St. George Environmental Assessment

Appendix B: Essential Fish Habitat Analysis

St. George, Alaska

US Army Corps of Engineers
Alaska District

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Acronyms

EFH	Essential Fish Habitat
NMFS	National Marine Fisheries Service
USACE	United States Army Corps of Engineers
CFR	Code of Federal Regulations
WRDA	Water Resources Development Act
PED	Preconstruction Engineering and Design
USC	United States Code
MLLW	Mean Lower Low Water
CY	Cubic Yards
MPRSA	Marine Preservation, Research, and Sanctuaries Act
BKC	Blue King Crab
NOAA	National Oceanic and Atmospheric Administration
USFWS	United States Fish and Wildlife Service
AMNWR	Alaska Maritime National Wildlife Refuge
SL	Source Level
hp	Horsepower
dB	decibel
ADFG	Alaska Department of Fish and Game
IFR	Integrated Feasibility Report
WOUS	Waters of the United States
FMP	Fishery Management Plan
kW	kilowatt

1.0 INTRODUCTION

The 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act set forth the essential fish habitat (EFH) provision to identify and protect important habitats of federally-managed marine and anadromous fish species. Federal agencies that fund, permit or undertake activities that may adversely affect EFH are required to consult with the National Marine Fisheries Service (NMFS) regarding the potential effects of their actions on EFH and respond in writing to NMFS recommendations.

EFH is defined as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. “Waters” include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate. “Substrate” includes sediment, hard bottom, structures underlying the waters, and associated biological communities.

Upon completing the U.S. Army Corps of Engineers’ (Corps’) EFH-coordination with the NMFS, the Corps will incorporate its EFH evaluation and findings and NMFS conservation recommendations (if any) into the project’s environmental assessment.

In June 2019, the Alaska District organized a benthic survey to the project area to collect information on the nature of the substrate, benthic and demersal ecology, and water column in the dredged material placement area, breakwater footprint, and dredge prism. The data collected in the June 2019 biological surveys were incorporated into this analysis and the Integrated Feasibility Report (IFR) and used in conjunction with literature reviews and other remote data collection methods to draw conclusions regarding the potential impacts associated with the Alaska District’s proposed action.

The Alaska District is evaluating the construction features and placement of dredged materials in waters of the United States (WOUS) under the Clean Water Act 404(b)1 Guidelines for Specification of Disposal Sites for Dredged or Fill Material. Additional information regarding the proposed project’s impacts to WOUS are found in the 404(b)1 assessment appended to the IFR.

2.0 PROJECT PURPOSE

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 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 limits opportunities for safe access and moorage to the current fleet. Both these conditions reduce subsistence opportunities and impacts the 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) 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 of $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. 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 monetary income and access the resources needed to engage in subsistence activities. The hindering of economic opportunities in the community would continue, and the costs of basic essential goods required to support a subsistence lifestyle would remain prohibitively high without a safe and functioning harbor.

Oppressive economic conditions contribute to continued out-migration from St. George. Inadequate attendance resulted in closure of the school following the 2016/2017 school year when enrollment fell below minimum thresholds for State funding. Similar phenomena have recently occurred in the remote Alaskan communities of Adak, Rampart, and Clarks Point. St. George has taken steps including implementing a distance learning program for children remaining on the island, assuming upkeep and maintenance of the school, and recruitment of families to the island to ensure that the school is in position to reopen if enrollment again surpasses that minimum threshold. Economic opportunities that a safe and functioning harbor could provide continues to be the missing component.

3.0 PROJECT 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

4.0 PROJECT AREA

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 near 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 independently, the islands are ecologically significant and are known 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 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.

The city of St. George is in the Aleutians West Census Area and had a population of 102 at the 2010 census. The city's location is in a small bight on the north shore of St. George Island. The surrounding topography is fairly steep, rising to 200' within a half-mile of the coast. A mile inland the elevation increases dramatically, going from 400' to 600' above sea level in just about 600 horizontal feet. St. George Island is treeless, like most of the Aleutian and Pribilof Islands. The vegetation is dominated by plants in the heath family, which are well adapted for the poor acidic soils found in the Pribilof and Aleutian Islands. The cold waters of the Bering Sea control the climate of St. George. The maritime location results in cool weather year-round, and a narrow range of mean temperatures varying from 24 to 52. Average precipitation is 23 inches, with 57 inches of snowfall. Cloudy, foggy weather is common during summer months.

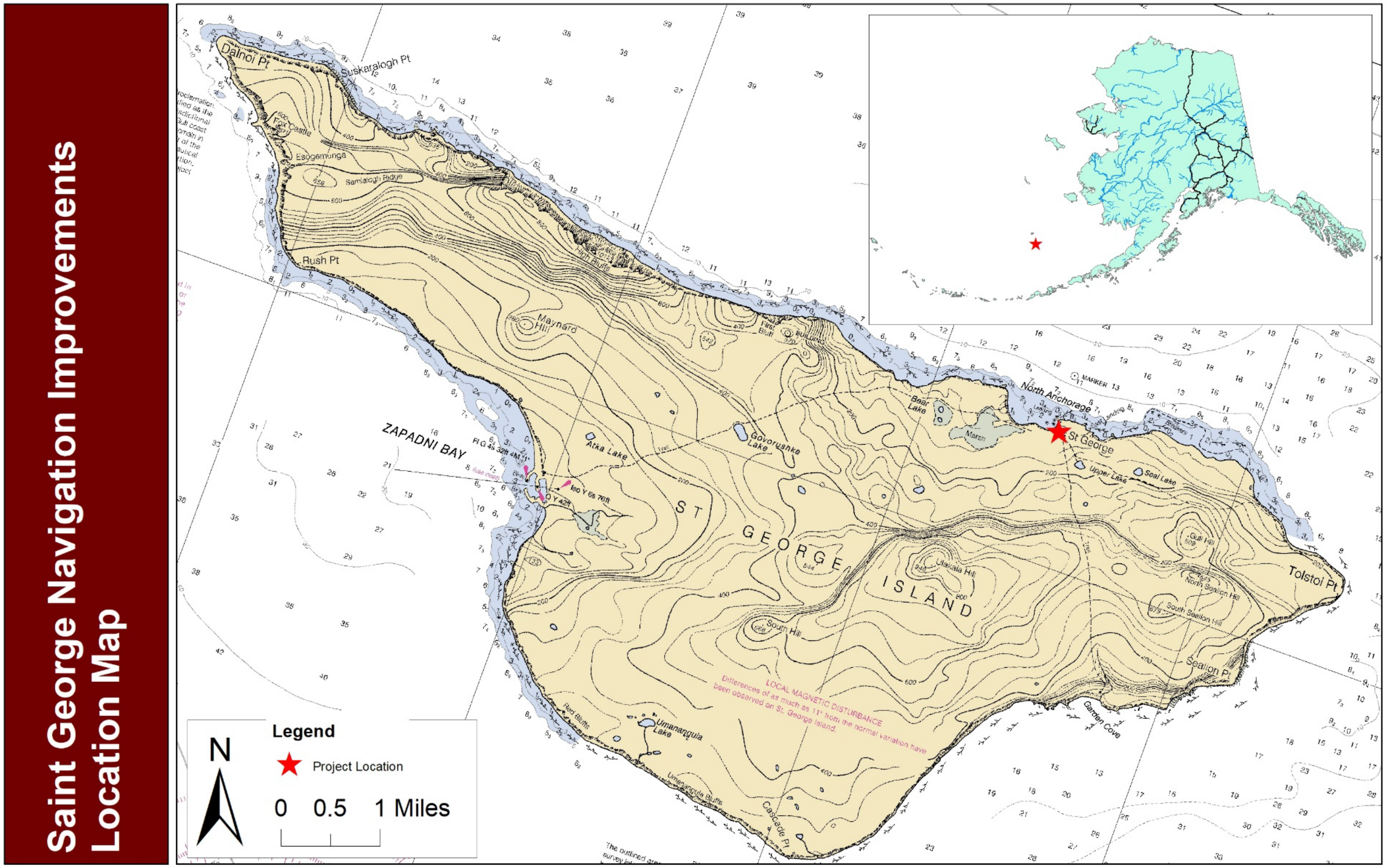

Figure 1. St. George Navigation Improvements Location Map

5.0 PROJECT DESCRIPTION

The Alaska District (District) proposes to construct a port facility on the north side of St. George Island. This project would consist 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 3.55 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. (Figure 2)

The north breakwater would require approximately 85,000 cubic yards (CY) of armor stone, 54,000 CY of B rock and 80,000 CY of core rock. The stub breakwater would require 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 would require the 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. The sediments removed from the mooring basin and navigation channel would be placed in ocean waters north of the project area. The placement would be designed to create habitat for blue king crab. The District has identified a suitable dredged material placement location approximately 1 mile offshore (Figure 3).

The material source for breakwater construction would be offsite from an established quarry such as Cape Nome or Granite Cove on Kodiak Island. 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. Initial observations of the site indicated that blasting is likely to be required for dredging; this may require special scheduling considerations due to the proximity of the fur seal rookery. Scheduled delays could be incurred due to the presence of marine mammals near the blasting zone during dredging operations. Dredging would produce relatively low levels of impacts, considering appropriate mitigation measures, than blasting and could likely occur throughout the year. Some dredging prior to constructing the breakwaters would provide access for construction barges to the breakwater sites. The total estimated duration of construction is three to five years.

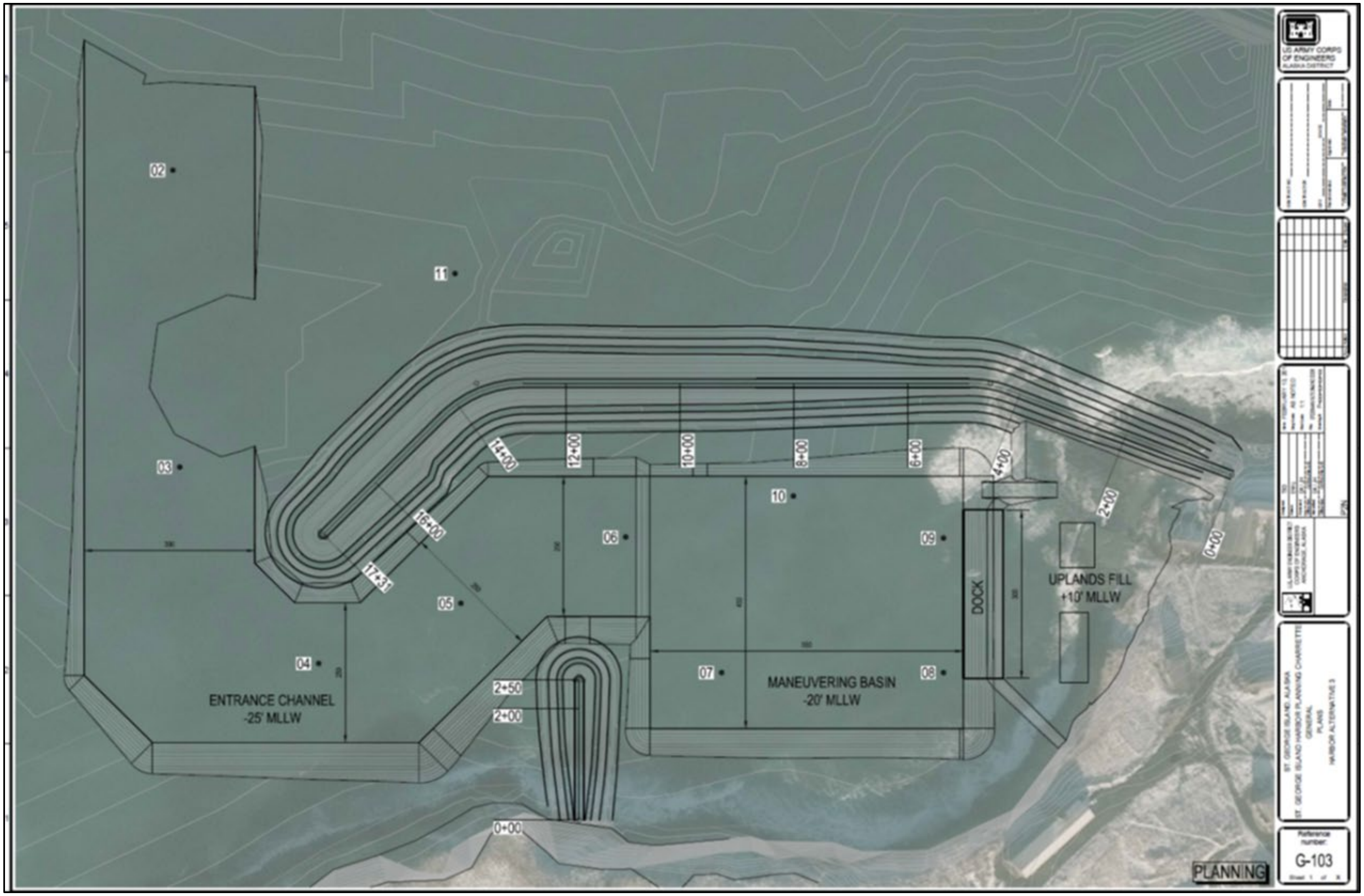

Figure 2. St. George Navigation Improvements Project Features Concept Drawing

The District assumes the breakwater foundations located at the North Anchorage Harbor site would most likely consist of relatively thin layers of medium dense to dense sediments consisting of coarse-grained soils with cobbles and boulders. The depth to bedrock may vary greatly, but for evaluation purposes it was assumed bedrock would be within 10-feet of the seafloor since the proposed breakwater alignments are close to shore.

The proposed North Anchorage Harbor entrance channel and maneuvering basin are planned to be dredged to a depth of -25 feet and -20 feet MLLW, respectively. The thickness of sediment and depth to bedrock is unknown within the proposed harbor entrance channel and maneuvering basin. For estimating purposes, the District anticipates bedrock would be encountered near the surface, three feet or less, within the south side of the entrance channel and maneuvering basin. The thickness of surface sediment may gradually get thicker as the entrance channel moves north away for the shoreline. Drilling and controlled blasting of bedrock would be required within the navigation channel and harbor basin before material can be mechanically dredged by clamshell or long-reach excavator. Dredge cuts in the surface sediment can be assumed to be stable at slopes of 1.5 horizontal to 1 vertical. Dredge cuts in bedrock may be cut at slopes of 0.25 horizontal to 1 vertical.

The weather would strongly influence timing of the dredging and marine construction. The exposure of the site and Pribilof Islands in general places seasonal constraints on constructability. Winter construction is currently considered infeasible due to weather, leaving the summer and shoulder seasons as the only realistic times of the year for marine construction.

Environmental windows to reduce the proposed project's impacts on marine mammals would further restrict the construction timing. The District's Endangered Species Act (ESA) and Marine Mammal Protection Act (MMPA) consultation would develop the final work avoidance windows; but given the proximity to fur seal rookeries and the abundance of marine mammal usage in the area, a prohibition on blasting between mid-August and November is likely to be imposed as mitigation. Additional windows to protect nesting birds may be incorporated into the final project design. Seabird nesting in cliffs and burrow colonies occurs between 15 May and 15 September in the Pribilof Islands

The construction material would likely be delivered to St. George Island in the summer before construction to avoid the worst part of the year for weather impacts. The blasting would be conducted before the environmental windows to minimize impacts to biological resources. Drilling is expected to last 488 days, and blasting is expected to last 369 days. These durations would be distributed across the five-year construction schedule.

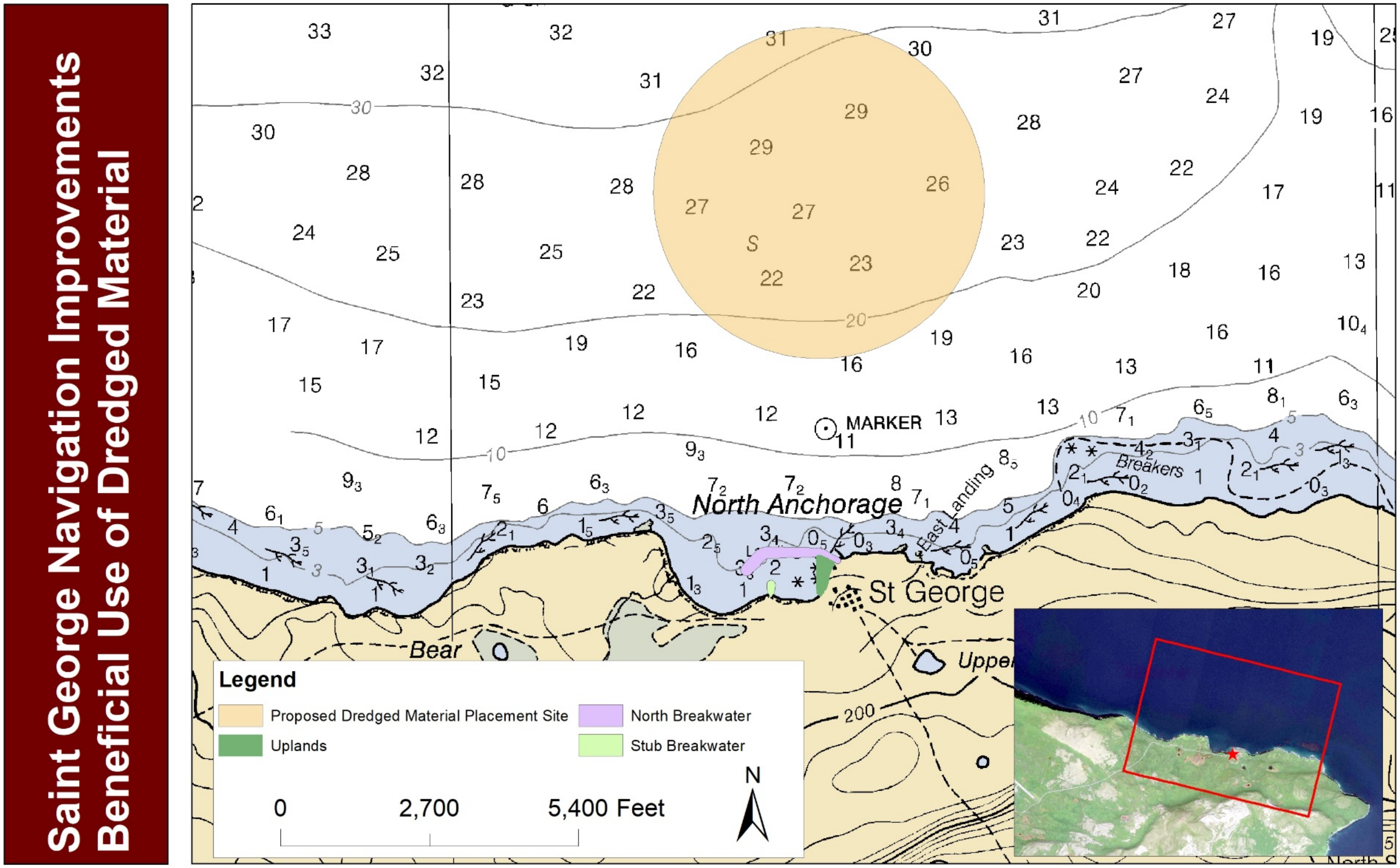

Figure 3. St. George Navigation Improvements Project Features with Respect to Habitat Creation Reef Site

6.0 ESSENTIAL FISH HABITAT

6.1 Federally Managed Species in the Project Area

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 National Oceanic and Atmospheric Administration (NOAA) NMFS on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH.

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.

The species list generated by the National Marine Fisheries Service's essential fish habitat (EFH) mapping tool for the Pribilof region was used to generalize marine fish diversity in the nearshore waters of St. George Island. USACE conducted vessel-based fisheries surveys in June of 2019 utilizing crab pots and underwater video collection methodologies, seas at that time were too rough to attempt trawl surveys. Figure 4 depicts the survey stations with respect to depth and the bounds of the survey area. USACE biologists identified the zone of dredged material placement siting feasibility by considering the economically viable transport distance, sensitive habitat areas, nature of the substrate, bathymetry, intensity of vessel traffic, and other factors. Pot survey stations were distributed within the zone of siting feasibility in order to capture relevant data from a representative range of depths and substrate types.

The USACE also collected benthic video from the survey area to contribute to the body of knowledge regarding the local benthos. The video revealed very low habitat complexity and biotic diversity. Some areas were home to a handful of sand dollars and hermit crabs, and there was evidence of marine snail habitation (egg cases);otherwise, the area appears desolate.

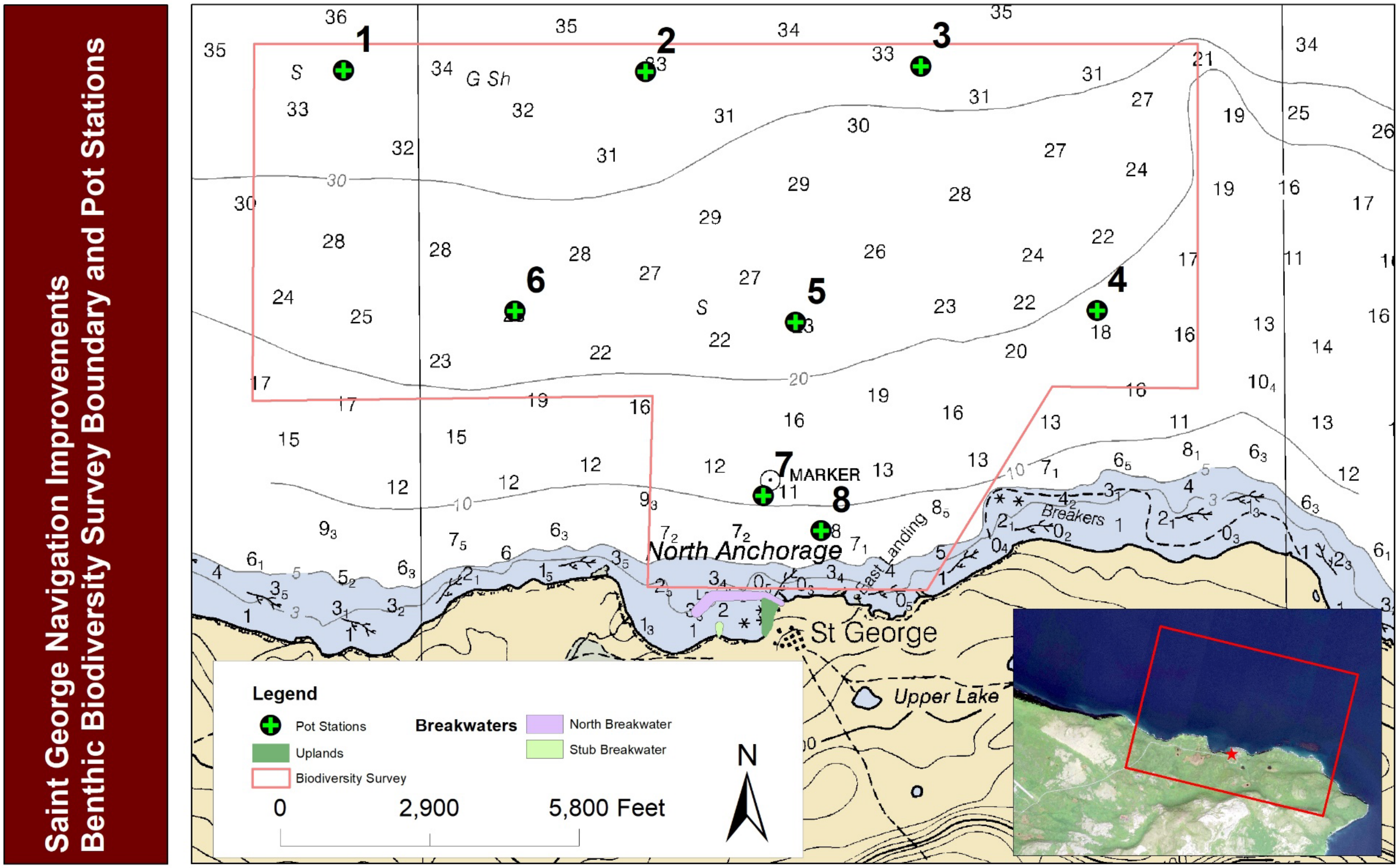

Figure 4. June 2019 USACE Biodiversity Survey Pot Stations

USACE's pot surveys proved to be indeterminate; only a single species of finfish was encountered in the crab pots and again captured on video, the yellow Irish lord (*Hemilepidotus jordani*), sculpin common to the region. The results of the pot sampling are displayed in Figure 4 and Figure 5. USACE biologists also did not conduct seine surveys at the beach areas of Village Cove, as the substrate is far too rocky to sample effectively. While conducting intertidal habitat observations in early June2019, USACE biologists encountered two deceased smooth lumpsuckers (*Aptocyclus ventricosus*) in the wrack near the high tide line on the sandy beach areas of Village Cove.

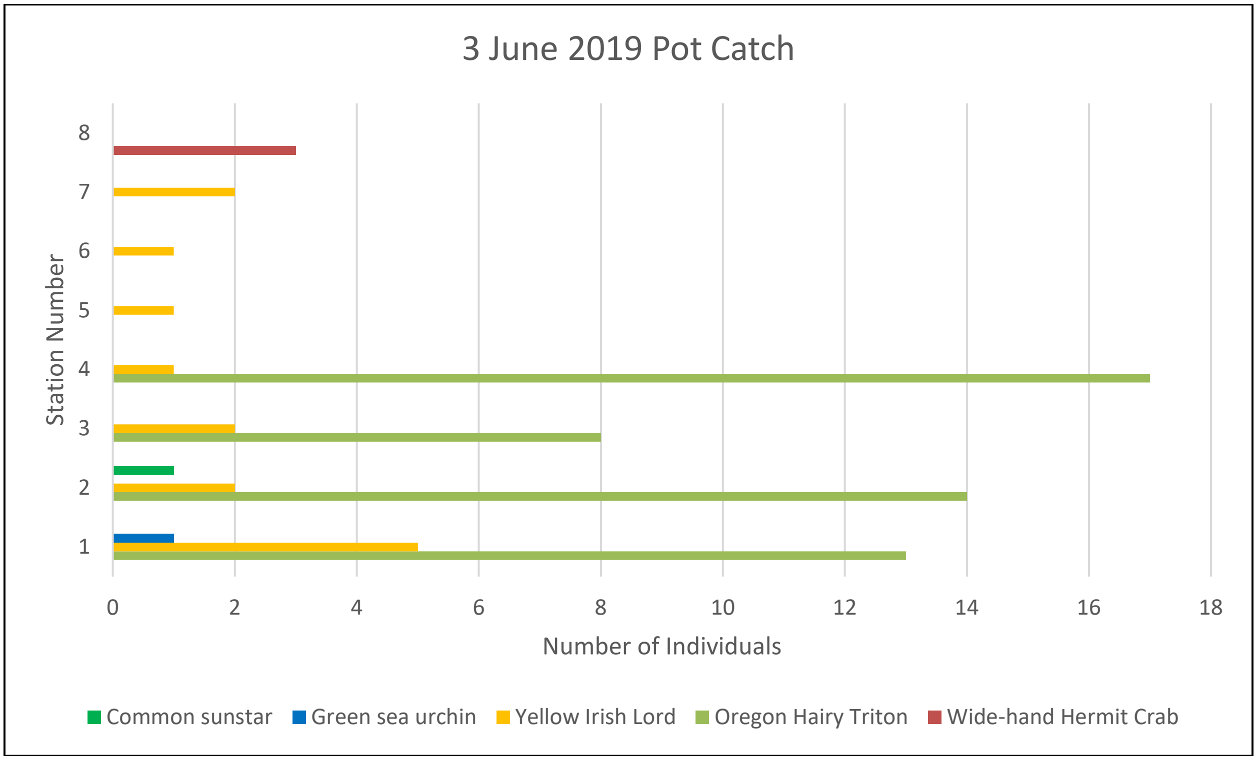

Figure 5. 3 June 2019 Pot Catch Results

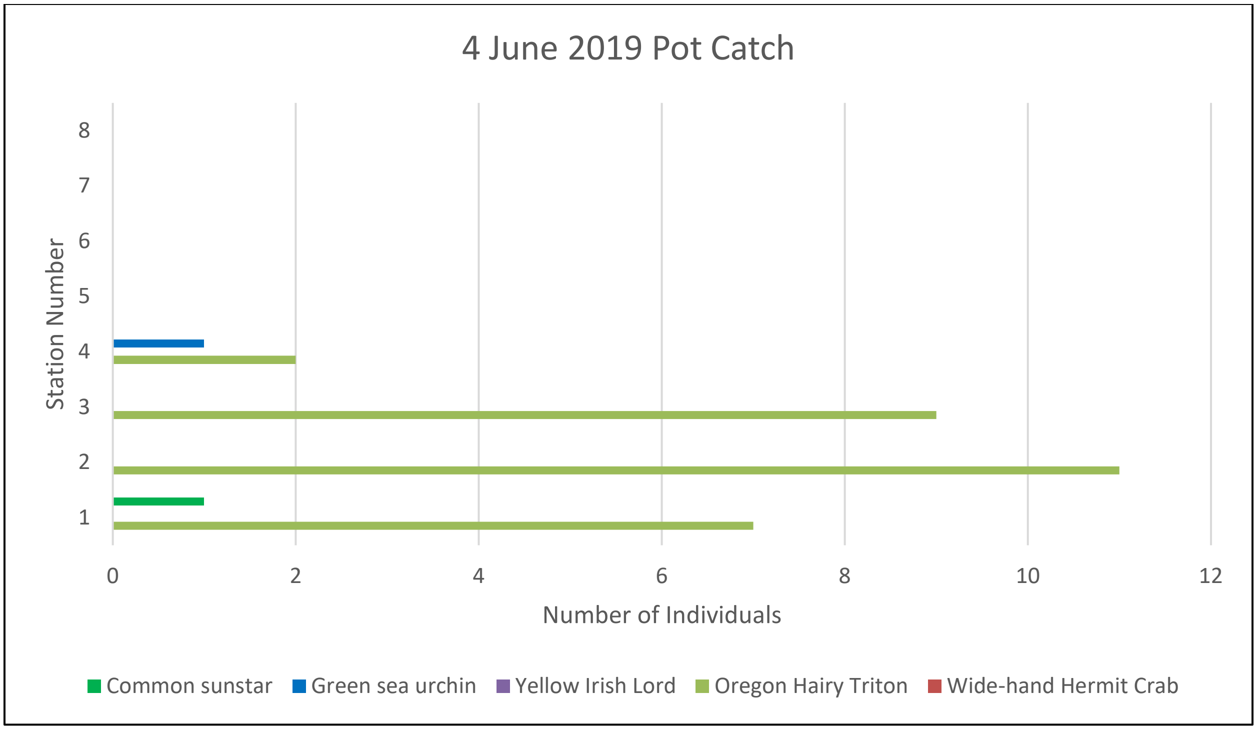

Figure 6. 4 June 2019 Pot Catch Results

According to the NMFS EFH habitat mapping tool, the following marine fish species are managed under the Groundfish of the Bering Sea Aleutian Islands (BSAI) Fishery Management Plan (FMP), the FMP for the Salmon Fisheries in the EEZ Off Alaska and are indicated as potentially occurring within the various habitat types occurring in the marine waters in close proximity to the Pribilof Islands:

- Alaska plaice (*Pleuronectes quadrituberculatus*)
- Alaska skate (*Bathyraja parmifera*)
- Aleutian skate (*Bathyraja aleutica*)
- Arrowtooth flounder (*Atheresthes stomias*)
- Atka mackerel (*Pleurogrammus monopterygius*)
- Bigmouth sculpin (*Hemitripterus bolini*)
- Dover sole (*Microstomus pacificus*)
- Dusky rockfish (*Sebastes ciliatus*)
- Flathead sole (*Hippoglossoides elassodon*)
- Great sculpin (*Myoxocephalus polyacanthocephalus*)
- Kamchatka flounder (*Atheresthes evermanni*)
- Northern rock sole (*Lepidopsetta polyxystra*)
- Northern rockfish (*Sebastes polyspinis*)
- Pacific cod (*Gadus macrocephalus*)
- Pacific ocean perch (*Sebastes alutus*)

- Rex sole (*Glyptocephalus zachirus*)
- Rougheye rockfish (*Sebastes aleutianus*)
- Sablefish (*Anoplopoma fimbria*)
- Southern rock sole (*Lepidopsetta bilineata*)
- Walleye Pollock (*Gadus chalcogrammus*)
- Yellow Irish lord (*Hemilepidotus jordani*)
- Yellowfin sole (*Limanda aspera*)
- Greenland Turbot (*Reinhardtius hippoglossoides*)
- Chinook salmon (*Oncorhynchus tshawytscha*)
- Chum salmon (*Oncorhynchus keta*)
- Pink salmon (*Oncorhynchus gorbuscha*)
- Sockeye salmon (*Oncorhynchus nerka*)
- Coho salmon (*Oncorhynchus kisutch*)

USACE conducted nearshore subtidal and nearshore inter-tidal surveys for marine invertebrates in early June of 2019. Nearshore subtidal surveys were conducted via vessel deployed crab pots and underwater videography. Nearshore intertidal surveys were conducted on foot at low tide along the beach areas of Village Cove. Eight individual crab pots were baited, deployed, and allowed to fish for approximately twenty hours. After twenty hours, the recovered crab pots had its contents processed, rebaited, and redeployed. The crab pots were allowed to fish for another approximate twenty-hour period. At which point the recovered crab pots had their contents processed and then stowed on deck. Four species encountered while employing crab pot sampling methodology were marine invertebrate. The most commonly encountered marine invertebrate was the Oregon hairy triton (*Fusitriton oregonensis*) n=64, followed by common Sunstar (*Crossaster papposus*) n=3, Widehand hermit crab (*Elassochirus tenumanus*) n=3, and green urchin n=2, respectively. No encounters of commercially relevant species of marine invertebrate while employing crab pot sampling methodology occurred. Marine invertebrates that are commercially relevant or that derive habitat protections under the BSAI FMP include blue king crab (*Paralithoides platypus*), red king crab (*Paralithoides camtschaticus*), tanner crab (*Chionoecetes bairdi*), and octopus (*Enteroctopus dofleini*).

Benthic invertebrates were notably absent in areas that displayed rapidly moving currents and along the sand wave-type substratum. There were tube worm casings in places where the substrate was mud or sandy mud. Also observed along the sandy mud substrate were two varieties of anemones (*Metridium farcimen*) and another variety not identified to genus. Invertebrate diversity increased once the substrate began to transition to shell hash and rocky reef. Also, there were various hermit crabs, sponges, scallops, green urchins, common Sunstar, and chitons. Video quality was not robust enough to identify smaller organisms to species.

Intertidal marine invertebrates observed during USACE's survey included blue mussels (family *Mytilidae*), limpets, chitons, various small snails, green urchins, giant green anemone (*Anthopleura xanthogrammica*), and barnacles.

6.2 Nature of the Substrate in the Project Area

The Alaska District will collect more detailed information regarding the geotechnical and bathymetric conditions of the proposed discharge site during the Preliminary Engineering and Design (PED) phase of the project if the project is selected to advance to that stage. In the absence of detailed information, this analysis will rely on remote sensing and form some assumptions regarding the generic conditions.

The North Breakwater, Stub Breakwater, uplands, and boat launch would be constructed in the bight forming North Anchorage next to the city of St. George. One of the primary reasons of city's establishment in this location is due to the North Anchorage bight being the most enclosed section of coastline on the north shore of St. George Island. The marine sediments in the bight are presumably basaltic bedrock overlain by sands, gravels, shell hash, cobbles, and boulders. The presence of the bight forms an area of relative protection from wave energy, so the sediments in the bight are likely dominated by a smaller grain size than the surrounding, more exposed area by virtue to the reduced energy allowing relatively fine grain material to be deposited (Figure 6).

Bathymetric surveys have not been completed in the project location, but the nautical chart for the area indicates that water depths range from about 6' to about 22' in the areas where the breakwaters would be constructed. The uplands construction would be an area that is fouled with boulders and currently inaccessible to navigation. Cobble dominates the low intertidal area, and there are areas of sand in the back-beach (Figure 5). Various macrophytes, including dragon kelp, colonize the low intertidal and subtidal areas. . There are no known areas of rooted aquatic vegetation.

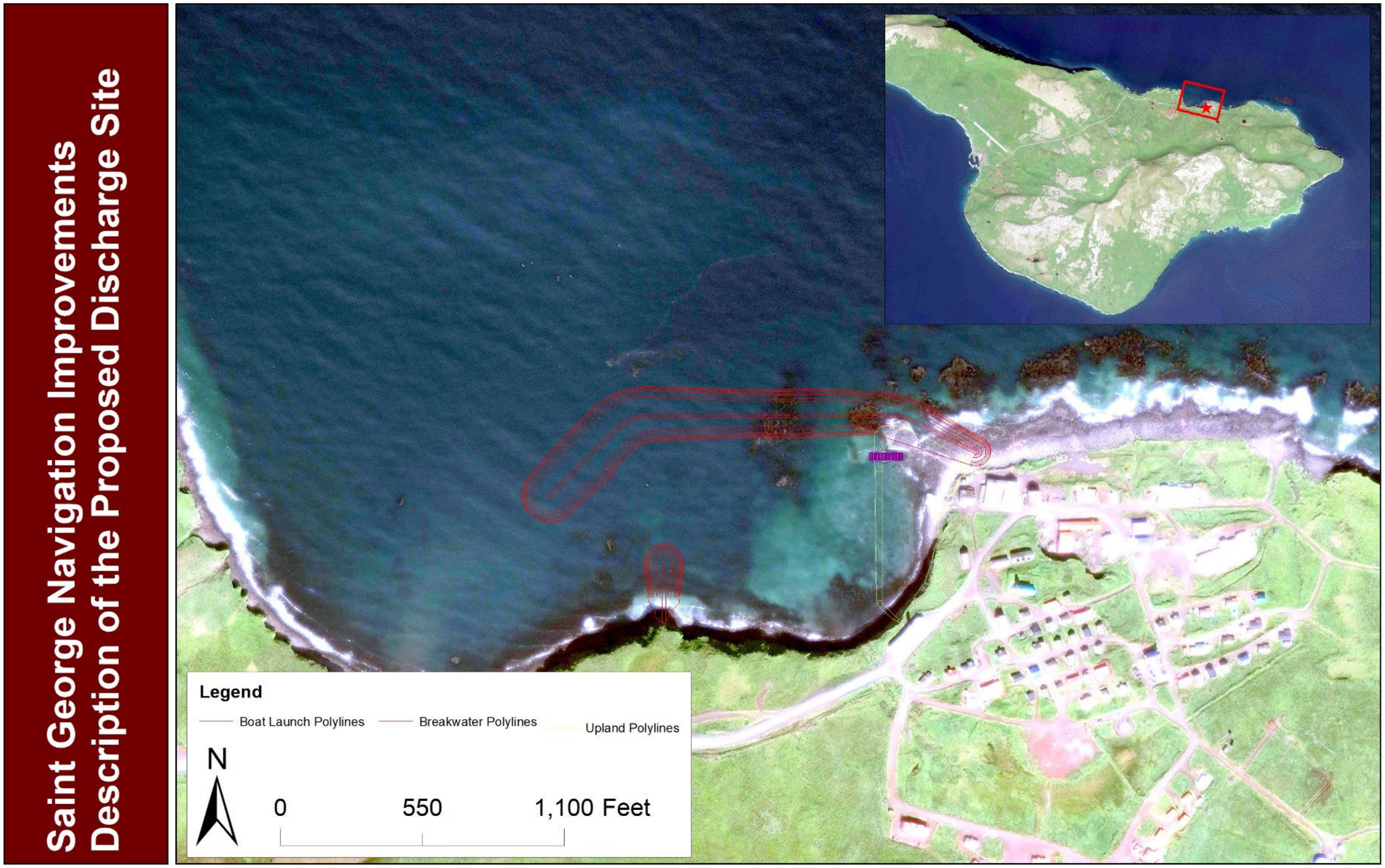

Figure 7. Description of the Proposed Discharge Site

6.3 Nature of the Substrate in the Placement Area

Geotechnical data has not been collected for the dredged material placement area, but the USACE biodiversity survey in June 2019 included a substantial benthic videography component. Nautical chart of 1638 describes the nature of the substrate from within the tentatively identified placement area as sandy. There are areas of gravel and shells identified on the chart outside of the bounds of the placement area. The USACE biodiversity survey corroborated the descriptions from the nautical chart.

Video from the June 2019 camera surveys indicate the majority of the substrate in the placement area is sand. The sand appears to be fairly dark in color and contains light-reflecting particles. Considering the properties of the sand in the video, it is likely that the olivine rock that forms the island of St. George is the parent material, and the mechanical weathering of the rock produced the sand throughout several millennia since the island was thrust forth from the sea. The surface of the sand is configured in waves and appears to be dominated by fairly large-sized particles. There is no visible plume emanating from the impact of the camera on the seafloor, which indicates that small-sized particles have been washed from the area by ocean currents or hydrodynamic conditions have never allowed the precipitation of small-sized particles.

Areas of variable shell litter density exist throughout the proposed placement area, and there are areas with multiple sand dollars inside the field of view concurrently. In general, the area surveyed by the USACE benthic video team appears to be a relatively featureless expanse of gradually sloping subaqueous plains.

7.0 ASSESSMENT OF POTENTIAL PROJECT IMPACT ON ESSENTIAL FISH HABITAT

Per the 1996 amendments to the MSFCMA, USACE has initiated consultation and coordination with the NMFS regarding the potential effects of the recommended plan action on EFH. Impacts from implementation of project alternatives would result in short-term or minor alterations of EFH for marine species and species such as rockfish, flatfish, gadids, salmonids, and crabs. These alterations would include temporary increases in turbidity in the future harbor location during dredging and in the placement area during discharge, as well as noise and elevated anthropogenic activity levels related to construction.

Substantial permanent impacts would also be realized from the dredging and placement of dredged material in the placement area. The bottom composition in the placement area would become more complex due to the placement of cobble and boulders, creating refuge and additional habitat for forage species. The bottom composition in the harbor area would become homogenized as the dredging creates uniform basins at the project design depth. The construction of the breakwaters would alter hydrodynamic conditions and increase the vertical surface area.

The types of impacts that would possibly affect EFH species/species complexes (five Pacific salmon species, the sculpin complex, flatfish, rockfish, crabs, and forage fish) known or highly likely to occur within the project area are described as discrete project components and separated into short-term and long- term impacts.

7.1 Transitional Dredging

Transitional dredging would have little direct effect on mature fish inhabiting the project area, as their mobility allows them to avoid construction activities (e.g., mechanical dredging, generated turbidity, vessel movements, and underwater construction noise). No long-shore movements of juvenile fish would be disrupted by maintenance dredging.

7.1.1 Short-term impacts

Short-term impacts include: direct mortality to some sessile organisms, or those without the means to evade, through smothering or crushing; water quality impacts in the form of temporarily increased levels of turbidity resulting from dredging; noise disturbance from operation of heavy equipment, cranes, or barges; disturbance from increased construction-related workboat traffic in the project area and along supply routes; and a temporary increase in waterborne noise from the excavation of harbor sediments and operation of equipment including boats, barges, and support vessels.

Direct Mortality. Transitional dredging has the potential to entrain, displace, injure, smother, and kill demersal and benthic organisms. The probability of injury, impact, or death is inversely related to the affected taxon's mobility; i.e., a sessile animal is more likely to be impacted than a motile organism because the sessile organism lacks the ability to move away from the dredge or placement area as the disturbance occurs. Crabs and, to a lesser extent, shrimp would be more susceptible to impact than flatfishes, which would, in turn, be more vulnerable than demersal fishes like sculpin and cod.

The construction project area is likely sparsely populated with some sea urchins and anemone, which would almost certainly be killed by the dredge; but otherwise mostly devoid of marine life. The project area is considered to be very poor in terms of fish/shellfish productivity by the local populace, and the results of the June 2019 research pot fishing event corroborate that characterization. Results from the June biodiversity survey are displayed in Figure 5 and Figure 6. The immediate direct impact on FMP species from dredging is negligible, but there would likely be a short term impact on the forage taxa of FMP species.

Water Quality Impacts. Transitional dredging would result in temporarily elevated concentrations of suspended sediment as fine-grained particles are disturbed by the dredge and released as the bucket is drawn up through the water column. The sediment in the project area is believed to be uncontaminated by anthropogenic pollutants based on the site history and physical characteristics of the material. There are no known sources of contamination present in the project area; i.e., no industrial facilities, refueling stations, antifouling agent operations, pulp mills, or other risk factors have ever been sited near the proposed project location. The material that would be dredged is consolidated olivine that predates the Industrial Revolution and has never been exposed to pollutants. The substrate is not considered to be a carrier of contaminants because it is predominantly coarse and contains little to no organic material.

The sole water quality consideration is the temporary elevation of turbidity in the immediate project area, but the water velocity in the area is great enough that any increases in turbidity would be quickly diluted to below perceptible levels. There are no vegetated shallows or other sensitive habitat areas in the vicinity that would be negatively impacted by the ephemeral increase in localized apparent turbidity.

Juvenile salmon have been shown to avoid areas of high turbidities (Servizi 1988), although they may seek out areas of moderate turbidity (10 to 80 NTU), presumably as refuge against predation (Cyrus and Blaber 1987a and 1987b). Feeding efficiency of juveniles is impaired by turbidities in excess of 70 NTU, well below sublethal stress levels (Bisson and Bilby 1982). Reduced preference by adult salmon homing to spawning areas has been demonstrated where turbidities exceed 30 NTU (20 mg/L suspended sediments). However, Chinook salmon exposed to 650 mg/L of suspended volcanic ash were still able to find their natal water (Whitman et al. 1982).

Based on these data, it is unlikely that short-term (measured in hours based on tidal exchange frequency), and localized elevated turbidities generated by the proposed action would directly affect EFH juvenile or adult salmonids and EFH groundfish, such as flatfish, sculpins, and rockfish that may be present. Potential impacts would be further minimized by conducting all in-water work within approved regulatory.

Elevated Activity and Noise. Transitional dredging would result in temporary increases in the amount of anthropogenic activity and underwater noise in the project area during construction and after construction is completed, due to the presence of a harbor where there had previously been a semi-enclosed bight and austere landing area.

The USACE would employ a mechanical dredge, likely a clamshell dredge, to excavate virgin sediment to the project depth of -25 feet MLLW for the entrance channel and -20 feet MLLW for the turning basin. The dredged material from these navigation features would be placed in the nearshore region north of the project location for the construction of the BKC reef, requiring the operation of a tug and scow to transport dredged material from the project location to the placement area.

Mechanical dredges are relatively stationary, so the noise source would not move around during dredging. The dredge plant would excavate sediment and place the material on a barge for transportation to the placement location. The barge would only be capable of traveling about 8 knots, which would produce a relatively constant, low-frequency noise.

Bucket dredging noise can be delineated into six distinct events to complete a single cycle. These events are repeated every time the bucket is deployed and retrieved. The first event is winch noise as the boom and bucket are swung into position, and the bucket is lowered. The bucket striking the water surface creates a splash noise detectable at short distances. The second event is the noise of the bucket striking the sediment surface. This is followed by the noise of the bucket closing and capturing the dredged material. The fourth event is the noise of the bucket jaws contacting each other. The bucket is raised by the winch, creating the fifth noise. The sixth and final noise of the cycle is the sound of the material being dumped into the scow. The amplitude of the second, third, and sixth event are strongly influenced by the granularity of the sediment that is being excavated. Coarse material produces for powerful sounds than fine material. Winching noise is produced at a higher frequency than the other event noises, so it attenuates more quickly. Bucket dredging is classified as a repetitive class of sound, rather than continuous.

Clark, et al., recorded the clamshell dredge Viking dredging sand and gravel from Cook Inlet in 2001. The Viking is a 1,475 hp clamshell dredge with an 11.5-cubic meter bucket. Clark recorded sounds digging sounds between 113-107 dB at distances of 158-464 meters from the source, respectively. Assuming a transmission loss coefficient of 15 for the practical spreading calculation, a received level of 113 dB at a range of 158 meters indicates an SL of 146 dB. The same calculation using a received level of 107 dB at a range of 464 meters indicates an SL of 147 dB.

The equipment used to dredge the St. George Harbor navigation channel and turning basin would be similar in scale to the Viking and could be assumed to generate noise of a similar amplitude. The St. George dredging would likely produce more powerful sounds due to the coarser grain-size sediment that would be excavated, but it would be difficult to predict how much more powerful the sounds would be. Therefore, it is appropriate to state that the amplitude of the sounds produced by dredging near Cape Blossom would be equal to or greater than the amplitude of the sounds produced by the Viking dredging in Cook Inlet.

Assuming a source level (SL) of between 146-147 dB, the dredging noise would be below 180 dB at the source, which is below the Alaska Department of Fish and Game (ADFG) reporting threshold for hydroacoustic monitoring in fish-bearing waters. The sound would attenuate to 120 dB between 54-63 meters from the source. The area inside the 120 dB isopleth is thought to be of low-quality fish habitat based on the Corps' June biodiversity survey, and the impacts of underwater noise on FMP species from dredging is negligible. The transportation of dredged material to the placement location would produce sounds of similar amplitude and would also result in negligible impacts on FMP species.

7.1.2 Long-term impacts

The dredging of the entrance channel and turning basin would create a relatively uniform depth within the dredge prism and uncover in-situ bedrock. This would present a permanent alteration of the habitat inside the dredge prism, changing the areas with sandy substrate to bare rock. The presence of a breakwater would likely prevent sand from infilling the basin, so the alteration of the nature of the substrate is expected to be permanent. The dredging would facilitate consistent vessel access to the new harbor and increase the amount of anthropogenic activity in the area.

Substrate Alteration. The areas within the entrance channel and turning basin dredge prism appear to be mixed sandy and rocky substrate types (Figure 7). Nearshore sandy areas may provide habitat for flatfishes, sculpins, and the forage fish complex. The conversion of these sandy areas to bare rock may reduce the suitable habitat for taxa adapted for life in sandy environs, but increase the habitat available for invertebrates requiring hard attachment substrate and finfish that require crevices and bare rock.

Increased Activity. The presence of a harbor on the north shore of St. George Island would increase the amount of general disturbance to the aquatic environment due to an increase in the number and size of the vessels that call on the area. There would likely be refueling and boat maintenance activities in the harbor area as well, which would increase the potential for fuel, oil, and other hazardous material spills. There are no known sensitive habitat areas that would be exposed to the impacts of increased activity in the immediate vicinity. The operation of the harbor would be subject to best management practices associated with spill prevention and cleanup, reducing the likelihood and impacts of a potential spill.

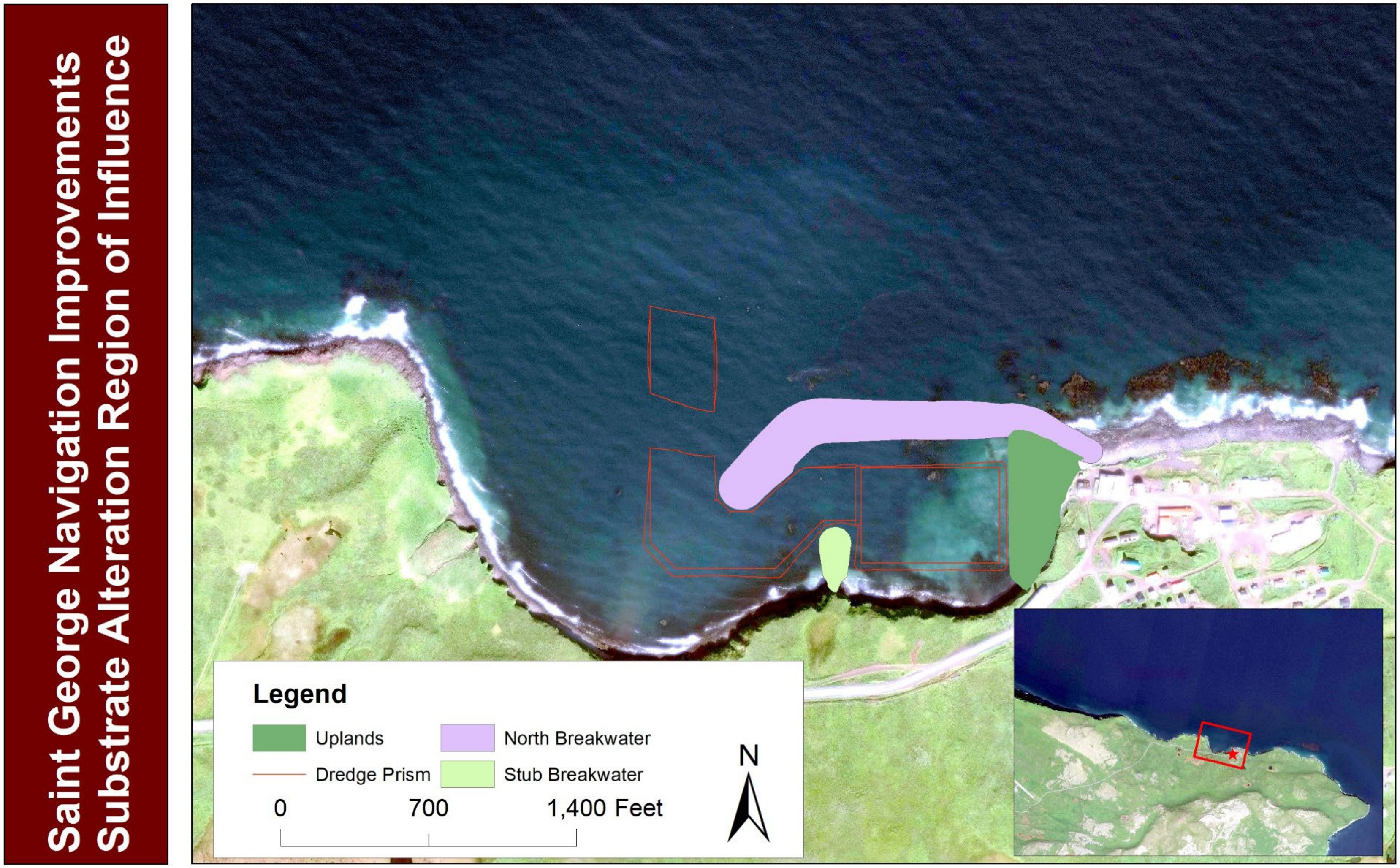

Figure 8. Substrate Alteration Region of Influence

7.2 Dredged Material Placement

Fine-grain material released from the dredge scow would be dispersed and have no measurable impact on the bottom habitat. The sediment plume disturbed by the impact of the cobble and boulder material would be of the same nature as the surrounding area. There would also be short-term impacts on forage fish that are important prey for species with designated EFH. Permanent impacts on the nature of the substrate offshore would be presented by the placement of dredged material.

7.2.1 Short-term impacts

Direct Mortality. The placement of dredged material has the potential to entrain, displace, injure, smother, and kill demersal and benthic organisms. The probability of injury, impact, or death is inversely related to the affected taxon's mobility; i.e., a sessile animal is more likely to be impacted than a motile organism because the sessile organism lacks the ability to move away from the placement area as the disturbance occurs. Crabs and, to a lesser extent, shrimp would be more susceptible to impact than flatfishes, which would, in turn, be more vulnerable than demersal fishes like sculpin and cod.

The placement area is sparsely populated with marine snails, sculpins, and some urchins, some of which would almost certainly be killed by the placement. The placement area is considered to be very poor in terms of fish/shellfish productivity by the local populace, and the results of the June 2019 research pot fishing event corroborate that characterization. Results from the June biodiversity survey are displayed in Figure 5 and Figure 6. The immediate direct impact on FMP species from placement is negligible, but there would likely be a short term impact on the forage taxa of FMP species.

Water Quality. Turbidity would temporarily increase in the vicinity of the placement area as the sediment is released from the scow; but the depth of the water, energetic nature of the hydrodynamic environment, and substantially similar nature of dredged material and placement area substrate ensure the turbidity impacts to water quality would be temporary and insignificant. All dredged material that would be placed on the reef is exempt from chemical testing and determined to be suitable for in-water placement in accordance with the Alaska District's 404(b)1 analysis. The Alaska Department of Environmental Conservation has determined that an Anti-Degradation Analysis for the proposed project is not warranted due to the low level of potential impact to water quality.

Waterborne Noise. Waterborne noise would result from construction activities, such as the noise generated directly by work vessels (propulsion, power generators, on-board cranes, etc.) or by activities conducted by those vessels (e.g., clamshell dredging and placing material into the barge).

Underwater noise or sound pressure from construction activities can have a variety of impacts on marine biota, especially fish and marine mammals. The most adverse impacts are associated with activities like underwater explosions and impact pile driving that produce a sharp sound through the water column (Hastings and Popper, 2005). However, in-water activities associated with the

Corps' proposed dredging (e.g., work vessel traffic and operation) do not have the potential to generate the type and intensity of sound pressures that would result in adverse impacts to fish. At levels of sound resulting from the work activities anticipated, the primary reaction of EFH fish species/species complexes is expected to be simply a movement away from the work area. Groundfish species such as flatfish, rockfish, and sculpins may be present year-round so that they may move out of the area during the construction period as well.

7.2.2 Long-term impacts

The discharge of the dredged material would be configured so that new blue king crab habitat is created. Long term impacts associated with dredged material placement would be presented by the creation of a rocky reef extending perpendicular from the coast of St George Island. This reef would significantly alter the nature of the seabed by increasing the complexity of the area.

The District enlisted the USACE Engineering Research and Development Center (ERDC) to model the discharge using Short Term Fate of Dredged Material (STFATE) based on feasibility level information and assumptions. A distinct mound is predicted to be formed. The mound would approximate a truncated rectangular pyramid.

The height of the pyramid would be about 5 feet, and the top area of the pyramid would approximate the area of the hopper of the dump scow, approximately 140 feet long and 35 feet wide. The side slopes of the pyramid would be about 1V:10H. Therefore, the base of the pyramid would be a rectangle approximately 240 feet long and 135 feet wide. A few inches of fine rock would likely extend another 30 feet in all directions beyond the toe of the pyramid.

Greater detail regarding the precise configuration of the placement would be developed collaboratively with NMFS HCD and other stakeholders during the PED phase of the project. The District's feasibility level plans for placement include the discharge of dredged material by the scow-load, spaced approximately 100 feet apart. This would produce a reef at least 5 feet tall, extending nearly 3 miles from the nearshore terminus.

Blue king crab requires complex habitat for all demersal life stages. Sand, gravel, cobble, and rocks are necessary substrate types for mature, late juvenile, early juvenile, and egg life stages. Blue king crabs (BKC) are associated with slumps, rockfalls, debris, channels, ledges, pinnacles, reefs, and vertical walls between 0 and 200 meters deep.

BKC generally spend the 3.5-4 months after hatching as pelagic larva in water between 40-60 meters deep before settling out into complex benthic habitat areas. The larvae are planktonic, as their limited ability to swim is greatly outweighed by the effects of ocean currents on their horizontal movements. There is some evidence BKC larvae intentionally move vertically through the water column on a daily basis. Because BKC larvae are pelagic plankton, the placement of dredged material to create habitat does not consider the larval life stage, and no effort is made to create or enhance larval BKC habitat requirements beyond ensuring the benthic habitat is confined to the epipelagic zone in waters less than 200 meters deep.

Considering what is known about the existing conditions in the placement area (gently sloping featureless expanses of sand mixed with shell litter), the introduction of a rocky reef would create ideal BKC habitat. BKC are known to prefer the interface of complex rocky, vertical structure, and areas of sand, mud, and shell liter. The presence of sand dollars and marine snails (known BKC prey item) confirms nominal forage base exists in the placement area. Low capture during the June 2019 pot surveys indicate few natural BKC predators are present in the area. The placement site is not known to be productive for trawling or any other types of fishing, so the District has no reason to anticipate adverse impacts to competing user groups.

7.3 Maintenance Dredging

Maintenance dredging is expected to be required on a ten-year interval. Sand and gravel would fill in the dredge prism at a rate of approximately 1,000 cubic yards per year until the authorized project depth is no longer available, at which time a mechanical dredge would remove the material and place it on the reef.
The maintenance dredging would create short and long term effects similar to transition dredging, except the magnitude of the effect would be much less due to the volume of material and intensity of the dredging effort.

7.4 Marine Construction

The construction of the two breakwaters and upland area would convert nearshore subtidal habitat to dry land and vertical structure. There would be short term impacts from the construction and long-term impacts from the habitat alteration.

7.4.1 Short Term Impacts

Direct Mortality. The placement of rock for the construction of the two breakwaters and the upland infrastructure has the potential to crush, smother, kill, or injure aquatic organisms in the project area. The potential for harm is inversely related to mobility; i.e., animals with greater mobility (such as finfish) are less likely to be harmed by the construction than animals with lower mobility (like anemones or urchins).

Water Quality Impacts. The marine construction would have the potential to increase the turbidity in the immediate project area by introducing entrained fine-grained sediments into the water column from the rock used for construction. The placement of rock on the seafloor may also suspend local sediments, contributing to temporarily elevated turbidity. The sediment that may be suspended by construction is not a carrier of contaminants due to the site history and physical characteristics of the material, and the only negative water quality impact that may be caused by the marine construction is temporarily elevated turbidity. The turbidity would return to ambient levels within a short radius of the construction activities due to the large size of the particles and the great hydrodynamic energy.

Increased Activity and Noise Levels. The construction of two breakwaters and the marine infrastructure would increase the amount of noise and human activity in the project area for a period of up to five years. The amplitude of the noise is not expected to be great enough to cause damage to fish or other aquatic resources, but the presence of additional humans may cause disturbance. The project area is naturally energetic, and the action of the surf may act to mask the additional disturbance.

7.4.2 Long-Term Impacts

Habitat Alteration. The construction of the full navigation improvement project would include the 1,731-foot long north breakwater, the 250-foot long stub breakwater, 3.9 acres of fill placed for the creation of uplands, and 0.1-acre concrete boat ramp. Portions of the boat ramp (0.08-acres) and north breakwater (0.35-acres) are coincidental to the upland area, so the total area of fill would be slightly less than the sum of the four features.

The north breakwater would include a cumulative volume of 219,000 cubic yards of armor stone, B rock, and core rock and cover approximately 8.3-acres. The stub breakwater would include a cumulative volume of 20,500 cubic yards of armor stone, B rock, and cover rock and cover approximately 0.8 acres. The uplands require 45,000 cubic yards of fill and would cover a total of 3.9-acres, but only about 3.5-acres would be in addition to the North Breakwater fill. The concrete boat ramp would be mostly contained within the upland fill footprint, but a small portion consisting of 0.02 acres would extend beyond the west margin of the fill. The total volume of fill for all features is about 284,500 cubic yards, and the area of fill is about 12.6 acres.

The North breakwater would represent the loss of about 8.3-acres of poorly characterized subtidal habitat, replacing it with relatively steep, rocky subtidal, intertidal, and supratidal habitat. The Stub breakwater would convert about 0.8-acres, and the uplands would convert about 3.9-acres. The conversion of these habitats would be a permanent increase in the complexity of the area.

Increased Activity and Noise Levels. The presence of a harbor facility where there had previously been a semi-enclosed bight would increase the amount of human activity in the area, by design. The amplitude of the noise is not expected to present meaningful impacts to EFH. The additional human activity in the area increases the amount of fuel, oil, and other hazardous material usage, which presents a corresponding increase in the potential for hazardous material spills.

7.5 Drilling and Blasting

The project description includes the drilling and blasting of submerged bedrock to dislodge the material and allow it to be removed by the mechanical dredge. Drilling for the placement of charges is expected to last for 488 non-consecutive days, and blasting is expected to occur on 369 non-consecutive days. These days would be distributed throughout the five-year construction duration.

7.5.1 Short-term Impacts

Underwater noise would be produced by the drill rig. Precise information regarding the source sound pressure produced by drilling is not available, but a 120 kW drill with 83 mm drill bit operating at 1500 RPM was measured producing, 145 dB at frequencies between 30 and 2000 Hz. (Erbe and McPherson, 2017) The amplitude of drilling noise is not sufficient to present meaningful impacts to EFH or FMP species.

The intact bedrock inside the dredge prism would have to be blasted to enable dredging to occur. Impacts on marine fish as a result of underwater explosions are dependent upon a variety of factors: animal size and depth, charge size and depth, depth of the water column, and distance between the animal and the charge. Gas-containing organs, the (swim bladders), are most vulnerable to blast injury. Severe injury to these organs is presumed to lead to mortality. Data on blast injury to marine fish is limited because those factors which determine the extent of an injury may not be known at the time that the potential exposure occurred. Aside from the immediate death and recovery of an animal, an animal could sustain injury and never be observed or recovered.

Mortalities from the blasting may be mitigated to an unknown degree by drilling activities that would be a prerequisite; i.e., the noise from drilling may deter fish from entering the immediate area or cause fish in the area to leave for proximal alternative habitats. Fish that remained or entered the shockwave radii and are killed by the blast could attract other fish and detritivorous benthic invertebrates like crabs into the area to be exposed to subsequent blasts. The Alaska District does not possess adequate data regarding the precise configuration of the blasting or the fish assemblages that would be exposed to the blast to quantify the effects of blasting on FMP species.

7.5.2 Long-term Impacts

The Alaska District does not expect the drilling and blasting to present any long-term impacts beyond those described in the dredging section; 7.1.2.

8.0 MITIGATION

Mitigation Measures. "Mitigation" is the process used to avoid, minimize, and compensate for the environmental consequences of an action. Incorporating the following mitigation measures and conservation measures into the recommended corrective action will help to ensure that no significant adverse impacts would occur to EFH and EFH-managed species/species complexes and other fish and wildlife resources in the project area.

- The proposed action shall cease in-water construction between May 15 and November 15th during peak seabird nesting, marine mammal whelping, rearing, and abundance is expected to be greatest in the project area.
- To minimize the danger to marine mammals from project-related vessels, speed limits (e.g., less than 8 knots) shall be imposed on vessels moving in and around the project area.
- Project-related vessels and barges shall not be permitted to ground themselves on the bottom during low tide periods unless there is a human safety issue requiring it.
- A construction oil spill prevention plan shall be prepared.
- Project-related vessels shall not travel within 3,000 feet of designated Steller sea lion or fur seal critical habitat (haulouts or rookeries).

- The Corps will conduct post-dredge bathymetry surveys to ensure that only the material identified to be dredged was removed to the authorized depth.
- A scow barge will be loaded so that enough of the freeboard remains to allow for safe movement of the barge and its material on the route to the offloading site to be identified.

9.0 CONCLUSIONS AND DETERMINATION OF EFFECT

The project actions described above have the potential to affect the EFH for several BSAI groundfish species (e.g., rockfish, sculpin, and flatfish), crab, and for Alaska stocks of Pacific salmon.

Some FMP species individuals and forage base for FMP species would be temporarily lost through direct mortality from dredging, the placement of dredged material, marine construction, and blasting, but these effects would be localized and temporary. Short-term effects in the form of avoidance because of noise disturbances, boat traffic, and turbidity would be intermittent and low level. No significant negative long-term effects are expected.

The potential effects of turbidity would be intermittent and low level. No adverse impacts related to circulation and harbor-flushing is expected. Year-round resident EFH species such as rockfish, flatfish, and sculpins would likely respond by temporarily moving out of work areas during construction.

The proposed construction would likely occur over a period of five years and within an anticipated in-water work window. Seasonal work restrictions would minimize any impacts to nesting birds and marine mammals.

Potential impacts to EFH and EFH-managed species/species complexes are likely to be highly localized, temporary, and minimal, and not reduce the overall value of EFH in the Bering Sea. The aforementioned mitigation measures would be implemented to offset the potential unavoidable impacts of the Corps' activity. The construction of a reef intended to provide habitat for BKC would represent a substantial beneficial impact of the project. Therefore, the Corps concludes that its Federal action may affect but is not likely to adversely affect EFH and EFH-managed species/species complexes for BSAI groundfish, crab, and Alaska stocks of Pacific salmon.

10.0 REFERENCES

Alaska Fisheries Science Center. 2010. Blue King Crab fact sheet. National Marine Fisheries Service, National Oceanic and Atmospheric Administration, US Department of Commerce.

Bisson, P.A., and R.E. Bilby, 1982. Avoidance of Suspended Sediment by Juvenile Coho Salmon. North American Journal of Fisheries Management, 4:371-374.

Carr, H., and E. Amaral, 1981. Review of the Potential for Artificial Reefs along Coastal Massachusetts. In Proc. Oceans '81, p. 765-769.

Cyrus, D.P., and S.J.M. Blaber, 1987a. The Influence of Turbidity on Juvenile Marine Fishes in Estuaries. Part 1: Field Studies at Lake St. Lucia on the Southeastern Coast of Africa. Journal of Experimental Marine Biology and Ecology, 109:53-70.

Cyrus, D.P., and S.J.M. Blaber, 1987b. The Influence of Turbidity on Juvenile Marine Fishes in Estuaries. Part 2: Laboratory Studies, Comparisons with Field Data and Conclusions. Journal of Experimental Marine Biology and Ecology, 109:71-91.

Erbe, C and McPherson, C. 2017. Underwater noise from geotechnical and standard penetrations testing. The Journal of the Acoustical Society of America 142. https://doi.org/10.1121/1.5003328

Hastings, M.C. and A.N. Popper, 2005. Effects of Sound on Fish. Prepared for the California Department of Transportation by Jones and Stokes, Sacramento, California.

Lewis, L., J. Davenport, and T. Kelly, 2002. A Study of the Impact of a Pipeline Construction on Estuarine Benthic Invertebrate Communities. Estuar. Coast. Shelf Sci. Vol. 55, no. 2, pp. 213-221.

Servizi, J.A., 1988. Sublethal Effects of Dredged Sediments on Juvenile Salmon. C.A. Simenstad, editor. Effects of Dredging on Anadromous Pacific Coast Fishes. University of Washington, Seattle, Washington.

Underwood, A., 2000. Experimental Ecology of Rocky Intertidal Habitats: What are We Learning? J. Exp. Mar. Biol. Ecol. Vol. 250, no. 1-2, pp. 51-76.

Whitman, R.P., T.P. Quinn, and E.L. Brannon, 1982. Influence of Suspended Volcanic Ash on Homing Behavior of Adult Chinook Salmon. Transactions of the American Fisheries Society, 111:63-69.

Zheng, J. and Ianelli, J. 2018. Saint Matthew Island blue king crab stock assessment 2018. BSAI Crab SAFE, September 2018. Alaska Department of Fish and Game/National Oceanic and Atmospheric Administration.

ATTACHMENT 1

Description of Essential Fish Habitat (EFH) for the Groundfish Resources of the Bering Sea-Aleutian Island Management Area

Walleye Pollock

Eggs: EFH for walleye pollock eggs is the general distribution area for this life stage, located in pelagic waters along the entire shelf (0 to 200 m), upper slope (200 to 500 m), and intermediate slope (500 to 1,000 m) throughout the BSAI

Larvae: EFH for larval walleye pollock is the general distribution area for this life stage, located in epipelagic waters along the entire shelf (0 to 200 m), upper slope (200 to 500 m), and intermediate slope (500 to 1,000 m) throughout the BSAI

Early Juveniles: EFH for early juvenile walleye pollock is the habitat-related density area for this life stage, located in the lower and middle portion of the water column along the inner (0 to 50 m), middle (50 to 100 m), and outer (100 to 200 m) shelf throughout the BSAI. Relative abundance of age 1 pollock is used as an early indicator of year-class strength and is highly variable (presumably due to survival factors and differential availability between years).

Late Juveniles: EFH for late juvenile walleye pollock is the habitat-related density area for this life stage, located in the lower and middle portion of the water column along the inner (0 to 50 m), middle (50 to 100 m), and outer (100 to 200 m) shelf throughout the BSAI. Substrate preferences, if they exist, are unknown.

Adults: EFH for adult walleye pollock is the habitat-related density area for this life stage, located in the lower and middle portion of the water column along the entire shelf (~10 to 200 m) and slope (200 to 1,000 m) throughout the BSAI. Substrate preferences, if they exist, are unknown.

Pacific Cod

Eggs: No EFH description determined. Insufficient information is available. Pacific cod eggs, which are demersal, are rarely encountered during surveys in the BSAI.

Larvae: EFH for larval Pacific cod is the habitat-related density area for this life stage, located in epipelagic waters along much of the middle (50 to 100 m) and outer (100 to 200 m) Eastern Bering Sea (EBS) shelf, with hotspots in the vicinity of the middle shelf north of Unimak Pass and the Pribilof Islands. The habitat-related density area of larval Pacific cod in the Aleutian Islands (AI) is unknown.

Early Juveniles: EFH for early juvenile Pacific cod is the habitat-related density area for this life stage, centered over the middle (50 to 100 m) EBS shelf between the Pribilof Islands and the Alaska Peninsula and broadly similar to the habitat-related density area for larval Pacific cod, but not extending as far north. The habitat-related density area of early juvenile Pacific cod in the AI is unknown.

Late Juveniles: EFH for late juvenile Pacific cod is the habitat-related density area for this life stage, including nearly all of the EBS shelf (0 to 200 m) and upper slope (200 to 500 m), with highest abundances in the inshore portions of the central and southern domains of the EBS shelf, and broadly throughout the AI at depths up to 500 m.

Adults: EFH for adult Pacific cod is the habitat-related density area for this life stage, including nearly all of the EBS shelf and slope, with highest abundances in the central and northern domains over the middle (50 to 100 m) and outer (100 to 200 m) shelf, and broadly throughout the AI at depths up to 500 m.

<u>Sablefish</u>

Eggs: No EFH description determined. Insufficient information is available. Scientific information notes the rare occurrence of sablefish eggs in the BSAI.

Larvae: No EFH description determined. Insufficient information is available.

Early Juveniles: No EFH description determined. Information is insufficient. Early juveniles have generally been observed in inshore water, bays, and passes, and on shallow shelf pelagic and demersal habitat.

Late Juveniles: EFH for late juvenile sablefish is the general distribution area for this life stage, located in the lower portion of the water column, varied habitats, generally softer substrates, and deep shelf gulleys along the slope (200 to 1,000 m) throughout the BSAI.

Adults: EFH for adult sablefish is the general distribution area for this life stage, located in the lower portion of the water column, varied habitats, generally softer substrates, and deep shelf gulleys along the slope (200 to 1,000 m) throughout the BSAI.

<u>Yellowfin Sole</u>

Eggs: EFH for yellowfin sole eggs is the general distribution area for this life stage, found to the limits of inshore ichthyoplankton sampling over a widespread area, to at least as far north as Nunivak Island.

Larvae: EFH for yellowfin sole larvae is the general distribution area for this life stage. Larvae have been found to the limits of inshore ichthyoplankton sampling over a widespread area, to at least as far north as Nunivak Island.

Early Juveniles: EFH for early juvenile yellowfin sole is the general distribution area for this life stage, located in the lower portion of the water column within nearshore bays and along the inner (0 to 50 m), middle (50 to 100 m), and outer (100 to 200 m) shelf throughout the BSAI wherever there are soft substrates consisting mainly of sand. Upon settlement in nearshore areas, juveniles preferentially select sediment suitable for feeding on meiofaunal prey and burrowing for protection. Juveniles are separate from the adult population, remaining in shallow areas until they reach approximately 15 cm. Most likely are habitat generalists on abundant physical habitat.

Late Juveniles: EFH for late juvenile yellowfin sole is the general distribution area for this life stage, located in the lower portion of the water column within nearshore bays and along the inner (0 to 50 m), middle (50 to 100 m), and outer (100 to 200 m) shelf throughout the BSAI wherever there are soft substrates consisting mainly of sand.

Adults: EFH for adult yellowfin sole is the general distribution area for this life stage, located in the lower portion of the water column within nearshore bays and along the inner (0 to 50 m), middle (50 to 100 m), and outer (100 to 200 m) shelf throughout the BSAI wherever there are soft substrates consisting mainly of sand.

<u>Greenland Turbot</u>

Eggs: No EFH description determined. Insufficient information is available.
Larvae: EFH for larval Greenland turbot is the general distribution area for this life stage, located principally in benthypelagic waters along the outer shelf (100 to 200 m) and slope (200 to 3,000 m) throughout the BSAI and seasonally abundant in the spring.

Early Juveniles: EFH for early juvenile Greenland turbot is the general distribution area for this life stage, located in the lower and middle portion of the water column along the inner (0 to 50 m), middle (50 to 100 m), and outer (100 to 200 m) shelf and upper slope (200 to 500 m) throughout the BSAI wherever there are softer substrates consisting of mud and sandy mud.

Late Juveniles: EFH for late juvenile Greenland turbot is the habitat-related density area for this life stage, located in the lower and middle portion of the water column along the inner (0 to 50 m), middle (50 to 100 m), and outer (100 to 200 m) shelf and upper slope (200 to 500 m) throughout the BSAI wherever there are softer substrates consisting of mud and sandy mud.

Adults: EFH for late adult Greenland turbot is the habitat-related density area for this life stage, located in the lower and middle portion of the water column along the outer shelf (100 to 200 m), upper slope (200 to 500 m), and lower slope (500 to 1,000 m) throughout the BSAI wherever there are softer substrates consisting of mud and sandy mud,.

<u>Arrowtooth Flounder</u>

Eggs: No EFH description determined. Insufficient information is available.

Larvae: EFH for larval arrowtooth flounder is the general distribution area for this life stage, found in epipelagic waters located in a demersal habitat throughout the shelf (0 to 200 m) and upper slope (200 to 500 m).

Early Juveniles: EFH for early juvenile arrowtooth flounder is the general distribution area for this life stage, located in a demersal habitat of the inner (0 to 50 m) and middle (50 to 100 m) shelf.

Late Juveniles: EFH for late juvenile arrowtooth flounder is the habitat-related density area for this life stage, located in the lower portion of the water column along the inner (0 to 50 m), middle (50 to 100 m), and outer (100 to 200 m) shelf and upper slope (200 to 500 m) throughout the BSAI wherever there are softer substrates consisting of gravel, sand, and mud.

Adults: EFH for adult arrowtooth flounder is the habitat-related density area for this life stage, located in the lower portion of the water column along the inner (0 to 50), middle (50 to 100 m), and outer (100 to 200 m) shelf and upper slope (200 to 500 m) throughout the BSAI wherever there are softer substrates consisting of gravel, sand, and mud.

Kamchatka Flounder

Eggs: No EFH description determined. Insufficient information is available.

Larvae: No EFH description determined. Insufficient information is available.

Early Juveniles: EFH for early juvenile Kamchatka flounder is the general distribution area for this life stage, located in a demersal habitat of the middle (50 to 100 m) and outer (100 to 200 m) shelf.

Late Juveniles: EFH for late juvenile Kamchatka flounder is the general distribution area for this life stage, located in the lower portion of the water column along the middle (50 to 100 m), and outer (100 to 200 m) shelf and upper slope (200 to 500 m) throughout the BSAI wherever there are softer substrates consisting of gravel, sand, and mud.

Adults: EFH for adult Kamchatka flounder is the general distribution area for this life stage, located in the lower portion of the water column along the middle (50 to 100 m), and outer (100 to 200 m) shelf and slope waters down to 600 m throughout the BSAI wherever there are softer substrates consisting of gravel, sand, and mud.

Northern Rock Sole

Eggs: No EFH description determined. Insufficient information is available.

Larvae: EFH for larval northern rock sole is the general distribution area for this life stage, located in pelagic waters along the entire shelf (0 to 200 m) and upper slope (200 to 1,000 m) throughout the BSAI.

Early Juveniles: EFH for early juvenile northern rock sole is the general distribution area for this life stage, located in the lower portion of the water column along the inner (0 to 50 m), middle (50 to100 m), and outer (100 to 200 m) shelf throughout the BSAI wherever there are softer substrates consisting of sand, gravel, and cobble. Upon settlement in nearshore areas from

1-40 m deep, juveniles preferentially select sediment suitable for feeding on meiofaunal prey and burrowing for protection but may be prevented from settling inshore by the seasonal inner front. Juveniles are separate from the adult population, remaining in shallow areas until they reach approximately 15-20 cm. Most likely are habitat generalists on abundant physical habitat.

Late Juveniles: EFH for late juvenile northern rock sole is the general distribution area for this life stage, located in the lower portion of the water column along the inner (0 to 50 m), middle (50 to100 m), and outer (100 to 200 m) shelf throughout the BSAI wherever there are softer substrates consisting of sand, gravel, and cobble.

Adults: EFH for adult northern rock sole is the general distribution area for this life stage, located in the lower portion of the water column along the inner (0 to 50 m), middle (50 to 100 m), and outer (100 to 200 m) shelf throughout the BSAI wherever there are softer substrates consisting of sand, gravel, and cobble.

Southern Rock Sole

Eggs: No EFH description determined. Insufficient information is available.

Larvae: EFH for Southern rock sole larvae is the general distribution area for this life stage. Larvae are located in the pelagic waters along the entire shelf (0 to 200m) and upper slope (200 to 1,000m) throughout the BSAI.

Early Juveniles: EFH for early juvenile Southern rock sole is the general distribution area for this life stage, located in the lower portion of the water column within nearshore bays and along the inner (0 to 50 m), middle (50 to 100 m), and outer (100 to 200 m) shelf throughout the BSAI wherever there are soft substrates consisting mainly of sand.

Late Juveniles: EFH for late juvenile Southern rock sole is the general distribution area for this life stage, located in the lower portion of the water column within nearshore bays and along the inner (0 to 50 m), middle (50 to 100 m), and outer (100 to 200 m) shelf throughout the BSAI wherever there are soft substrates consisting mainly of sand.

Adults: EFH for adult Southern rock sole is the general distribution area for this life stage, located in the lower portion of the water column along the inner (0 to 50 m), middle (50 to 100 m), and outer (100 to 200 m) shelf throughout the BSAI wherever there are soft substrates consisting mainly of sand, gravel, and cobble.

Alaska Plaice

Eggs: EFH for Alaska plaice eggs is the general distribution area for this life stage, located in pelagic waters along the entire shelf (0 to 200 m) and upper slope (200 to 500 m) throughout the BSAI in the spring.

Larvae: EFH for Alaska plaice larvae is the general distribution area for this life stage. Pelagic larvae are primarily collected from depths greater than 200 m, with the majority occurring over bottom depths ranging from 50 to 100 m. Densities of preflexion stage larvae are concentrated at depths 10 to 20 m.

Early Juveniles: No EFH description determined. Insufficient information is available.

Late Juveniles: No EFH description determined. Insufficient information is available.

Adults: EFH for adult Alaska plaice is the general distribution area for this life stage, located in the lower portion of the water column along the inner (0 to 50 m), middle (50 to 100 m), and outer (100 to 200 m) shelf throughout the BSAI wherever there are softer substrates consisting of sand and mud.

Rex Sole

Eggs: EFH for rex sole eggs is the general distribution area for this life stage, located in epipelagic waters throughout the shelf (0 to 200 m) and upper slope (200 to 300 m).

Larvae: No EFH description determined. Insufficient information is available.

Early Juveniles: EFH for early juvenile rex sole is the general distribution area for this life stage, located in a demersal habitat of the inner (0 to 50 m) and middle (50 to 100 m) shelf.

Late Juveniles: EFH for late juvenile rex sole is the habitat-related density area for this life stage, located in the lower portion of the water column along the inner (0 to 50 m), middle (50 to 100 m), and outer (100 to 200 m) shelf throughout the BSAI wherever there are substrates consisting of gravel, sand, and mud.

Adults: EFH for adult rex sole is the habitat-related density area for this life stage, located in the lower portion of the water column along the inner (0 to 50 m), middle (50 to 100 m), and outer (100 to 200 m) shelf throughout the BSAI wherever there are substrates consisting of gravel, sand, and mud.

Dover Sole

Eggs: No EFH description determined. Insufficient information is available.

Larvae: No EFH description determined. Insufficient information is available.

Early Juveniles: EFH for early juvenile Dover sole is the general distribution area for this life stage, located in a demersal habitat of the inner (0 to 50 m) and middle (50 to 100 m) shelf.

Late Juveniles: EFH for late juvenile Dover sole is the habitat-related density area for this life stage, located in the lower portion of the water column along the middle (50 to 100 m), and outer (100 to 200 m) shelf and upper slope (200 to 500 m) throughout the BSAI wherever there are substrates consisting of sand and mud.

Adults: EFH for adult Dover sole is the habitat-related density area for this life stage, located in the lower portion of the water column along the middle (50 to 100 m) and outer (100 to 200 m) shelf, and upper (200 to 500 m) and intermediate (500 to 1000 m) slope throughout the BSAI wherever there are substrates consisting of sand and mud.

Flathead Sole

Eggs: EFH for flathead sole eggs is the general distribution area for this life stage, located in pelagic waters along the entire shelf (0 to 200 m) and slope (200 to 3,000 m) throughout the BSAI in the spring.

Larvae: EFH for larval flathead sole is the general distribution area for this life stage, located in pelagic waters along the entire shelf (0 to 200 m) and slope (200 to 3,000 m) throughout the BSAI.

Early Juveniles: EFH for early juvenile flathead sole is the habitat-related density area for this life stage, located in the lower portion of the water column along the inner (0 to 50 m) and middle (50 to 100 m) shelf throughout the BSAI wherever there are softer substrates consisting of sand and mud.

Late Juveniles: EFH for late juvenile flathead sole is the habitat-related density area for this life stage, located in the lower portion of the water column along the inner (0 to 50 m), middle (50 to 100 m), and outer (100 to 200 m) shelf throughout the BSAI wherever there are softer substrates consisting of sand and mud.

Adults: EFH for adult flathead sole is the habitat-related density area for this life stage, located in the lower portion of the water column along the inner (0 to 50 m), middle (50 to 100 m), and outer (100 to 200 m) shelf throughout the BSAI wherever there are softer substrates consisting of sand and mud.

Pacific Ocean Perch

Eggs: No EFH description determined. Insufficient information is available.

Larvae: EFH for larval Pacific ocean perch is the general distribution area for this life stage, located in pelagic waters along the middle and outer shelf (50 to 200 m) and slope (200 to 3,000 m) throughout the BSAI.

Early Juveniles: EFH for early juvenile Pacific ocean perch is the general distribution area for this life stage, located throughout the water column along the entire shelf (0 to 200 m).

Late Juveniles: EFH for late juvenile Pacific ocean perch is the habitat-related density area for this life stage, located in the middle to lower portion of the water column along middle shelf (50 to 100 m), outer shelf (100 to 200 m), and upper slope (200 to 500 m) throughout the BSAI wherever there are substrates consisting of boulders, cobble, gravel, mud, sandy mud, or muddy sand.

Adults: EFH for adult Pacific ocean perch is the habitat-related density area for this life stage, located in the lower portion of the water column along the outer shelf (100 to 200 m) and upper slope (200 to 500 m) throughout the BSAI wherever there are substrates consisting of cobble, gravel, mud, sandy mud, or muddy sand.

Northern Rockfish

Eggs: No EFH description determined. Insufficient information is available.

Larvae: No EFH description determined. Insufficient information is available.

Early Juveniles: EFH for early juvenile northern rockfish is the general distribution area for this life stage, located throughout the water column along the entire shelf (0 to 200 m.

Late Juveniles: EFH for late juvenile northern rockfish is the habitat-related density area for this life stage, located in the middle and lower portions of the water column along the outer shelf (100 to 200 m) throughout the BSAI.

Adults: EFH for adult northern rockfish is the habitat-related density area for this life stage, located in the middle and lower portions of the water column along the outer shelf (100 to 200 m) throughout the BSAI wherever there are substrates of cobble and rock.

Shortraker Rockfish

Eggs: No EFH description determined. Insufficient information is available.

Larvae: No EFH description determined. Insufficient information is available.

Early Juveniles: EFH for early juvenile shortraker rockfish is the general distribution area for this life stage, located in pelagic waters throughout the middle and outer (50 to 200 m) shelf and slope (200 to 3,000 m).

Late Juveniles: EFH for late juvenile shortraker rockfish is the habitat-related density area for this life stage, located in the lower portion of the water column along the outer shelf (100 to 200 m) and upper slope (200 to 500 m) regions throughout the BSAI wherever there are substrates consisting of mud, sand, sandy mud, muddy sand, rock, cobble, and gravel.

Adults: EFH for adult shortraker rockfish is the habitat-related density area for this life stage, located in the lower portion of the water column along the outer shelf (100 to 200 m) and upper slope (200 to 500 m) regions throughout the BSAI wherever there are substrates consisting of mud, sand, sandy mud, muddy sand, rock, cobble, and gravel.

Blackspotted Rockfishes

Eggs: No EFH description determined. Insufficient information is available.

Larvae: No EFH description determined. Insufficient information is available.

Early Juveniles: EFH for early juvenile blackspotted/rougheye rockfish is the general distribution area for this life stage, located in pelagic waters throughout the middle and outer (50 to 200 m) shelf and slope (200 to 3,000 m).

Late Juveniles: EFH for late juvenile blackspotted/rougheye rockfish is the general distribution area for this life stage, located in the lower portion of the water column along the upper slope (200 to 500 m) regions throughout the BSAI wherever there are substrates consisting of mud, sand, sandy mud, muddy sand, rock, cobble, and gravel.

Adults: EFH for adult blackspotted/rougheye rockfish is the habitat-related density area for this life stage, located in the lower portion of the water column along the upper slope (200 to 500 m) regions throughout the BSAI wherever there are substrates consisting of mud, sand, sandy mud, muddy sand, rock, cobble, and gravel.

Rougheye Rockfishes

Eggs: No EFH description determined. Insufficient information is available.

Larvae: No EFH description determined. Insufficient information is available.

Early Juveniles: EFH for early juvenile blackspotted/rougheye rockfish is the general distribution area for this life stage, located in pelagic waters throughout the middle and outer (50 to 200 m) shelf and slope (200 to 3,000 m).

Late Juveniles: EFH for late juvenile blackspotted/rougheye rockfish is the general distribution area for this life stage, located in the lower portion of the water column along the upper slope (200 to 500 m) regions throughout the BSAI wherever there are substrates consisting of mud, sand, sandy mud, muddy sand, rock, cobble, and gravel.

Adults: EFH for adult blackspotted/rougheye rockfish is the habitat-related density area for this life stage, located in the lower portion of the water column along the upper slope (200 to 500 m) regions throughout the BSAI wherever there are substrates consisting of mud, sand, sandy mud, muddy sand, rock, cobble, and gravel.

Yelloweye Rockfish

Eggs: No EFH description determined. Insufficient information is available.

Larvae: No EFH description determined. Insufficient information is available.

Early Juveniles: No EFH description determined. Insufficient information is available.

Late Juveniles: No EFH description determined. Insufficient information is available.

Adults: No EFH description determined. Insufficient information is available.

Dusky Rockfish

Eggs: No EFH description determined. Insufficient information is available.

Larvae: No EFH description determined. Insufficient information is available.

Early Juveniles: EFH for early juvenile dusky rockfish is the general distribution area for this life stage, located in the pelagic waters along the entire shelf (0 to 200 m) and slope (200 to 3,000 m) throughout the BSAI.

Late Juveniles: EFH for late juvenile dusky rockfish is the habitat-related density area for this life stage, located in the middle and lower portions of the water column along the outer shelf (100 to 200 m) and upper slope (200 to 500 m) throughout the BSAI wherever there are substrates of cobble, rock, and gravel.

Adults: EFH for adult dusky rockfish is the habitat-related density area for this life stage, located in the middle and lower portions of the water column along the outer shelf (100 to 200 m) and upper slope (200 to 500 m) throughout the BSAI wherever there are substrates of cobble, rock, and gravel.

Thornyhead Rockfish (Shortspine)

Eggs: No EFH description determined. Insufficient information is available.

Larvae: No EFH description determined. Insufficient information is available.

Early Juveniles: EFH for early juvenile thornyhead rockfish is the habitat-related density area for this life stage, located in epipelagic waters along the middle and outer shelf (50 to 200 m) and upper to lower slope (200 to 1,000 m) throughout the BSAI.

Late Juveniles: EFH for late juvenile thornyhead rockfish is the habitat-related density area for this life stage, located in the lower portion of the water column along the middle and outer shelf (50 to 200 m) and upper to lower slope (200 to 1,000 m) throughout the BSAI wherever there are substrates of mud, sand, rock, sandy mud, muddy sand, cobble, and gravel.

Adults: EFH for adult thornyhead rockfish is the habitat-related density area for this life stage, located in the lower portion of the water column along the middle and outer shelf (50 to 200 m) and upper to lower slope (200 to 1,000 m) throughout the BSAI wherever there are substrates of mud, sand, rock, sandy mud, muddy sand, cobble, and gravel.

Atka Mackerel

Eggs: EFH for Atka mackerel eggs is the general distribution area for this life stage, located in a demersal habitat along the shelf (0 to 200 m). There are widespread observations of nesting sites throughout the Aleutian Islands; however, observations are not complete for the entire area.

Larvae: EFH for larval Atka mackerel is the general distribution area for this life stage, located in epipelagic waters along the shelf (0 to 200 m), upper slope (200 to 500 m), and intermediate slope (500 to 1000 m) throughout the BSAI.

Early Juveniles: No EFH description determined. Insufficient information is available.

Late Juveniles: EFH for late juvenile Atka mackerel is the general distribution area for this life stage, located in the entire water column, from sea surface to the sea floor, along the inner (0 to 50 m), middle (50 to 100 m), and outer shelf (100 to 200 m) throughout the BSAI wherever there are substrates of gravel and rock and in vegetated areas of kelp.

Adults: EFH for adult Atka mackerel is the habitat-related density area for this life stage, located in the entire water column, from sea surface to the sea floor, along the inner (0 to 50 m), middle (50 to 100 m), and outer shelf (100 to 200 m) throughout the BSAI wherever there are substrates of gravel and rock and in vegetated areas of kelp. Habitat related densities of Atka mackerel are available, usually at depths less than 200 m and generally over rough, rocky, and uneven bottom near areas where tidal currents are swift.

Bigmouth Sculpins

Eggs: No EFH description determined. Insufficient information is available.

Larvae: No EFH description determined. Insufficient information is available.

Juveniles: EFH for juvenile bigmouth sculpin is the habitat-related density area for this life stage, located in the deeper waters offshore (100 and 300m) in the Bering Sea and Aleutian Islands.

Adults: EFH for adult bigmouth sculpins is the habitat-related density area for this life stage, located in the lower portion of the water column along the inner (0 to 50 m), middle (50 to 100 m, and outer shelf (100 to 200 m) and portions of the upper slope (200 to 500 m) throughout the BSAI wherever there are substrates of rock, sand, mud, cobble, and sandy mud.

Great Sculpins

Eggs: No EFH description determined. Insufficient information is available.

Larvae: No EFH description determined. Insufficient information is available.

Juveniles: EFH for juvenile great sculpin is the habitat-related density area for this life stage, located in pelagic waters along the entire shelf (0 to 200 m) wherever there are substrates of sand and muddy/sand bottoms.

Adults: EFH for adult great sculpins is the habitat-related density area for this life stage, located in the lower portion of the water column along the inner (0 to 50 m), middle (50 to 100 m, and outer shelf (100 to 200 m) and portions of the upper slope (200 to 500 m) throughout the BSAI wherever there are substrates of rock, sand, mud, cobble, and sandy mud.

Alaska Skate

Eggs: No EFH description determined. Insufficient information is available.

Larvae: Not applicable, skates emerge from egg fully formed.

Early Juveniles: EFH for early juvenile skates is the general distribution area for this life stage, located in the lower portion of the water column on the shelf (0 to 200 m) and the upper slope (200 to 500 m) throughout the BSAI wherever there are of substrates of mud, sand, gravel, and rock.

Late Juveniles: EFH for late juvenile skates is the habitat-related density area for this life stage, located in the lower portion of the water column on the shelf (0 to 200 m) and the upper slope (200 to 500 m) throughout the BSAI wherever there are of substrates of mud, sand, gravel, and rock.

Adults: EFH for adult skates is the habitat-related density area for this life stage, located in the lower portion of the water column on the shelf (0 to 200 m) and the upper slope (200 to 500 m) throughout the BSAI wherever there are of substrates of mud, sand, gravel, and rock.

Aleutian Skate

Eggs: No EFH description determined. Insufficient information is available.

Larvae: Not applicable, skates emerge from egg fully formed.

Early Juveniles: EFH for early juvenile skates is the general distribution area for this life stage, located in the lower portion of the water column on the shelf (0 to 200 m) and the upper slope (200 to 500 m) throughout the BSAI wherever there are of substrates of mud, sand, gravel, and rock.

Late Juveniles: EFH for late juvenile skates is the habitat-related density area for this life stage, located in the lower portion of the water column on the shelf (0 to 200 m) and the upper slope (200 to 500 m) throughout the BSAI wherever there are of substrates of mud, sand, gravel, and rock.

Adults: EFH for adult skates is the habitat-related density area for this life stage, located in the lower portion of the water column on the shelf (0 to 200 m) and the upper slope (200 to 500 m) throughout the BSAI wherever there are of substrates of mud, sand, gravel, and rock.

Bering Skate

Eggs: No EFH description determined. Insufficient information is available.

Larvae: Not applicable, skates emerge from egg fully formed.

Early Juveniles: EFH for early juvenile skates is the general distribution area for this life stage, located in the lower portion of the water column on the shelf (0 to 200 m) and the upper slope (200 to 500 m) throughout the BSAI wherever there are of substrates of mud, sand, gravel, and rock.

Late Juveniles: EFH for late juvenile skates is the habitat-related density area for this life stage, located in the lower portion of the water column on the shelf (0 to 200 m) and the upper slope (200 to 500 m) throughout the BSAI wherever there are of substrates of mud, sand, gravel, and rock.

Adults: EFH for adult skates is the habitat-related density area for this life stage, located in the lower portion of the water column on the shelf (0 to 200 m) and the upper slope (200 to 500 m) throughout the BSAI wherever there are of substrates of mud, sand, gravel, and rock.

Mud Skate

Eggs: No EFH description determined. Insufficient information is available.

Larvae: Not applicable, skates emerge from egg fully formed.

Early Juveniles: EFH for early juvenile skates is the general distribution area for this life stage, located in the lower portion of the water column on the shelf (0 to 200 m) and the upper slope (200 to 500 m) throughout the BSAI wherever there are of substrates of mud, sand, gravel, and rock.

Late Juveniles: EFH for late juvenile skates is the habitat-related density area for this life stage, located in the lower portion of the water column on the shelf (0 to 200 m) and the upper slope (200 to 500 m) throughout the BSAI wherever there are of substrates of mud, sand, gravel, and rock.

Adults: EFH for adult skates is the habitat-related density area for this life stage, located in the lower portion of the water column on the shelf (0 to 200 m) and the upper slope (200 to 500 m) throughout the BSAI wherever there are of substrates of mud, sand, gravel, and rock.

Octopus

Eggs: No EFH description determined. Insufficient information is available.

Larvae: No EFH description determined. Insufficient information is available.

Early Juveniles: No EFH description determined. Insufficient information is available.

Late Juveniles: No EFH description determined. Insufficient information is available.

Adults: EFH for adult octopus is the habitat-related density area for this life stage, located in demersal habitat throughout the intertidal, subtidal, shelf (0 to 200 m), and slope (200 to 2,000 m).

<u>Yellow Irish Lord</u>

Eggs: No EFH description determined. Insufficient information is available.

Larvae: No EFH description determined. Insufficient information is available.

Juveniles: EFH for juvenile yellow Irish lord is the habitat-related density area for this life stage, located from the subtidal areas near shore to the edge of the continental shelf (0 to 200 m) throughout the BSAI.

Adults: EFH for adult yellow Irish lord is the habitat-related density area for this life stage, located from the subtidal areas near shore to the edge of the continental shelf (0 to 200 m) throughout the BSAI.

ATTACHMENT 2

Description of Essential Fish Habitat (EFH) for the Crab Resources of the Bering Sea-Aleutian Island Management Area

Red King Crab

Eggs: Essential fish habitat of the red king crab eggs is inferred from the general distribution of egg-bearing female crab. (See also Adults.)

Larvae: No EFH Description Determined. Insufficient information is available.

Early Juveniles: No EFH Description Determined. Insufficient information is available.

Late Juveniles: EFH for late juvenile red king crab is the general distribution area for this life stage, located in bottom habitats along the inner (0 to 50 m), middle (50 to 100 m), and outer shelf (100 to 200 m) throughout the BSAI wherever there are substrates consisting of rock, cobble, and gravel and biogenic structures such as boltenia, bryozoans, ascidians, and shell hash.

Adults: EFH for adult red king crab is the general distribution area for this life stage, located in bottom habitats along the nearshore (spawning aggregations) and the inner (0 to 50 m), middle (50 to 100 m), and outer shelf (100 to 200 m) throughout the BSAI wherever there are substrates consisting of sand, mud, cobble, and gravel.

Blue King Crab

Eggs: Essential fish habitat of the blue king crab eggs is inferred from the general distribution of egg-bearing female crab. (See also Adults.)

Larvae: No EFH Description Determined. Insufficient information is available.

Early Juveniles: No EFH Description Determined. Insufficient information is available.

Late Juveniles: EFH for late juvenile blue king crab is the general distribution area for this life stage, located in bottom habitats along the nearshore where there are rocky areas with shell hash and the inner (0 to 50), middle (50 to 100 m), and outer shelf (100 to 200 m) throughout the BSAI wherever there are substrates consisting of rock, cobble, and gravel.
Adults: EFH for adult blue king crab is the general distribution area for this life stage, located in bottom habitats along the inner (0 to 50 m), middle (50 to 100 m), and outer shelf (100 to 200 m) throughout the BSAI wherever there are substrates consisting of sand and mud adjacent to rockier areas and areas of shell hash.

Golden King Crab
Eggs: Essential fish habitat of golden king crab eggs is inferred from the general distribution of egg-bearing female crab. (See also Adults.)

Larvae: No EFH Description Determined. Insufficient information is available.

Early Juveniles: No EFH Description Determined. Insufficient information is available.

Late Juveniles: EFH for late juvenile golden king crab is the general distribution area for this life stage, located in bottom habitats along the along the upper slope (200 to 500 m), intermediate slope (500 to 1,000 m), lower slope (1,000 to 3,000 m), and basins (more than 3,000 m) of the BSAI where there are high-relief living habitats, such as coral, and vertical substrates, such as boulders, vertical walls, ledges, and deep water pinnacles.

Adults: EFH for adult golden king crab is the general distribution area for this life stage, located in bottom habitats along the along the outer shelf (100 to 200 m), upper slope (200 to 500 m), intermediate slope (500 to 1,000 m), lower slope (1,000 to 3,000 m), and basins (more than 3,000 m) of the BSAI where there are high relief living habitats, such as coral, and vertical substrates such as boulders, vertical walls, ledges, and deep water pinnacles.

Tanner Crab

Eggs: Essential fish habitat of Tanner crab eggs is inferred from the general distribution of egg-bearing female crab. (See also Adults.)

Larvae: No EFH Description Determined. Insufficient information is available.

Early Juveniles: No EFH Description Determined. Insufficient information is available.

Late Juveniles: EFH for late juvenile Tanner crab is the general distribution area for this life stage, located in bottom habitats along the inner (0 to 50 m), middle (50 to 100 m), and outer shelf (100 to 200 m) throughout the BSAI wherever there are substrates consisting mainly of mud.

Adults: EFH for adult Tanner crab is the general distribution area for this life stage, located in bottom habitats along the inner (0 to 50 m), middle (50 to 100 m), and outer shelf (100 to 200 m) throughout the BSAI wherever there are substrates consisting mainly of mud.

Snow Crab

Eggs: Essential fish habitat of snow crab eggs is inferred from the general distribution of egg-bearing female crab. (See also Adults.)

Larvae: No EFH Description Determined. Insufficient information is available.

Early Juveniles: No EFH Description Determined. Insufficient information is available.
Late Juveniles: EFH for late juvenile snow crab is the general distribution area for this life stage, located in bottom habitats along the inner (0 to 50 m), middle (50 to 100 m), and outer

shelf (100 to 200 m) throughout the BSAI wherever there are substrates consisting mainly of mud.

Adults: EFH for adult snow crab is the general distribution area for this life stage, located in bottom habitats along the inner (0 to 50 m), middle (50 to 100 m), and outer shelf (100 to 200 m) throughout the BSAI wherever there are substrates consisting mainly of mud.