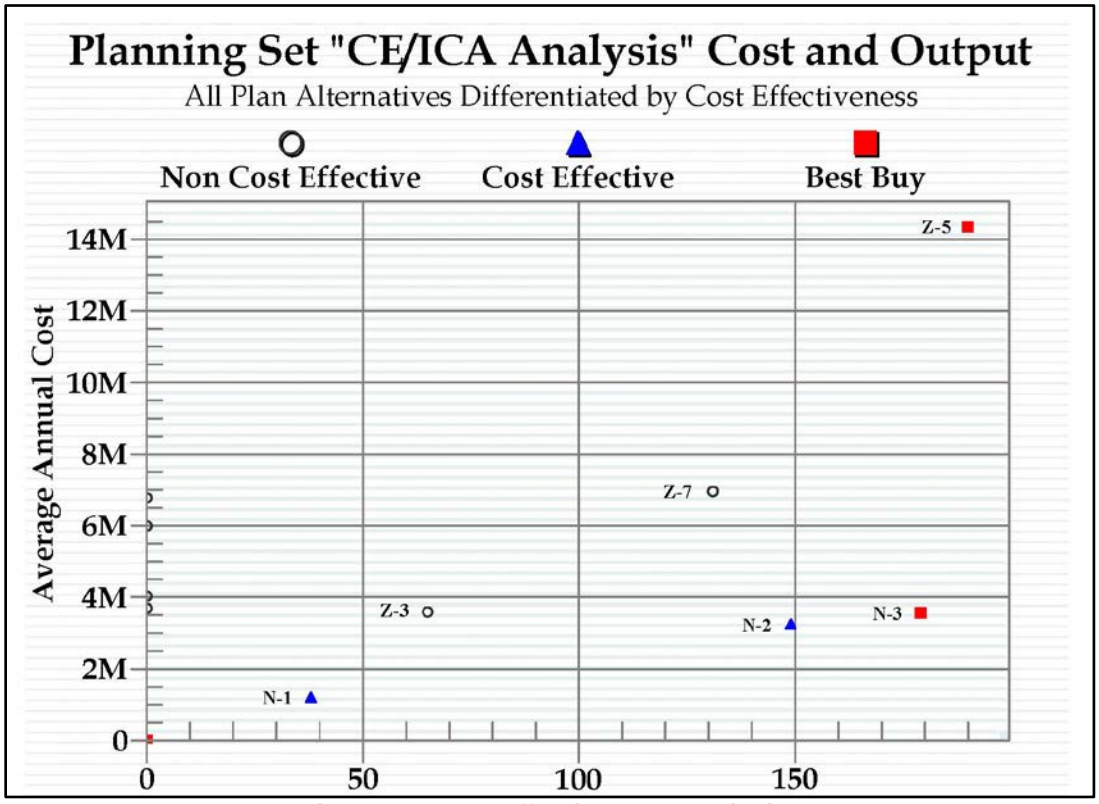

Figure 26. Cost Effectiveness Analysis:
Increased Vessel Opportunity Days for Safe Access and Moorage

The incremental cost analysis compared the incremental cost per unit of output (vessel opportunity days for safe access and moorage) for Alternatives N-3 and Z-5, as shown in Table 7 and Figure 27. For Alternative Z-5, note the substantial increase in cost required to achieve a marginal increase in output. Based on this analysis, Alternative N-3 is identified as the TSP.

Table 7. Incremental Cost vs. Output for Best Buy Alternatives

Alternative	Additional Days	Incremental Cost of Day Gained (Annualized)
N-3	179	$19,934
Z-5	11	$979,333

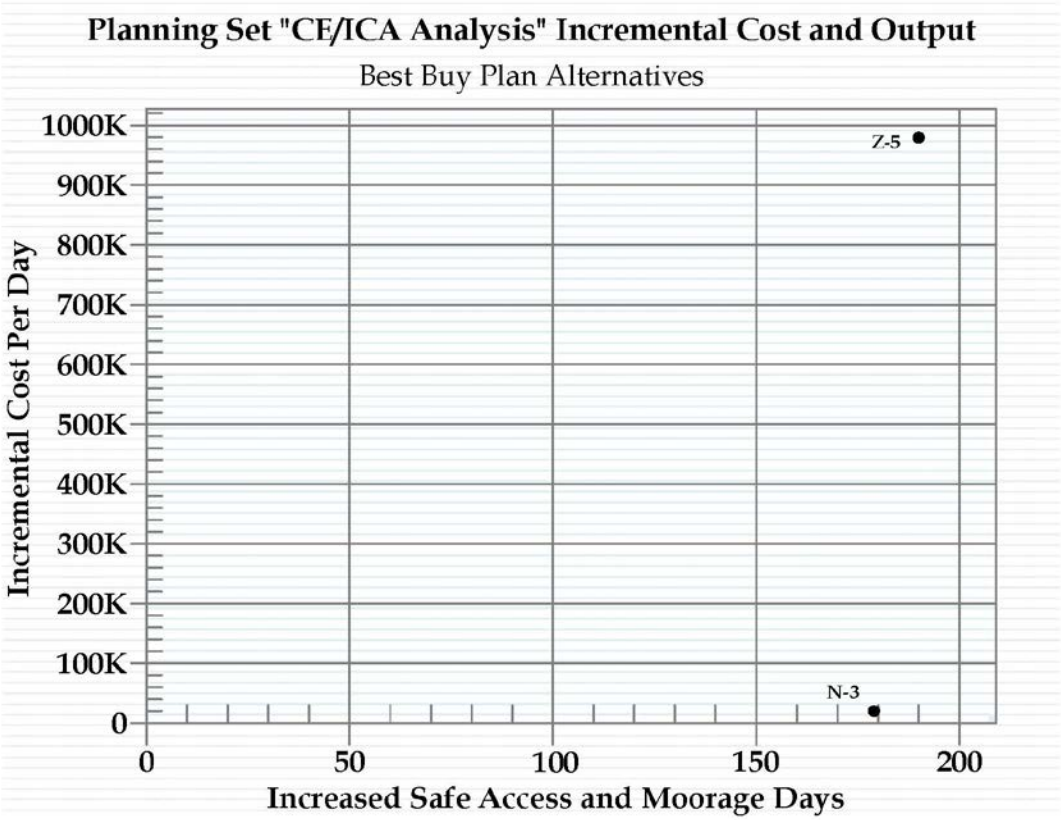

Figure 27: Incremental Cost Analysis:
Increased Vessel Opportunity Days for Safe Access and Moorage

Table 8 and Table 9 summarize project costs and the non-monetary benefits evaluated in the CE/ICA for each alternative.

Table 8. Project Cost by Alternative

Alternative	Project Cost	IDC	Operations & Maintenance	Total PV Cost	Annual Cost
Z-1	$154,739,366	$4,274,802	$59,761,111	$168,924,791	$5,993,372
Z-2	$94,973,124	$2,623,710	$59,344,836	$113,723,863	$4,034,869
Z-3	$87,088,293	$2,405,885	$47,028,988	$101,218,945	$3,591,200
Z-4	$84,758,409	$2,341,521	$58,805,481	$104,133,017	$3,694,590
Z-5	$408,267,296	$11,278,719	$65,202,037	$404,314,263	$14,344,879
Z-7	$190,123,483	$5,252,317	$47,028,988	$196,143,960	$6,959,095
N-1	$22,379,365	$618,248	$32,054,158	$34,067,433	$1,208,696
N-2	$84,488,142	$2,334,054	$33,086,817	$91,632,396	$3,251,074
N-3	**$94,313,027**	**$2,605,475**	**$33,086,817**	**$100,683,939**	**$3,572,219**

Table 9. CE/ICA Summary

Alternative	Annual Cost	Total Days	Annual Cost of Day Gained	Cost Effective	Best Buy
Z-3	$3,591,200	65	$55,249	No	No
Z-5	$14,344,879	190	$75,420	Yes	Yes
Z-7	$6,959,095	131	$53,123	No	No
N-1	$1,208,696	38	$32,061	Yes	No
N-2	$3,251,074	149	$21,863	Yes	No
N-3	**$3,572,219**	**179**	**$19,934**	**Yes**	**Yes**

Tentatively Selected Plan

In consideration of the CE/ICA presented in Section 6.2.2, the TSP is Alternative N-3 (Figure 28). This alternative consists of a 450-foot wide by 550-foot-long mooring basin dredged to -20 feet MLLW protected by a 1,731-foot-long north breakwater and a 250-foot-long stub breakwater at the west edge of the basin. Primary armor stone on the north breakwater has a median weight of 10 tons. The basin connects to the Bering Sea with a 250-foot wide navigation channel dredged to -25 feet MLLW. Inner harbor facilities include 2.6 acres of uplands area filled to +10 feet MLLW with a 300-foot-long pile supported dock and a concrete boat launch ramp to -5 feet MLLW for full tide launching access.

The north breakwater requires approximately 85,000 CY of armor stone, 54,000 CY of B rock and 80,000 CY of core rock. The stub breakwater requires approximately 9,000 CY of armor stone, 6,500 CY of B rock and 5,000 CY of core rock. The basin and navigation channel require removal of approximately 430,000 CY of material to reach the proposed maximum pay depths for the project. Uplands construction requires approximately 45,000 CY of fill.

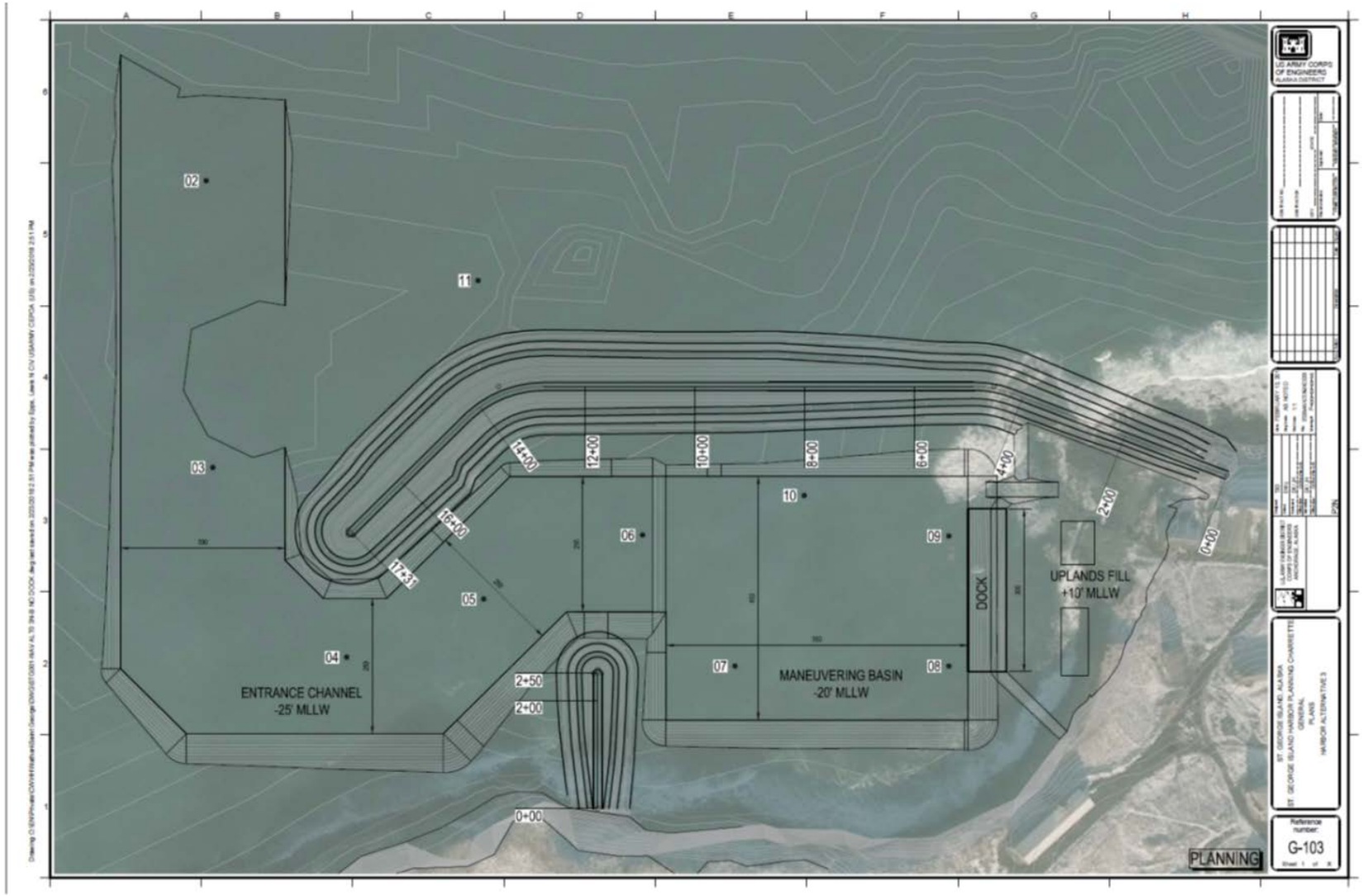

Figure 28: Alternative N-3 Schematic

Tentatively Selected Plan Costs

The Rough Order of Magnitude (ROM) cost for the TSP including costs to construct and maintain facilities is $100,683,939. The average annual cost over the 50-year period of analysis is $3,572,219. Interest during construction assumes a 2-year construction window. Initial estimates of operations and maintenance assume dredging would occur every 10 years, and 2.5 percent of breakwater armor rock would be replaced in 25 years. Project costs were developed without escalation and are in 2018 dollars. Operation, Maintenance, Repair, Replacement, and Rehabilitation costs for Alternative N-3 are $33,086,817, which has a present value of $13,066,029.

Net Benefits of Tentatively Selected Plan

Alternative N-3 is expected to produce an additional 179 vessel opportunity days for safe access and moorage for the anticipated fleet. These additional days will allow for the more efficient delivery of fuel and goods to the community, increase opportunities to harvest subsistence resources, and allow a portion of the crabbing fleet to utilize the harbor. The resulting reduction in the cost of essential goods coupled with expanded economic opportunities will contribute to the long-term viability of the mixed, subsistence-cash local economy of St. George.

7 TENTATIVELY SELECTED PLAN

Description of Tentatively Selected Plan

7.1.1 Plan Components and Construction of Tentatively Selected Plan

Major construction features for the TSP include rubblemound north and spur breakwaters, dredging, pile supported docks, and upland fill areas. The material source for breakwater construction would be offsite from an established quarry such as Cape Nome or Granite Cove on Kodiak Island. The material source would most likely be far enough away from the site that rock production would need to significantly lead placement operations to ensure that the construction crew on site has enough material delivered to the site for a full season of work. Stone production in the quarry and delivery to the site would likely be the first project tasks undertaken.

Construction of the North Breakwater is most likely to be performed with land based equipment. The breakwater core would be constructed to above the tide range to allow the placing equipment to drive the breakwater core and place B and A rock layers to protect the work in progress. Core rock would likely be transported and staged on the breakwater with off-road dump trucks, then shaped to the design prism by an excavator. Near the west end of the breakwater, an excavator on a barge may be required to shape the toe and benches of the breakwater where the seabed is deeper. Uplands

would be constructed concurrently with the breakwater to build a staging area for breakwater material.

Dredging could occur concurrently with stone production. With the anticipated approval of Incidental Harassment Authorizations, dredging actions could be authorized to occur throughout the majority of a calendar year. Some dredging prior to constructing the breakwaters would provide access for construction barges to the breakwater sites. The total estimated performance period for construction the project is a minimum of 3 years but could take up to 5 years.

7.1.2 Operations & Maintenance

Based upon preliminary operation and maintenance estimates, dredging would likely be performed at 10-year intervals. Sedimentation is expected at a rate of 1,000 CY per year. The dredging cost, approximately $30 per CY, would be less than the construction dredging unit price since this will be removal of sand and gravel with no blasting requirements. Approximately 2.5% of the armor stone will need to be replaced every 25 years. These estimates will be further refined between the TSP and ADM Milestones. Operation and Maintenance costs based on these assumptions are included in the economic analysis.

7.1.3 Mitigation Measures

If navigation improvements are pursued at the North Anchorage site, development of mitigation actions will be required due to adverse effects on the Old Dock (XPI-194), which is likely a contributing feature of the Seal Islands Historic District NHL (XPI-002).

A comprehensive mitigation measures list will be included in the aforementioned EA, and submitted for 30-day public review.

7.1.4 Integration of Environmental Operating Principles

USACE, Alaska District is proud to have integrated its core Environmental Operating Principals into every applicable aspect of its project planning process for assessing the feasibility of implementing navigational improvements at St. George. Every attempt was made to reduce waste and redundant behavior, foster sustainability, consider all possible environmental consequences, and to comply with all applicable laws, orders, and directives. Data requirements were identified and addressed with comprehensive environmental surveys and collaboration with regulatory agencies, field related subject matter experts, and social and tribal experts. Collaboration between stakeholders has transcended transparency as a united-team, singular-mission ethos has prevailed.

Real Estate Considerations

Any required Lands, Easements, Rights-of-Way, Relocations, and Disposals (LERRDs) will be determined as property owners are identified. Detailed LERRD requirements will be provided in a subsequent review of this report. Please consult Real Estate Appendix for further information.

Risk & Uncertainty

The wave climates at the potential projects site, particularly Zapadni Bay, are extreme. Uncertainties and risks will require careful identification and consideration. The wave climate combined with the extreme weather and remoteness of the site makes this a difficult and challenging project.

The dredging characteristics of the bottom material at the North Anchorage site are not well known. Large boulders on the shoreline could be representative of bottom conditions, but it is not known whether material within the dredge prisms under consideration are sands and gravel, cobbles and boulders or bedrock. The characteristic of this material greatly affects the requirements for dredging, and it is currently assumed that blasting and mechanical removal is required.

The bathymetric data of the North Anchorage site is very coarse and carries uncertainty in regards to bottom depth at the project site. This in turn adds uncertainty to the volume estimates of dredging and breakwater construction for the alternatives at the North Anchorage site.

The numerical model used for the study, FUNWAVE, was determined to be the most appropriate model to simulate observed harbor responses in Zapadni Bay. Calibration runs with the limited wave data available provided good results for storm events; however, model tests of St. Paul Harbor showed that the model over predicts the energy reflected off engineered harbor structures such as spending beaches and

breakwaters. While inclusion of developmental code into the model produces reasonable results at St. Paul Harbor, application of this method has not produced reasonable results for the St. George alternatives at Zapadni Bay and the North Anchorage site at the time of the writing of this feasibility report. Energy damping abilities of FUNWAVE are currently being investigated by USACE Coastal Hydraulics Laboratory (CHL) and Alaska District personnel. Any needed model changes will be performed as the study continues. Current modeling results are preliminary until CHL and Alaska District personnel determine that FUNWAVE, or another 2D model, are obtaining reasonable results. New model results are likely to alter the number of moorable days calculated for each alternative and may change the relative merits of the harbor alternatives. Potentially, a different harbor configuration could be found to be more beneficial than the proposed TSP.

A new physical model will be required to study the impacts of the Bering Sea wave climate on alternatives considered as numerical modeling alone would not capture all of the effects anticipated. Conducting a physical modeling was delayed until PED to comply with current USACE planning budget and schedule policies.

USACE biologists still need to complete field surveys to properly categorize biological diversity and existing underwater habitat conditions within the envisioned TSP footprint, as well as to confer with local marine mammal monitors regarding seasonal trends in abundance and habitat utilization. Additional regulatory agency coordination is required and shall continue. An Incidental Harassment Authorization that assesses and authorizes potential impacts to marine mammals as a function of underwater noise generated by construction of the project must be obtained from the NMFS. Also, the selection by the District Commander of an “Alternate Site” for offshore dredge material disposal pursuant to Section 103 of the Marine Protection, Research, and Sanctuaries Act is required for this project prior to the initiation of dredge material placement activities.

Cost Sharing

Section 101 of WRDA 1986, as amended states that General Navigation Features not in excess of -20 feet MLLW will be cost shared at a rate of 80 percent Federal/20 percent non-Federal and the proportionate share in excess of -20 feet MLLW will be cost shared at a rate of 65 percent Federal/35 percent non-Federal.

Local service facilities (LSF), uplands, and LERRDS for construction are a non-Federal responsibility; however, LSF determined necessary to obtain benefits shall be incorporated into total project cost. Certified LERRDS obtained for construction may be credited back to the non-Federal sponsor as part of the construction cost sharing amounts.

8 POTENTIAL ENVIRONMENTAL IMPACTS

A more complete analysis of environmental impacts associated with the TSP will be included in the future EA to be released as part of a revised Integrated Feasibility Report and Environmental Assessment. Currently, data deficiencies in bathymetry, intertidal and submerged marine habitat characterization, archaeological, nearshore benthic biological community composition, and cultural and historic resources do not allow for legally sufficient analyses. However, existing information concerning the specific geology of St. George Island and the general physical characteristics of the North Anchorage site, USACE reasonably envisions that confined underwater blasting will be necessary to prepare material in the project footprint for mechanical dredging. USACE has conveyed these assumptions to NMFS, USEPA, ADEC, and USFWS in anticipation of a comprehensive coordination effort.

Water Quality

It is likely that water quality at the North Anchorage will only be temporarily impacted during anticipated confined area blasting, dredging, and material disposal activities. However, USACE expects that because the dredged material is being disposed of within the marine environment for the sole purpose of disposal, and that there is no currently designated offshore disposal area designated as such in the relative vicinity, this action engages section 103 of the Marine Protection Research and Sanctuaries Act (MPRSA) 33 U.S.C. 1413. Rather than a typical dredge project's Section 401 water quality certification, under Section 103, the Commander of the USACE Alaska district would designate an alternative site for offshore material disposal, with USEPA concurrence.

MPRSA Section 103 alternate site designation process is expected to be time consuming in that the requirement for site characterization will consist of multiple site surveys and data collection efforts conducted at different times of the year. One optimistic item of note is that the dredged sediments are reasonably expected to be free of any type of anthropogenic contamination, and most similar to the sediments that they will be placed upon and may not require comprehensive testing and analysis.

Sediments

Based upon the history and usage of the North Anchorage site, dredge materials are expected to be free of anthropogenic contaminants and most closely resembling those in the identified dredge material disposal area. Furthermore, finer sediments that may increase turbidity in the water column are not expected to be a significant portion of the overall dredge prism volume.

Air Quality

No significant impacts to air quality are expected as a result of the execution of the TSP.

Noise

No significant impacts to the ambient above water noise are expected as a result of the execution of the TSP. However, underwater point-source noise levels resulting from confined underwater blasting, mechanical removal and disposal of material and the mechanical placement of breakwater armor stone are reasonably expected to exceed behavioral impact thresholds for various taxa of marine mammals. See section 8.5.1.4. Marine Mammals, for expanded discussion of noise impacts to marine mammals.

Biological Resources

8.1.1 Marine Habitat

Rocky intertidal and submerged marine habitat will necessarily be disrupted by project related activities, and in some cases habitat may destroyed or converted. Because so little is known about the existing habitat conditions, and the ability to access St. George Island is so difficult, marine habitat characterization surveys are planned to be conducted with a submersible Remote Operated Vehicle (ROV). The ROV surveys will be conducted from the existing historic dock face, or from an available vessel.

USACE believes that at this time, the hard bottom sediments will not be contaminated and will most closely resemble the sediments in the theoretical placement area, and will not have a significant impact on the nearshore marine habitat of St. George Island. Further analysis will be carried forward in the EA.

8.5.1.1 Birds

Impacts to colonial nesting seabirds whose preferred cliff-side nesting habitat defines the North Anchorage's southern and western boundaries, will be mitigated to the maximum extent practicable. Significant impacts to birds are not expected to occur with appropriate conservation measures in place. Further analysis and potential conservation strategies will be carried forward in the EA.

8.5.1.2 Submerged Aquatic Vegetation

It is envisioned that submerged aquatic vegetation occurring within the TSP's footprint will be more adequately characterized during concurrent ROV surveys. Submerged aquatic vegetation is ubiquitous in the nearshore waters of St. George Island, and the loss or temporary degradation of the portion that occurs within the TSP's footprint does not constitute a significant impact. Further analysis of project actions upon submerged aquatic vegetation shall be carried forward in the EA.

8.5.1.3 Marine Fish

See Section 8.5.4, Essential Fish Habitat.

8.5.1.4 Marine Mammals

On May 14, 2018, USACE biologists presented the North Anchorage site TSP presentation to NMFS' Office of Protected Resources' Pribilof Island Biologist, and a NMFS' Division of Fish Habitat's fisheries biologist. USACE proposed, as part of its TSP, that impacts to marine mammals could be avoided if blasting, dredging, and other underwater noise-generating activities were remanded to winter timeframes when marine mammals would not be expected to be present in the TSP footprint. Responses were encouraging, the Pribilof Island Biologist was concerned that USACE's envisioned wintertime, in-water work window was not realistic, and that attempting to avoid impacts to marine mammals in the area was equally not realistic. Rather, USACE should pursue multiple Incidental Harassment Authorizations (IHA) so that project data collection and construction actions would be authorized to occur over a longer period of the year, if not year round. USACE believes that with these authorizations in hand, no significant impact to marine mammals will result as a function of the execution of the TSP. Updated analyses shall be provided in the EA.

8.5.1.5 Marine Invertebrates & Associated Habitat

No known characterization of the marine invertebrate community has occurred at the North Anchorage or the theoretical dredge material disposal site. USACE hopes to conduct ROV underwater surveys of the entire project footprint.

Sessile and slow moving invertebrates within the TSP footprint will necessarily be disrupted and/or destroyed, but these do not represent significant impacts to the overall marine invertebrate community in the nearshore waters of St. George Island.

8.1.2 Threatened & Endangered Species

Upon conclusion of the IHA process, USACE will be required to coordinate under Section 7 of the Endangered Species Act for potential effects to threatened or endangered species. USACE believes that with an IHA in hand, the prevailing analysis will support a finding of may affect, but not likely to adversely affect threatened and endangered species occurring in the nearshore waters of St. George Island.

8.1.3 Special Aquatic Sites

Impacts to special aquatic sites, should they be warranted, following the marine habitat assessment, will be analyzed and presented in the EA.

8.1.4 Essential Fish Habitat

Impacts to essential fish habitat will be analyzed concluding ROV marine habitat characterizations of the TSP's footprint. NMFS Fish Habitat Division's personnel are actively engaged in the habitat survey design and will likely assist USACE in determining effects associated with the project. EFH analyses will be better developed in the near term, but may not be complete for full inclusion in the EA. However, at this time, USACE does not believe that execution of the TSP constitutes a significant impact to EFH in the cumulative nearshore waters of St. George Island.

Cultural Resources

The TSP is located within the Seal Islands Historic District (XPI-002), which was designated as a NHL in 1962. The boundary of the NHL encloses the village of St. George and the proposed harbor location (Figure 29). Construction of a harbor on the north side of the island near the village of St. George will likely have an adverse effect requiring mitigation on at least two structures within the Fur Seal Rookeries NHL: historic docks (XPI-194 and XPI-195). The proposed breakwater will be built on top of as well as extended from XPI-194, while XPI-195 will likely be removed. Consultation was initiated with the Alaska State Historic Preservation Office (SHPO) and National Park Service – Alaska Region (NPS) on January 12, 2018. Once project funding has been secured and the harbor design finalized, the USACE will enter into a Memorandum of Agreement with the SHPO, NPS, City of St. George, and any other interested parties in order to determine appropriate mitigation for any adverse effects to XPI-194, XPI-195, and the NHL (XPI-002).

Figure 29: Approximate Location of the Seal Islands Historic District NHL on St. George Island (AHRS 2018)

Environmental Justice and Protection of Children

No negative impacts to children, peoples of lower income, or ethnic minorities are anticipated as a result of this project. Further analysis of anticipated impacts will be included in the Environmental Analysis.

Unavoidable Adverse Impacts

Further analysis of anticipated impacts, adverse or otherwise will be included in the Environmental Analysis.

Cumulative & Long-term Impacts

Further analysis of anticipated impacts, adverse or otherwise will be included in the Environmental Analysis.

Summary of Mitigation Measures

If navigation improvements are pursued at the North Anchorage site, development of mitigation actions will be required due to adverse effects on the Old Dock (XPI-194), which is likely a contributing feature of the Seal Islands Historic District NHL (XPI-002).

9 PUBLIC AND AGENCY INVOLVEMENT

Public/Scoping Meetings

Planning Charette - January 2016

While this planning meeting was not open for participation to the general public, it served as an appropriate scoping exercise that helped USACE define its overall project objectives. It was decided over the course of the Charrette to study the feasibility of implementing navigational improvements at the St. George Harbor at Zapadni Bay.

Community Meeting at St. George – June 2017

A USACE sponsored public meeting was held in the St. George school gymnasium and attended by approximately 11 community members and 2 US Fish and Wildlife personnel. USACE subject matter experts presented to the community about the progress of data collection efforts and regulatory coordination updates. Upon conclusion of the interdisciplinary presentation, local community members presented their concerns to USACE staff:

- Concern was expressed regarding a separate City initiative seeking designation of a marine sanctuary in the vicinity of St. George. Concern was expressed that this action could be the gateway to a more restrictive monument designation and could have an impact upon the implementation of harbor improvements. Pat Pletnikoff, Mayor of St. George, responded that the harbor site would be precluded from the sanctuary designation and pointed out that 14 other

sanctuaries have harbors. Further, the designation of a marine sanctuary is a 5-year process and still requires additional efforts to be completed by the City of St. George.

- Lack of community attendance to the meeting and lack of responses to the previously provided survey is frustrating.
- In 2006 there were foreign crab processors in the harbor but they left and didn't return.

USACE attempted to hold Feb 2018 Scoping Meeting after the project site selection had changed, but inclement weather prohibited flights to and from St. George Island. This meeting is now scheduled to be conducted in August 2018.

Federal & State Agency Coordination

Planning Charrette – January 2016:

- NMFS
- USFWS
- ADEC Water Quality

While in project development:

- Alaska Maritime National Wildlife Refuge – interim coordination for bird surveys and planning elements.
- USEPA – guidance for dredge material disposal actions. – Ongoing.
- USFWS – Formal request for coordination under FWCA – February 2018
- NMFS (Protected Resource Division and FHD) – May 2018

Status of Environmental Compliance

Federal Statutory Authority	Compliance Status	Compliance Date/Comment
Clean Air Act	FC	This project is not reasonably expected to negatively impact air quality, nor is it in a non-attainment area
Clean Water Act	PC	Upon receipt of 401 certification
Coastal Zone Management Act	N/A	CZMA Federal consistency provision, section 307, no longer applies in Alaska
Endangered Species Act	PC	Section 7 consultation for Steller sea lion and bearded seal. Project occurs within critical habitat for SSL. No submittals to date
Marine Mammal Protection Act	PC	Multiple species of pinniped and cetaceans being considered, pending concurrence from NMFS - not yet submitted
Magnuson-Stevens Fishery Conservation and Management Act	PC	Pending EFH effects determination - Initial coordination initiated, not yet submitted
Fish and Wildlife Coordination Act	PC	Not yet submitted
Marine Protection, Research, and Sanctuaries Act	PC	Offshore disposal of dredge sediments requires alternate site designation by USACE , Alaska District Commanding Officer after proper environmental analysis has been conducted
Migratory Bird Treaty Act	PC	Pending conservation measures form FWCA coordination
National Historic Preservation Act	PC	In progress
National Environmental Policy Act	PC	Pending completion of the EA/Feasibility Report
Executive Order 11990: Protection of Wetlands	FC	No wetlands are expected to be impacted by this project
Executive Order 12898: Environmental Justice	FC	Project does not disproportionately negatively affect underserved communities
Executive Order 13045: Protection of Children from Environmental Health Risks and Safety Risks	FC	Does not disproportionately affect the health or well-being of children
Executive Order 13112: Invasive Species	FC	Conservation measures will include anti-rat provisions
Executive Order 13186 Protection of Migratory Birds	PC	Pending conservation measures form FWCA coordination

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

Views of the Sponsor

The City unconditionally believes that economic and cultural survival of the community is dependent upon a more accessible harbor as there can be no viable long-term economy on St. George without it. They are supportive of the TSP identified on the north side of the island. A letter of support from the City of St. George is included as Appendix G of this report.

10 CONCLUSIONS & RECOMMENDATIONS

Conclusions

CE/ICA completed thus far confirm that construction of the TSP will effectively meet the identified objectives of improving wave and seiche conditions, providing for the safe maneuverability and protected mooring of the existing and anticipated fleet, and increasing the percentage of time that harbor facilities can be safely accessed. The

assessment of any adverse impacts of construction and operation of the TSP are ongoing and will be updated in a subsequent review of this report.

Recommendations

The Alaska District recommends that the navigational improvements at St. George, 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 $68.4 million provided that prior to construction the local sponsor agrees to the following:

a. Provide, during the period of design, 10 percent of design costs allocated by the Government to commercial navigation in accordance with the terms of a design agreement entered into prior to commencement of design work for the project; and provide, during the first year of construction, any additional funds necessary to pay the full non-Federal share of design costs allocated to the Government to commercial navigation in accordance with the cost sharing as set out in paragraph b. below;

b. Provide, during construction, 10 percent of the total cost of construction of the general navigation features attributable to dredging to a depth not in excess of 20 feet; plus 25 percent of the total cost of construction of the general navigation features attributable to dredging to a depth in excess of 20 feet but not in excess of 45 feet; plus 50 percent of the total cost of construction of the general navigation features attributable to dredging to a depth in excess of 45 feet;

c. Pay with interest, over a period not to exceed 30 years following completion of the period of construction of the project, up to an additional 10 percent of the total cost of construction of the general navigation features. The value of lands, easements, rights-of-way, and relocations provided by the non-Federal sponsor for the general navigation features, described below, may be credited toward this required payment. If the amount of credit 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 in excess of 10 percent of the total cost of construction of the general navigation features;

d. Provide all lands, easements, and rights-of-way, and perform or ensure the performance of all relocations determined by the Federal Government to be necessary for the construction or operation and maintenance of the general navigation features (including all lands, easements, and right-of-way, and relocations necessary for dredged material disposal facilities);

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

f. Provide, operate, maintain, repair, replace, and rehabilitate, at its own expense, 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. Shall not use funds from other Federal programs, including any non-Federal contribution required as a matching share thereof, to meet any of the non-Federal obligations for the project unless the Federal agency providing the Federal portion of such funds verifies in writing that expenditure of such funds for such purpose is authorized;

h. Shall prepare and implement a harbor management plan that incorporates best management practices to control water pollution at the project site and to coordinate such plan with local interests;

i. Comply with all 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 Par 24, in acquiring lands, easements, and rights-of-way required for construction or operation and maintenance of the general navigation features and the local service facilities, including those necessary for relocations, the borrowing of materials, or the disposal of dredged or excavated material and inform all affected persons of applicable benefits, policies, and procedures in connection with said Act;

j. 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 operating and maintaining the general navigation features;

k. 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;

l. Keep and maintain books, records, documents, or 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, or other

evidence are required, to the extent and in such detail as will properly reflect total costs of construction of the general navigation features, 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;

m. 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 substantial 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 *et seq.*);

n. 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), Public Law 96-520, as amended (42 U.S.C. 9601-9675), that may exist in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for construction or operation and maintenance of the general navigation features. However, for lands that the Federal Government determines to be subject to the navigation servitude, only the Federal Government shall perform such investigations 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;

o. Assume, as between the Federal Government and the non-Federal sponsor, complete financial responsibility for necessary cleanup and response costs of any hazardous substances regulated under CERCLA that are located in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for construction or operation and maintenance of the general navigation features;

p. To the maximum extent practicable, perform its obligations in a manner that will not cause liability to arise under CERCLA; and

q. 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 of 1986, Public Law 99-662, as amended (33 U.S.C. 2211), which provides that the Secretary of the Army shall not commence the construction of any water resources project, or separable element thereof, until each non-Federal sponsor has entered into a written agreement to furnish its required cooperation for the project or separable element.

The recommendations for implementing navigation improvements at St. George, 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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