US Army Corps
of Engineers
ALASKA DISTRICT

Navigation Improvements Integrated Interim Feasibility Report and Final Environmental Impact Statement

Vol I

Unalaska, Alaska

September 2004

ERRATA

Integrated Feasibility Report and
Final Environmental Impact Statement for
Navigation Improvements, Unalaska, Alaska

Vol. II dated June 2004 has not been updated. However it is a part of this report. The following new and/or revised appendixes are included with this final FR/EIS:

Appendix E–Correspondence (updated)
Appendix H–USFWS Coordination Act Report (revised)
Appendix J–Responses to Comments (new)

The following appendixes in Vol. II are unchanged since public review of the draft FR/EIS.

Appendix A–Hydraulic Design
Appendix B–Economic Analysis
Appendix C–Geotech
Appendix D–Real Estate
Appendix F–Cost Estimating
Appendix G–404 (b)(1) Evaluation
Appendix I–Endangered Species

Integrated Feasibility Report and Final Environmental Impact Statement for Navigation Improvements, Unalaska, Alaska

Abstract: The community of Unalaska is in the Aleutian Island chain, about 1,300 kilometers southwest of Anchorage. The City of Unalaska is the largest community and port in the Aleutian Islands. Although the City of Unalaska functions as a regional transportation center for fuel and other materials to many communities of western and northern coastal Alaska, its primary economic base is the North Pacific and Bering Sea fisheries. The deep-water natural harbors in Unalaska do not offer adequate protection to ensure that most Unalaska commercial fishing vessels can be protected from damage if left unattended for extended periods. Rafting vessels at existing moorage causes damage to vessels and docks and increased labor costs. As a consequence, many fishing vessels return to homeports or other harbors during extended fisheries closures. This results in increased fuel cost, crew time, and other travel related expenses. This could be reduced or avoided if commercial fishing vessels were provided with protected moorage in Unalaska between fishing periods.

This integrated feasibility report and environmental impact statement examines a full range of alternatives that could meet both local needs and contribute to meeting National Economic Development (NED) objectives. Most of the alternative sites initially considered were eliminated because they did not meet NED objectives or because the mountainous shoreline is too steep to allow development of upland facilities required for harbor operation, the water is too deep near shore for breakwater construction, and/or the site has too much wave energy to allow use of floating breakwaters. Of the three alternatives considered in detail, the U.S. Army Corps of Engineers recommends construction of a harbor on the southwestern shore of Amaknak Island in an area locally known as "Little South America" (LSA). The LSA-South alternative (LSA-South Mussel Bed Avoidance plan) is the alternative that offers the greatest net annual benefits. It is designed to moor 75 boats 24 to 45 meters in overall length and is the recommended plan. Issues analyzed in relation to the development of this alternative include potential impacts to biological resources and traditional human uses, and the availability of other less environmentally damaging alternatives to meet project needs. The recommended plan incorporates a mitigation plan that includes all justifiable measures to avoid and minimize impacts to important natural and cultural resources that might be affected by harbor construction and operation.

Lead Agency: U.S. Army Corps of Engineers, Alaska District. Comments on the final FR/EIS may be directed to the address below within 30 days from the date the FR/EIS's availability is published in the Federal Register.

U.S. Army Corps of Engineers
Policy Compliance Division
HQUSACE (CECW-PC)
7701 Telegraph Road
Alexandria, VA 22315-3860

PERTINENT DATA

Recommended Plan: LSA-South Mussel Bed Avoidance Plan

Basin		Breakwaters	
Area	6.8 hectare	Rubblemound	
Basin depth	-5.5 m MLLW	Design wave	2.8 m
Entrance channel depth	-6.1 m MLLW	Length, total	181 m
Dredging volume		Crest elevation	3.05 m MLLW
Entrance channel	0 m^3	Crest width	2.5 m
Maneuvering basin	0 m^3	Primary armor	6,300 m^3
Mooring basin	36,600 m^3	Secondary (B)	6,400 m^3
Total	36,600 m^3	Core rock	15,000 m^3
Filling Volume		Floating	
Intertidal Fill	36,600 m^3	Design wave	1.0 m
Area	1.10 hectare	Length, total	398 m
		Width	6.4 m
		Depth	1.83 m

Project Costs [a]

Item	Federal ($)	Non-federal ($)	Total ($)
General Navigation Features°	12,306,000	1,367,000	13,673,000
Associated costs°		9,984,000	9,984,000
LERR (GNF)		195,000	195,000
Navigation aids–U.S. Coast Guard	20,000	-	20,000
TOTAL NED PROJECT COST	**12,326,000**	**11,546,000**	**23,872,000**
NED investment cost (includes interest during construction)			25,215,000
Annualized initial cost plus interest during construction			1,517,000
Annual NED maintenance cost			82,000
Total average annual NED cost			1,599,000
Average annual NED benefits			2,152, 000
Net annual NED benefits			553,000
Benefit/cost ratio			1.3

a Basic assumptions: (1) October 2003 price levels; (2) 50-year project life; (3) 5-5/8% interest

Cost sharing reflects provisions of the Water Resources Development Act of 1986–non-Federal initial share 10% of GNF plus reimbursement of 10% GNF minus LERR credit

° NED = National Economic Development

Summary

This report integrates into a single document the feasibility report and the environmental impact statement for navigation improvements at Unalaska, Alaska.

Recommended Action. The U.S. Army Corps of Engineers (USACE) recommends construction of a harbor on Amaknak Island in the Aleutian Island chain of western Alaska. The harbor would be constructed on the southeastern shore of a peninsula locally known as "Little South America" (LSA).

The recommended plan is identified as the "LSA-South Alternative" in this document. The LSA-South alternative is designed to moor 75 boats 24 to 45 meters in overall length. Boats of this length are a major segment of vessels working out of Unalaska that participate in the Bering Sea and North Pacific Ocean fishing fleet.

Construction of protected harborage for commercial vessels in this size range is needed because the available moorage that can adequately protect boats of this size is limited and used far beyond capacity. Construction of the LSA-South alternative is economically justified largely because the transient vessels that make up most of the fleet at Unalaska incur damage at the existing over-capacity or unprotected moorage and incur the expense and lost time of trips to reach protected moorage at other locations.

The LSA-South alternative would be constructed on and adjacent to the southeastern shore of LSA in a broad natural channel between Amaknak and Unalaska Islands (figure S-1). The land masses of Unalaska and Amaknak Islands protect the proposed harbor site from the open Bering Sea to the north, and the curving LSA peninsula reduces waves from the west and south, making breakwater construction economically feasible.

The project would construct a 181-meter-long rubblemound breakwater and two floating breakwaters totaling 398 meters in length to protect 5.6 hectares of mooring area at least -5.5 meters MLLW and a 1.2-hectare entrance and maneuvering area. Figure S-2 shows principal features of the recommended plan.

Project construction is estimated to require 2 years and to cost $23,872,000, including aids to navigation and local service facilities. The project would produce $2,152,000 in average annual national economic development (NED) benefits and a benefit/cost ratio of 1.3. The recommended project would achieve the greatest net benefits of the project alternatives considered in detail and is identified as the NED plan.

Constructing a harbor at the LSA-South alternative location would take advantage of several natural features:

(1) Wave protection by surrounding lands;

(2) Natural bathymetry, which is deep enough to allow moorage for the 75-boat fleet without extensive dredging;

(3) A natural reef that could support a rubblemound breakwater to reduce longer-period waves from the south;

(4) Water depths to the east and north that are too deep for economical rubblemound breakwaters, but that would allow floating breakwaters to be economically anchored;

(5) Adjacent shoreline that could be developed at just above high tide level to allow a harbor to be operated safely and efficiently;

(6) Nearby uplands that could be developed for additional harbor-related facilities that can be more distant from the moorage areas.

(7) No unusually severe natural hazards and no freshwater inflow that would increase the potential for icing to affect harbor operations. Unalaska Island is south of the normal range of the Bering Sea ice pack. Icing in marine waters rarely affects navigation at Unalaska.

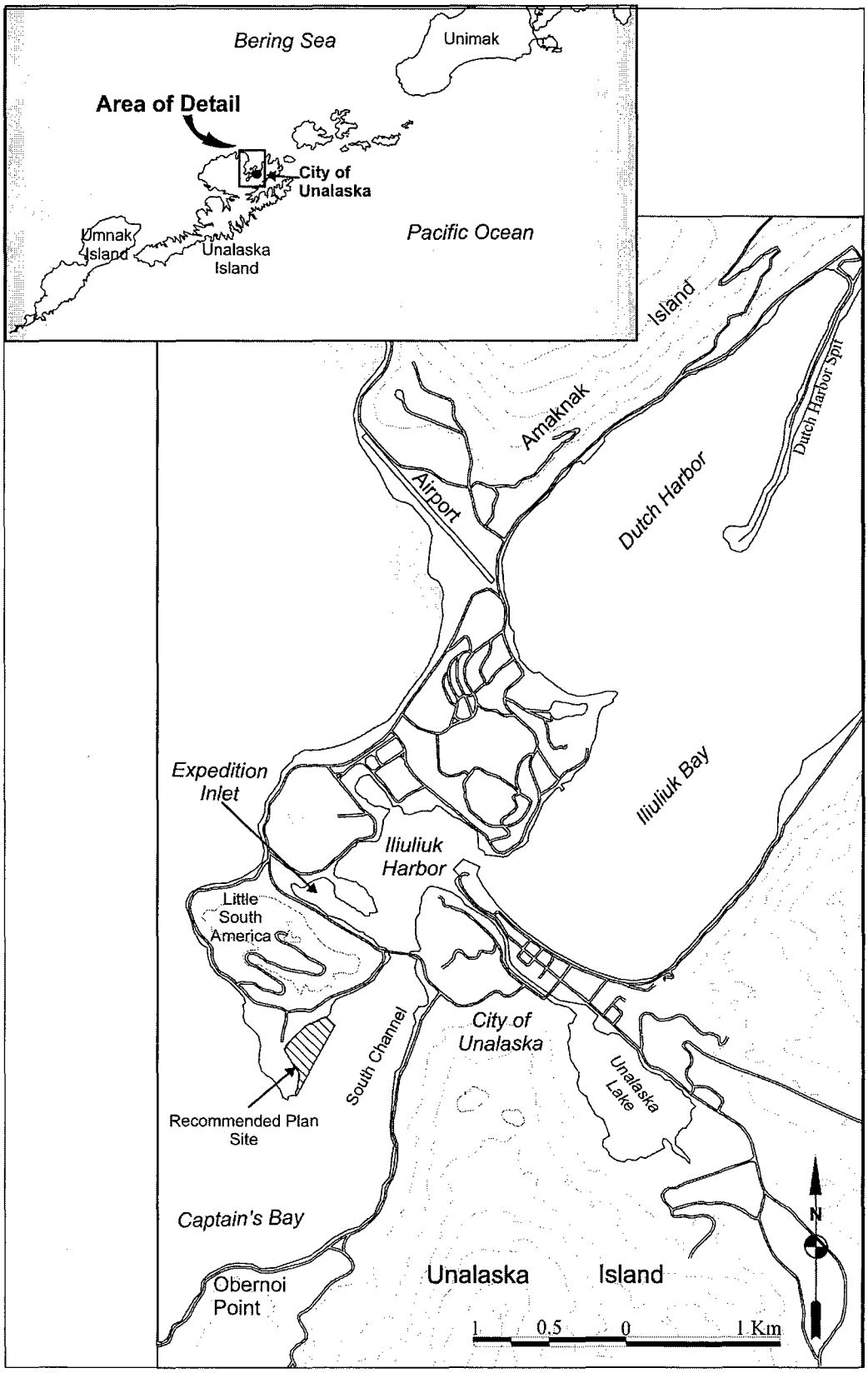

Figure S-1. Location of LSA-South alternative.

Figure S-2 shows the principal features of the LSA-South alternative. The LSA-South alternative would provide protected moorage with a rubblemound breakwater to the south and floating breakwaters on the east and north sides of the harbor. The natural bottom contour of the mooring area would be dredged in the moorage area to -5.5 meters below Mean Lower Low Water (MLLW). The breakwaters would protect 5.6 hectares of mooring area at least -5.5 meters MLLW and a 1.2-hectare entrance and maneuvering area. Mooring area construction would require dredging of 36,600 cubic meters (m^3) of mixed material from 1.85 hectares along the shoreline. No dredging would be required for the entrance channel or maneuvering area.

Material dredged from the mooring basin would be placed in the intertidal and the narrow band of available adjacent uplands to construct a 1.10-hectare access and staging area at just above high water level so users could have safe access to the moorage facilities. This staging area near sea level is an important non-Federal component of the project because the only nearby area level enough to be developed for harbor support is about 15 meters higher in the adjacent quarry. The most active periods for the harbor would be during extremely harsh autumn and winter months, when ice, snow, wind and darkness create difficult and hazardous working conditions. There is nowhere else that a staging area could be constructed without steep gradients between the staging area and the harbor. The dredged material also would be used to construct a boat ramp and the staging and preparation areas required to operate the ramp efficiently. The boat ramp would be constructed at non-Federal expense to meet the needs of local boat owners.

The LSA-South alternative, with site development during construction, would be accessible from the existing road system. Project construction and operation would use existing developed land and the staging area constructed from dredged material to keep activities from adversely affecting the safe use of the existing road system. The project and its operation would not impede navigation or other transportation. Utilities can be extended to the site at reasonable cost, and no utilities or other facilities would be relocated to construct or operate the harbor. The City of Unalaska has the utilities capacity and the capacity in law enforcement, emergency services, and other services to support operation of the project.

A mitigation plan for the LSA-South alternative is an integral part of the recommended plan. The mitigation plan includes all justifiable measures to avoid and minimize impacts to important natural and cultural resources of concern that might be affected by harbor construction and operation. The mitigation plan also includes compensatory construction of intertidal habitat and measures to compensate for impacts to the Dutch Harbor Naval Operating Base and Fort Mears, U.S. Army, National Historic Landmark, which includes the recommended project site.

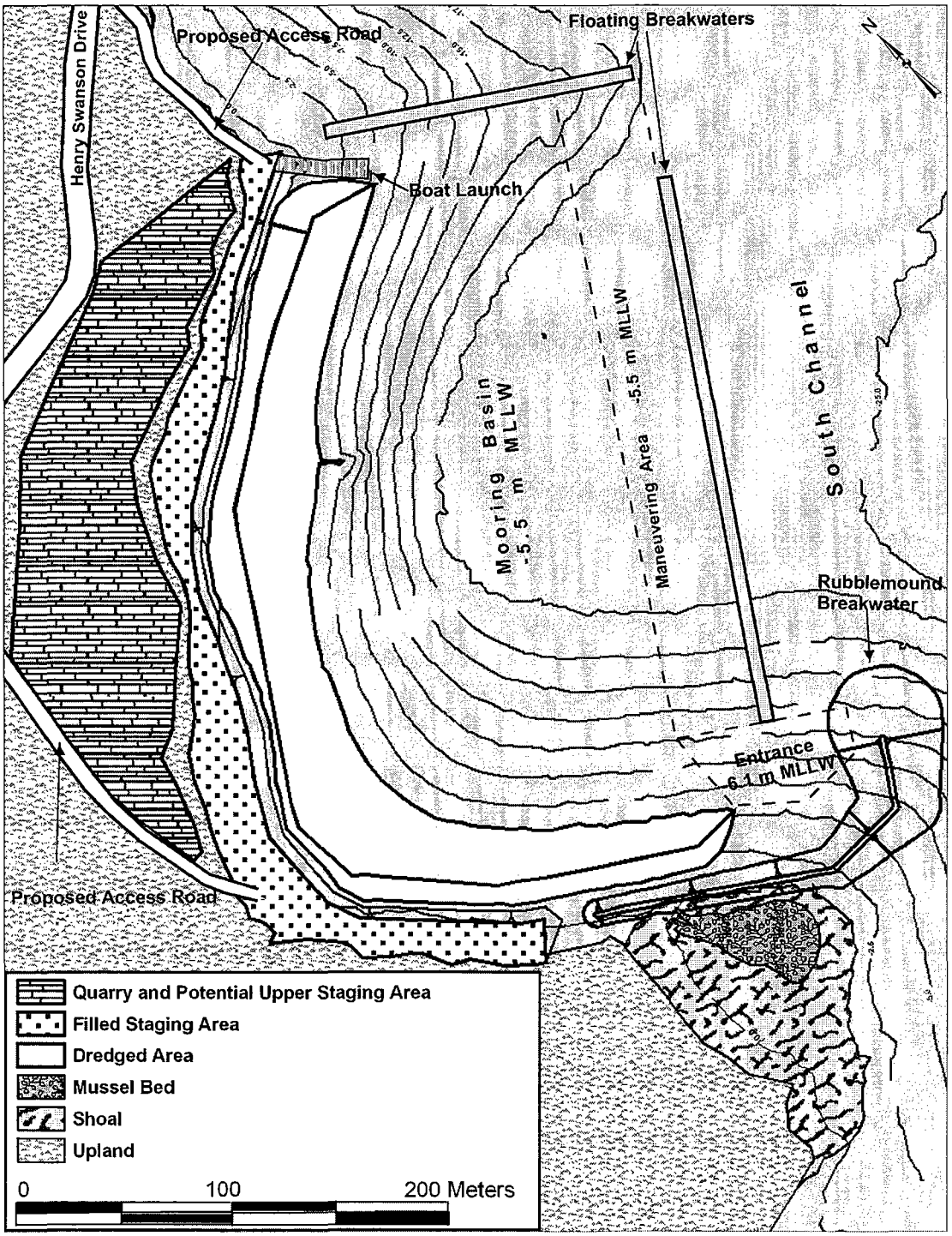

Figure S-2. Features of the LSA-South alternative

Alternatives. The Aleutian Islands are the exposed tops of a 1,600-km-long range of submerged mountains. Although modified by the sea and by ancient glacial activity, the Aleutian Islands are still mountainous. The Unalaska and Amaknak Island coasts are, with few exceptions, steep and rocky, and most drop sharply into deep water. Most of the broad range of alternative sites initially considered were eliminated because the mountainous shoreline was too steep on land to allow access and operation of a harbor, too steep underwater to allow breakwater construction, and/or had too much wave energy to allow use of floating breakwaters that might otherwise be used in deep water. Costs of construction eliminated all but three sites: one in Expedition Inlet and two on the eastern coast of Little South America, from detailed consideration.

Two alternative sites, in addition to the recommended plan, were considered in detail. Both alternatives would be no more than marginally acceptable in operability and in the benefits they would produce as compared to their costs. Those sites were at LSA-North, just north of the LSA-South Alternative site and in Expedition Inlet, a small nearby inlet formed by construction fill that joined Amaknak and Expedition Islands during World War II.

The sea bottom at the LSA-North alternative site, compared with the LSA-South site, drops much more steeply into deeper water. Less dredging would be required, but the rubblemound breakwater required to reduce waves from the south would extend into deeper water and would be more massive than for the LSA-South alternative. Breakwater costs would make this project expensive to build, and even with no compensatory mitigation, the benefit/cost ratio would be about 1.1. There is no economical way to develop a working/staging area at water level because the site is at the base of a steep mountainside and the bottom drops sharply into deep water. The existing quarry site south of this alternative could be used for staging, but it is about 10 meters higher and connected to the site by a narrow road. Using the quarry as the only staging area for the LSA-North Alternative would be inefficient and dangerous during the busy autumn and winter seasons when snow, ice, driving rain, and high winds are commonplace. User access to harbor facilities also would directly and unavoidably impact traffic on the only access road to LSA and would be unsafe. This alternative also would be very close to the only bridge between Amaknak and Unalaska Islands, which raised concerns that if a vessel lost steering it could damage land access essential to the economy of both islands. Although this alternative would produce the least benefits of the alternatives considered in detail and would be the most inefficient and hazardous to operate, it is the environmentally preferred alternative.

The best attributes of both the LSA-North and Expedition Inlet sites were joined in a Combination alternative that was considered in detail. This alternative would moor part of the 75-boat target fleet at the LSA-North site and the remainder at Expedition Inlet. Expedition Inlet could be economically developed for a small number of boats, but developing moorage for the majority of the 75 boats that need moorage would require excavation of bottom material that nearby construction records indicate would

be rocky and expensive to develop. Additional moorage in Expedition Inlet also would disrupt other commercial activities in the inlet. Adequate staging areas could be developed economically at the site, but could be developed by filling land on the other side of the busy Airport Beach Road.

The Combination alternative would construct moorage for 31 of the smaller boats in Expedition Inlet and construct a reduced-sized harbor at the LSA-North site for the remaining 44 larger vessels. Economically, this alternative would be viable (benefit/cost ratio of 1.2 before mitigation costs), but the divided project would be difficult to operate and the largest part of the project at the LSA-North site would be dangerous to operate. It was, however, the best of the available alternatives to the LSA-South alternative. Both the LSA-North site and the Expedition Inlet sites were considered to be of substantially less biological importance than the LSA-South site. The Fish and Wildlife Coordination Act revised draft report (Appendix H) estimated that the environmental effects of the Combination alternative would be about equal to those of the LSA-South alternative.

Environmental Consequences. Consultation with other agencies, public comment, and reference to regulations and guidelines identified biological and human resources and concerns that were principal reasons that an environmental impact statement was prepared for this action. The impacts of the recommended action to those resources are summarized as follows:

Endangered Species. The threatened Alaska breeding population segment of Steller's eiders would lose 10 hectares of winter foraging habitat and could be intermittently displaced from an additional 30 hectares of foraging and resting habitat. They also would be at greater risk of harm from collision with boats and harbor features and from exposure to spilled petroleum. The draft biological opinion estimated that six eiders of the listed population segment would be taken during the 50-year life of the project. This level of take was determined to not cause jeopardy to the listed population.

Informal consultation with the National Marine Fisheries Service determined that the recommended plan would not adversely affect listed sea mammals. Formal consultation is not required.

Ducks and Seabirds. The recommended plan would displace ducks and seabirds from 10 hectares of wintering foraging and resting habitat, and during operation the harbor could at least occasionally displace them from 30 hectares of neighboring habitat. As with Steller's eiders, other ducks and seabirds could be at greater risk of colliding with harbor facilities and vessels and from petroleum contamination. Based on the calculations the USFWS used for the listed population segment of Steller's eiders, Corps biologists estimated that the recommended plan might affect (harm or kill) an average of about 4 ducks and seabirds each year of operation. That estimate was based on methods used by USFWS to calculate take of Steller's eiders.

Water Quality. Principal water quality concerns were related to petroleum contamination and seafood waste discharge. The great majority of fuel spills in the Unalaska area are associated with fuel transfer and industrial sites. About 1.5 percent of the total Unalaska spill volume in a recent 4-year period was reported from the city-operated harbor in Expedition Inlet. This and other data indicate that the recommended plan would introduce small amounts of spilled diesel fuel and other petroleum products into the area around the project site, but would not increase the potential for fuel spills in the Unalaska area. Spilled fuel would be substantially easier to contain in a constructed harbor than at many of the other sites where boats are moored. No seafood processing would be allowed in a harbor constructed for the recommended plan and no additional seafood processing would be induced by the action. The floating breakwaters on two sides of the harbor would minimize effects on currents and mixing.

Juvenile Fish. Three species of early juvenile fish were abundant at various times at the proposed harbor site. Walleye pollock early juveniles, pink salmon recent out-migrants (presumably from nearby streams), and small Pacific cod would lose nearshore habitat value along about 700 meters of shoreline that includes 1.85 hectares of near-shore bottom habitat that would be dredged for the project and 0.7 hectares of adjacent intertidal habitat that would be filled to create a staging area to support harbor operations. The affected habitat is not uncommon in the region and the affected species are known to use diverse habitat types throughout the Aleutians. Effects would appear to be local and of relatively little consequence to commercial or personal use fish stocks.

Benthic (Sea Bottom) Communities. Construction of the breakwater, dredging for moorage, and fill for staging area would severely impact about 3.5 hectares of diverse and productive habitat and associated kelps, other algaes, invertebrates, and fishes that live on or close to the bottom. Clams, sea stars, hermit and other small crabs, worms, and other invertebrates important as food for larger organisms and important in marine functions would be largely lost in those areas. Habitat productivity and diversity also would be impacted in the additional 6.5 hectares inside the harbor that were not directly affected by dredging or fill.

Cultural Resources. The recommended plan would be inside a national landmark and near both historic and pre-contact sites of importance. The project would affect those sites by altering the visual aspects of the land. Effects would be mitigated by agreement with the National Park Service and the State Historic Preservation Officer.

Personal Use Resource Harvest. People gathering food and other natural materials have used the coast of LSA, including the LSA-South alternative site, for thousands of years. The site was identified as a place where shellfish and other marine invertebrates were gathered. The marine species traditionally gathered are still present, but harvest has largely ended in the last three decades, apparently due to concerns about contamination and paralytic shellfish poisoning, but possibly also

influenced by cultural changes. Improving water quality might lessen those concerns and allow gathering to recommence sometime in the future, but a harbor at this site would end collection along this 700-meter stretch of beach for the foreseeable future. The LSA-South alternative also would cause minor displacement of the present personal use harvest of king crab at this site, but would make boat launching easier and safer for local users, which might increase access to personal use harvest of more distant marine resources.

Land use is compatible with existing zoning and land use plans and is supported by the owner of the uplands that would be developed for the harbor.

Issues. Principal issues have been related to choices between project costs and functionality versus impacts to environmental resources. The U.S. Fish and Wildlife Service (USFWS) strongly objected to construction of a harbor at the LSA-South site in early correspondence, but their more recent revised draft to the Coordination Act Report (Appendix H) does not specifically object to development of the LSA-South site and does not recommend further consideration of other sites.

Endangered species coordination focused on the listed Steller's eider. The USFWS, the City of Unalaska, and the U.S. Army Corps of Engineers would implement all terms and conditions of the final biological opinion to avoid jeopardy to the listed Steller's eider. Earlier public and agency concerns that construction of a harbor at the LSA-South alternative site would prevent traditional harvests of marine resources have been addressed by interviews with people who used the area and through participation and information provided by the Qawalangin Tribe of Unalaska.

Compliance Status. The LSA-South alternative was developed to meet all regulatory requirements and to be consistent with coastal management planning, Executive Orders, and applicable Federal, State, and local regulations. Endangered species coordination has been largely completed and all terms and conditions of that coordination are integrated into project plans. Coordination to ensure regulatory compliance has been conducted to the extent feasible for this stage of project review. Coordination indicates that, after review of the final report and environmental impact statement, the LSA South alternative will be granted all required permits and will be found consistent with all applicable regulatory requirements. Regulatory and coordination compliance status is documented in table S-1.

Table S-1. Summary of Federal Environmental Compliance.

Federal Statute	Status of Compliance
Abandoned Shipwreck Act (43 U.S.C. §§ 2101-2106)	**Full Compliance.** The Corps of Engineers has completed consultation with the Alaska State Historic Preservation Officer (SHPO) for a sunken barge near the LSA-South alternative site.
Clean Air Act, as amended (42 U.S.C. §§ 7401-7671g)	**Full Compliance**. The Unalaska area is outside any existing non-attainment areas. No new stationary emission sources are anticipated. Corps activities during construction of navigation improvements at Unalaska would employ procedures to limit fugitive nuisance dust emissions. No permit would be required from the Environmental Protection Agency or the State of Alaska.
Clean Water Act, as amended (33 U.S.C. §§ 1251 et seq.)	**Partial Compliance**. A Section 404(b)(1) analysis has been prepared and is contained in this final integrated feasibility report and environmental impact statement (FR/EIS). Section 401 Water Quality Certification is expected from the Alaska Department of Environmental Conservation after review of the final integrated feasibility report and environmental impact statement.
Coastal Zone Management Act (16 U.S.C. §§ 1451-1464)	**Partial Compliance**. A final consistency determination will be issued by the Alaska Department of Natural Resources after review of the final FR/EIS.
Endangered Species Act of 1973 as amended (16 U.S.C. §§ 1531 et seq.).	**Partial Compliance**. Formal consultation with the Fish and Wildlife Service on Steller's eider is ongoing. This consultation will be completed with the final biological opinion on Steller's eiders from the Fish and Wildlife Service. Informal consultation has been completed with National Marine Fisheries Service.
Estuary Protection Act (16 U.S.C. §§ 1221 et seq.)	**Full Compliance.** This FR/EIS identifies coastal resources at the project site and discusses potential impacts.
Federal Water Project Recreation Act as amended (16 U.S.C. §§ 460*l*-12-460*l*-22, 662)	**Not Applicable.** Recreation opportunities are not considered in the planning and design processes of Corps of Engineers navigation improvement projects.

Table S-2. Continued (Page 2 of 4).

Federal Statute	Status of Compliance
Fish and Wildlife Coordination Act (16 U.S.C. §§ 661 et seq)	**Full Compliance**. The final Department of the Interior Coordination Act report is appended to this FR/EIS.
Land and Water Conservation Fund Act as amended (16 U.S.C. §§ 460l-4 et seq)	**Not Applicable:** Navigation improvements at Unalaska would not affect or convert outdoor recreation properties or facilities acquired or developed with assistance from this action.
Magnuson-Stevens Fishery Management and Conservation Act (16 U.S.C. §§ 1801 et seq)	**Full Compliance**. Coordination with the National Marine Fisheries Service has been completed.
Marine Mammal Protection Act U.S.C. §§ 1361 et seq; 1401-1407, 1538, 4107)	**Full Compliance**. This FR/EIS addresses recommendations of the National Marine Fisheries Service and the Fish and Wildlife Service related to marine mammals.
Marine Protection, Research and Sanctuaries Act as amended (33 U.S.C. §§ 1401-1445; 16 U.S.C. §§ 1431 et seq; also 33 U.S.C. §§ 1271)	**Not Applicable**. Navigation improvements at Unalaska would not involve the transportation of dredged materials through territorial seas for ocean dumping.
Migratory Bird Conservation Act (16 U.S.C. §§ 715 to 715s)	**Not Applicable**. No compliance requirements specific to the Corps of Engineers are required by this act, FR/EIS includes a discussion of potential impacts on migratory birds in the project area.
Migratory Bird Treaty Act as amended (16 U.S.C. §§ 703-712)	**Full Compliance.** This FR/EIS considers migratory birds found at Unalaska. The U.S. Fish and Wildlife Service was consulted.

Table S-2. Continued (Page 3 of 4).

Federal Status	Status of Compliance
National Environmental Policy Act as amended (42 U.S.C. §§ 4321-4347)	**Partial Compliance.** Full compliance will be achieved when the record of decision is signed.
National Historic Preservation Act as amended (16 U.S.C. §§ 470 et seq)	**Partial Compliance.** Full compliance will be achieved with a Memorandum of Agreement (MOA) between the Corps of Engineers and the SHPO that specifies the terms of mitigation. Consultation is in progress.
1899 Rivers and Harbors Appropriation Act as amended (33 U.S.C. §§ 401, 403, 407)	**Full Compliance Pending**. The sponsor would obtain a permit under this act to place sponsor-owned structures in navigable waters of the United States.
Watershed Protection & Flood Prevention Act as amended (16 U.S.C. §§ 1001 et seq; 33 U.S.C. §§ 701b)	**Not Applicable**. Navigation improvements at Unalaska would not affect any flood preservation or soil conservation project.
Wild and Scenic Rivers Act as amended (16 U.S.C. §§ 1271 et seq)	**Not Applicable**. There are no wild and scenic rivers in the Unalaska area that would be affected by navigation improvements at Unalaska.
Wilderness Act (16 U.S.C. §§ 1131 et seq)	**Not Applicable**. Navigation improvements at Unalaska would not affect any designated wilderness area or the Alaska Maritime National Wildlife Refuge.

Table S-2. Continued (Page 4 of 4).

Executive Orders and CEQ Memos	Status of Compliance
Floodplain Management (E.O. 11988)	**Not Applicable**. No structures would be constructed within a floodplain.
Protection of Wetlands (E.O. 11990)	**Full Compliance**. The proposed action would not affect wetlands
Environmental Effects Abroad of Major Federal Action (E.O. 12114)	**Not Applicable.** No foreign country would be affected by construction of navigation improvements at Unalaska.
Protection and Enhancement of Environmental Quality (E.O. 11514 and 11991)	**Full Compliance**. The recommended plan includes justifiable mitigation measures to protect environmental resources.
Protection and Enhancement of the Cultural Environment (E.O. 11593)	**Full Compliance.**
Environmental Health and Safety Risks to Children (E.O. 13045)	**Full Compliance**. Environmental health and safety risks to children by navigation improvements at Unalaska is evaluated in this integrated feasibility report and environmental impact statement
Environmental Justice in Minority and Low-income Populations (E.O. 12898)	**Full Compliance**. Analysis of environmental justice in minority and low-income populations from navigation improvements at Unalaska is presented in this FR/EIS.
Consultation and Coordination with Indian Tribal Government (E.O. 13175)	**Full Compliance.** The local IRA tribal councils participated in the scoping process for this draft environmental impact statement through letters, public notices, and public meetings. The Corps of Engineers conducted government-to-government consultation.
Analysis of Impact on Prime and Unique Farmlands (CEQ Memo Aug. 11, 1980)	**Not Applicable.** Navigation improvements at Unalaska would not affect prime or unique farmlands.

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APPENDIXES

Appendixes unchanged since public review of the draft FR/EIS are not being reprinted for this final review. A copy of Vol. II, Appendixes, that accompanied the draft FR/EIS is available upon request. The following new and/or revised appendixes are included with this final FR/EIS:

Appendix E–Correspondence (updated)
Appendix H–USFWS Coordination Act Report (revised)
Appendix J–Responses to Comments (new)

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Acronyms and Abbreviations

ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
ADNR	Alaska Department of Natural Resources
ADOT/PF	Alaska Department of Transportation and Public Facilities
AHRS	Alaska Heritage Resources Survey
AMNWR	Alaska Maritime National Wildlife Refuge
ANSCA	Alaska Native Claims Settlement Act
AWCRSA	Aleutians West Coastal Resources Service Area
BCR	benefit/cost ratio
BOD	biological oxygen demand
BP	before present
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
Corps	U.S. Army Corps of Engineers Alaska District
CZMA	Coastal Zone Management Act
DO	dissolved oxygen
DOI	Department of Interior
EFH	essential fish habitat
EIS	environmental impact statement
ESA	Endangered Species Act
FAA	Federal Aviation Administration
ER	Engineer Regulations
FR/EIS	feasibility report and environmental impact statement
FUDS	Formerly Used Defense Sites
GNF	general navigation feature
IDC	interest during construction
LSA	Little South America
LCU	landing craft utility
LERR	lands, easements, real estate and rights-of-way
MHHW	mean higher high water
MHW	mean high water
MLLW	mean lower low water
MLW	mean low water

MSL	mean sea level
MSQS	marine sediment quality standards
MTL	mean tide level
NED	National Economic Development
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NPDES	National Pollution Discharge Elimination System
NPS	National Park Service
NRHP	National Register of Historic Places
OMRRR	operation, maintenance, repair, replacement and rehabilitation
PED	preconstruction engineering and design
PNW	Pacific Northwest
PSDDA	Puget Sound dredged disposal analysis
TMDL	total maximum daily limit
SHPO	State Historic Preservation Officer
SVOC	semivolatile organic compound
USACE	U.S. Army Corps of Engineers
USC	United States Code
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
WRDA	Water Resources Development Act

1.0 INTRODUCTION

1.1 Authority

This feasibility study was recommended in a November 6, 1998, report by the Alaska District, U.S. Army Corps of Engineers (Corps), titled "Preliminary Evaluation, Navigation Improvements, Unalaska, Alaska," and is authorized by a resolution adopted on December 2, 1970, by the Committee on Public Works of the U.S. House of Representatives. The resolution states:

> *Resolved by the Committee on Public Works of the House of Representatives, United States, that the Board of Engineers for Rivers and Harbors is hereby requested to review the reports of the Chief of Engineers on Rivers and Harbors in Alaska, published as House Document Numbered 414, 83rd Congress, 2nd Session; and other pertinent reports, with a view to determine whether any modifications of the recommendations contained therein are advisable at the present time.*

1.2 Scope of the Study

This study examines the feasibility and environmental effects of potential navigation improvements at Unalaska, Alaska (figure 1-1), a community on Unalaska and Amaknak Islands in the Aleutian Island chain, 1,287 kilometers (km) southwest of Anchorage. U.S. Army Corps of Engineers regulations (ER 1105-2-100) define the contents of feasibility reports for navigation improvements, and other Corps regulations (ER 200-2-2) direct the contents of environmental impact statements. This document presents the information required by both regulations as an integrated feasibility report and environmental impact statement (FR/EIS). It also complies with the requirements of the Council on Environmental Quality regulations for implementing the National Environmental Policy Act of 1969 (42 USC 4341 *et seq.*).

This draft environmental impact statement and feasibility report documents the studies and coordination conducted to determine whether the Federal Government should participate in navigation improvements for Unalaska, Alaska. Studies of potential navigation improvements considered a wide range of alternatives and the environmental consequences of those alternatives, but focused mainly on actions that would provide safe moorage for commercial fishing vessels. While there are many transportation needs in the North Pacific Ocean, the Bering Sea, and in the more limited area at Unalaska, most of those needs are not a Corps mission. Commercial navigation is a high priority mission for the Corps and only commercial vessels would generate enough national economic development (NED) benefits, such as reductions in transportation/travel costs, to allow the Corps to recommend a project to Congress. Studies for this action were limited to the Unalaska area because, under existing Federal authorities, the Corps of Engineers can only recommend to Congress navigation improvements cost-shared by non-Federal sponsors. The City of Unalaska has stated its intention to cost-share in a federally constructed harbor at Unalaska. This partnership of Federal and non-Federal interests in navigation improvements helps ensure that those improvements will effectively serve both local and national needs.

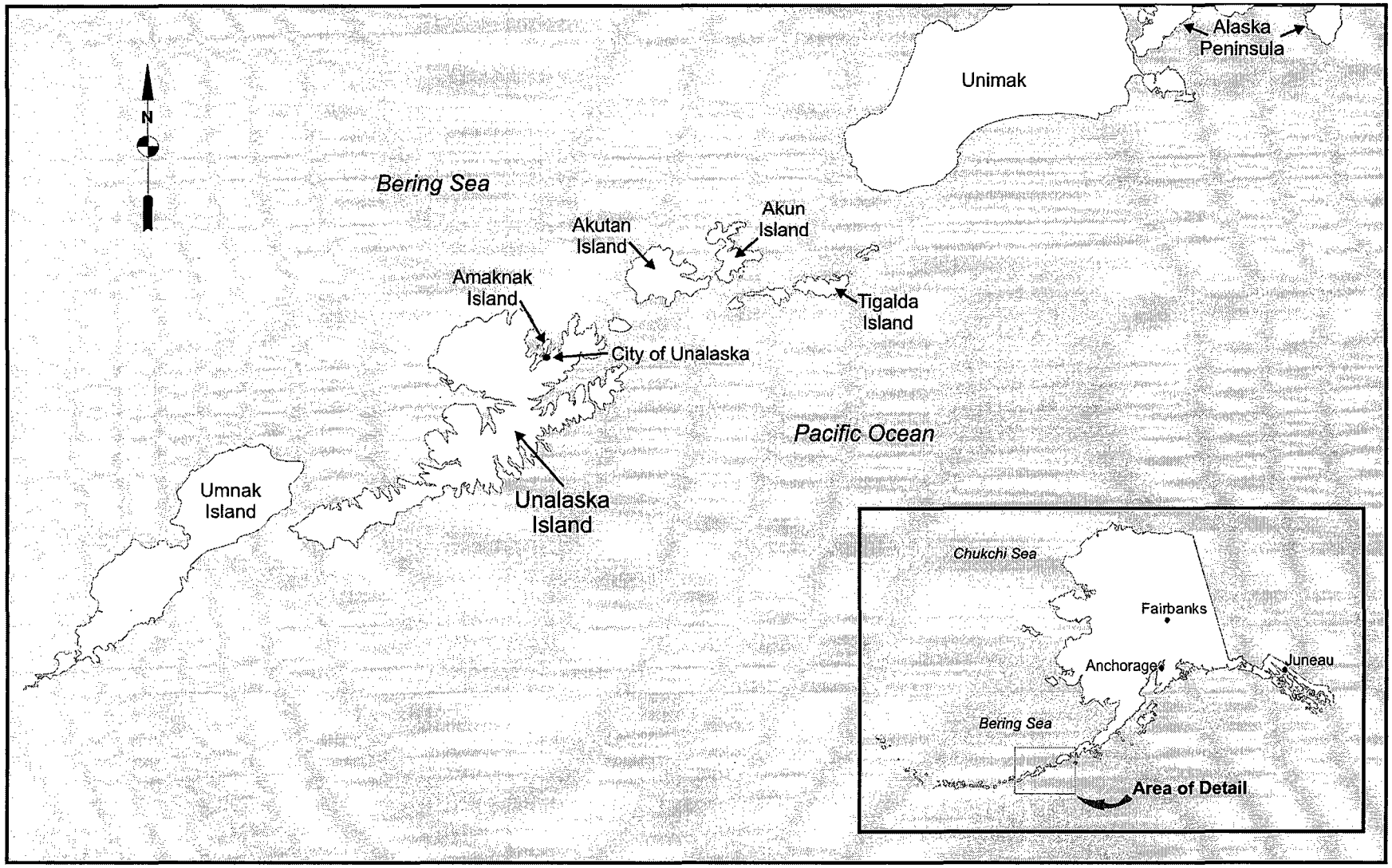

Figure 1-1. Unalaska location and vicinity map.

1.3 Study Participants and Coordination

The Alaska District, U.S. Army Corps of Engineers was primarily responsible for conducting studies for navigation improvements at Unalaska. The studies that are the basis for this report were conducted with the assistance of many individuals and agencies, including the City of Unalaska, the U.S. Fish and Wildlife Service (USFWS), the U.S. Coast Guard (USCG), the Alaska Department of Fish and Game (ADF&G), the Alaska Department of Environmental Conservation (ADEC), the Qawalangin Tribe of Unalaska, the Ounalashka Corporation, the Aleutians West Coastal Resource Service Area, the Members/Vessel Captains & Owners/Harbor Users of Unalaska, and the many members of the interested public who contributed information and constructive criticism to improve the quality of this report.

1.4 Related Studies and Reports

2000/2001—*Navigation Improvements Draft Feasibility Report and Environmental Assessment, Unalaska, Alaska* (August 2001), and *Navigation Improvements, Environmental Assessment and Finding of No Significant Impact, Unalaska, Alaska* (August 2000). Study and documentation for navigation improvements at Unalaska under the present authorization, funding, and cost-sharing agreements began in FY 1999. The Corps produced the two environmental assessments and the draft feasibility report referenced above in the course of this study. The August 2000 environmental assessment was released ahead of the feasibility report that was to have accompanied it. Public and agency review of the assessment identified needs for additional data collection and evaluation. The draft finding of no significant impact that accompanied the 2000 assessment was not signed. The 2000 environmental assessment was revised and released again in August 2001 along with a draft feasibility report. The two reports, released as a single bound document with appendices bound separately, presented additional environmental information and further information about the proposed action and alternatives. Public and agency comments identified substantial deficiencies in the environmental studies, and a number of comments stated that the proposed action would cause significant environmental impacts. After review of comments and unresolved issues, the Alaska District Engineer decided that an environmental impact statement was required because the Federal action could significantly affect water quality, marine habitat, Steller's eiders, and traditional food gathering activities.

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

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

1995—*Unalaska-Dutch Harbor Navigation Improvements: Supplement to the Northern Sea Route Reconnaissance Study* (July). This study identified an outer bar that large container vessels must cross traveling into or out of Iliuliuk Bay and Dutch Harbor. The study considered eliminating this bar and recommended proceeding to the feasibility phase. No non-Federal agency agreed to share costs of further studies and construction, and no further action was taken.

1991—*Harbor Facility Demand Study: a Component of the Harbor Management Plan,* (November). Prepared by ResourcEcon and Ogden Beeman & Associates, the report summarized moorage demand at Unalaska. The report identified shortages in moorage space for vessels less then 38 meters in length. It also identified potential new demand for moorage by larger container vessels.

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

2.0 PURPOSE AND NEED (PROBLEM IDENTIFICATION)

Navigation improvement studies at Unalaska were conducted to meet Federal and local needs to protect vessels at Unalaska through development that would produce positive national economic development benefits, meet local needs, and provide an acceptable level of environmental protection.

2.1 Study Area Conditions

This section briefly describes area conditions that relate to the proposed project's purpose and need. Section 6.0 contains more detailed information about the project area.

Unalaska is west of Akutan Pass in the Aleutian Island chain, 1,287 km southwest of Anchorage. Unalaska Bay and the contiguous marine waters are at latitude 54°00' N and longitude 166°30'W. The bay opens into the Bering Sea to the north. Amaknak Island and Hog Island are two significant land features in the bay. The City of Unalaska occupies the eastern shores of Iliuliuk Harbor and Captains Bay and extends across to the western shores of central Amaknak Island (figure 2-1). Unalaska is a 1st Class City with a council-manager form of government. The population is 4,283 (U.S. Census Bureau, 2000).

2.1.1 Climate and Topography

Unalaska has a maritime climate primarily influenced by strong low-pressure centers generated in the Bering Sea and western Pacific Ocean.

2.1.2 Winds

Predominant winds at Unalaska are generally caused by low-pressure systems tracking easterly across the western Pacific Ocean and southern Bering Sea. Strong winds occur throughout the year; however, the wind patterns have pronounced seasonal characteristics. Summer winds are generally from the south and are lighter, while winter winds are predominantly from the north and are stronger. The mean wind speed is 27 km/h. The most recent severe and damage-causing storm occurred in December 2003. Historical wind speed and direction data are summarized in Appendix A, Hydraulic Design.

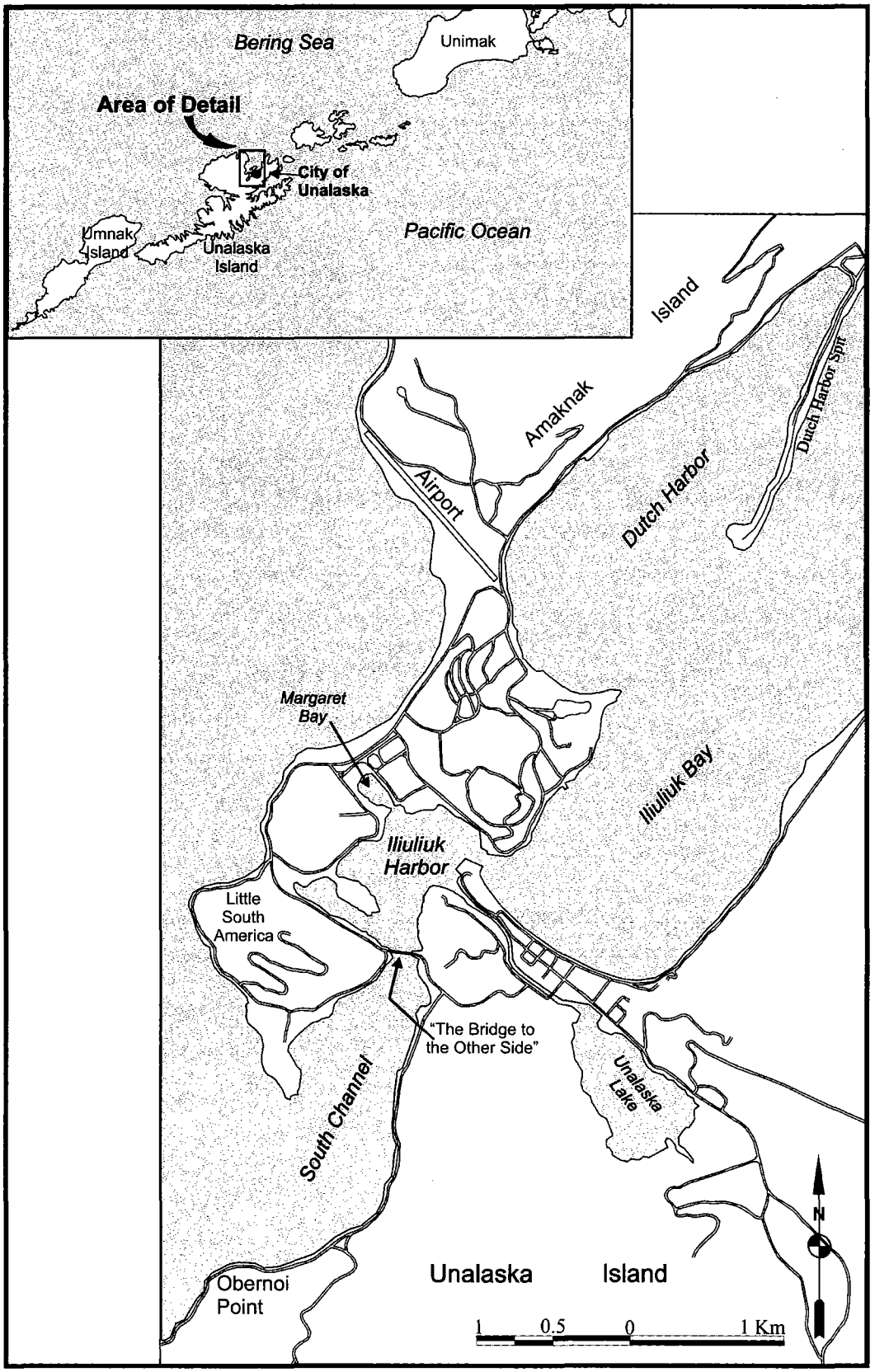

Figure 2-1. City of Unalaska vicinity map

2.1.3 Tides and Currents

The tides at Unalaska are diurnal and the mean tide is 0.67 meter. Tide levels, referenced to mean lower low water (MLLW), are shown in table 2-1. Extreme high water levels result from the combination of astronomic tides and rises in local water levels due to atmospheric and wave conditions. Water surface elevations have been recorded as high as +2.01 meters and as low as -0.82 meter at Unalaska under combinations of extreme high or low pressure systems and tides.

Table 2-1. Unalaska tide elevations

Level	Elevation (m MLLW)
Highest Tide (predicted)	+1.55
Mean Higher High Water (MHHW)	+1.13
Mean High Water	+1.04
Mean Low Water	+0.37
Mean Lower Low Water (MLLW)	0.0
Lowest Tide (predicted)	-0.55

Source: NOAA.

Mass movement of water into and out of Unalaska Bay appears to be most strongly influenced by wind. Under average wind conditions, tides have less effect on water movement and currents in most of the bay. Only during periods of low wind velocity do the tidal currents dominate the circulation patterns in the bay. In general, current velocities are 5 to 15 cm/sec along the western shores of Amaknak Island and from the Captains Bay eastern passage to the south end of Iliuliuk Harbor.

2.1.4 Fisheries

Unalaska serves as a regional transportation center for fuel and other materials that eventually reach many of the communities of western and northern coastal Alaska, but its primary economic base is the North Pacific and Bering Sea fisheries. Fish and crab from those fisheries are caught, often during short, intensive seasons, and transported to Unalaska where several processors on land and floating on the surrounding waters clean, prepare, and freeze or preserve the catches and ship them out to the world market. In 2002, Unalaska and its International Port of Dutch Harbor ranked as the number one port in Alaska and second in the nation in seafood volume (412 million kg) and value ($136 million).

The population of Unalaska increases almost four-fold, to about 16,000 persons at the height of the fishing season. Processing plants may operate 24 hours a day for weeks during a strong season, and businesses that serve and maintain the processors and the fishing fleet may work equally long hours.

An important segment of the North Pacific and Bering Sea fishery is a winter fishery, and winter in the Northern Pacific and Bering Sea is severe. High waves and winds, sometimes for weeks at a time, icing accumulations on decks and superstructures severe enough to sink ships, and heavy gear to fish intensive seasons in rough conditions all dictate larger fishing

vessels than are needed for most other Alaska fisheries. By the standards of this fishery, a boat of less than 18 meters may be considered a small fishing boat, while the same vessel might be as large as the biggest fishing boat moored in some Prince William Sound harbors.

Most of the crews that fish out of Unalaska do not live there, and full-time Unalaska residents do not own most of the boats in the fishery. Boats and crews arrive ahead of the fishery openings. Crews prepare the boats and then wait for the fishery to open, or sometimes for pricing or other arrangements to be completed with the processors. Between fishery openings, crews wait on the boats or in town or may fly out to wait at home or some other destination. Boats typically are moored at Unalaska between openings, but may be taken back to homeports if there will be an extended wait. During the long idle periods between the last major openings of late winter or early spring and the first openings of the next season, boats may be left moored at Unalaska or, more often, are returned to their home port. More information about principal fisheries and fisheries openings is in Section 6.1 and in Appendix B, Economics.

2.2 Moorage Conditions, Problems, and Needs

The coastlines of Amaknak and Unalaska Islands create natural, protected, deep-water moorage that has been used by larger vessels since early European exploration in the North Pacific Ocean and Bering Sea. Near Unalaska, the primary natural deep-draft harbor areas are Iliuliuk Bay, Dutch Harbor, and Iliuliuk Harbor (figure 2-2). The channels to Iliuliuk Bay and Dutch Harbor are readily navigable by ships that call at the port. The entrance to Iliuliuk Harbor is obstructed by an exposed reef and by vessels moored along the shore. Vessels less than 76 meters long regularly navigate the channel without special arrangement, but passage of larger ships may require temporary relocation of fishing vessels and freighters moored at two docks on opposite shores of the channel. Iliuliuk Bay and Dutch Harbor accommodate larger vessels without relocating moored vessels.

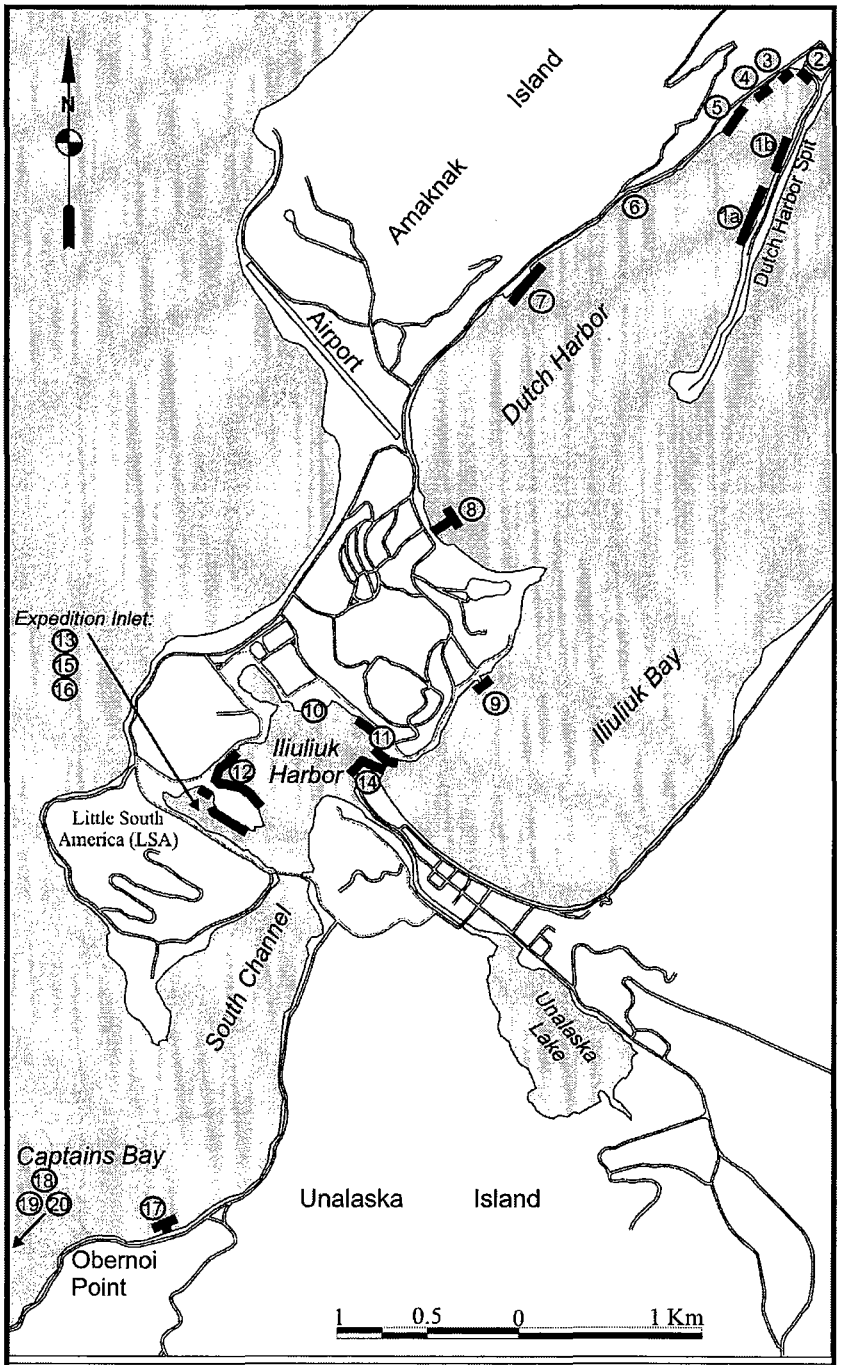

Figure 2-2. Existing mooring facilities at Unalaska.

The City operates four facilities shown in figure 2-2: the Spit Dock, the Light Cargo Dock, the Unalaska Marine Center, and a small boat harbor in Expedition Inlet (local name).

- The Spit Dock has 600 meters of total linear face and is available for the long-term and transient moorage of large commercial and fishing vessels up to 61 meters long.

- The Light Cargo Dock is 105 meters in length.

- The Unalaska Marine Center has 510 meters for use by the USCG; 267 meters of frontage dedicated berthing space for Horizon vessels of 213 to 274 meters in length; and 148 meters of dock face available to other ships.

- Small boat harbor facilities in Expedition Inlet serve fishing vessels and shipping, with 2,051 meters of moorage, and 375 meters of floating dock. The small boat harbor is a naturally protected site that provides moorage for 65 vessels up to 18 meters long. The floating docks in the small boat harbor were originally at the Spit Dock in the natural embayment of Dutch Harbor, but could not survive the winds and chop at that location and were moved to the Expedition Inlet. Small longliners, draggers, gillnetters, and small recreational vessels are the primary users of this moorage. A refurbished World War II submarine dock and marine ways at the head of Expedition Inlet are operated as part of a ship repair business that is important to the Unalaska shipping and commercial export of processed fish.

2.3 Need for the Action (Problem Description)

The City of Unalaska and its harbor in Dutch Harbor are the largest community and port in the Aleutian Islands. The two large, semi-enclosed natural bays of Dutch Harbor and Iliuliuk Harbor provide enough wave protection for deep-draft ships. Docks in both natural harbors are used for short-term moorage and freight transfer. Most ships waiting for cargo moor in the open waters of those harbors or in adjacent waters of Captains Bay, where they generally find enough protection from waves without having to shift anchorage.

The fishing boats that operate out of Unalaska can be expected to survive even severe storms, provided they have engine power and are crewed, in the same semi-protected natural harbors used by larger vessels. The big, deep-water natural harbors used by ships do not offer enough protection to ensure that most Unalaska commercial fishing boats would be protected from damage if they were left unattended for extended periods.

There is some moorage for fishing boats in Captains Bay, Dutch Harbor, and Iliuliuk Harbor (figure 2-2). Some of that moorage, because of alignment and protection afforded by local structures, can protect a few fishing boats in almost any of the wave conditions observed in those moorages, but there is not enough protection and/or room for a larger moorage system or more boats.

Most of the protected moorage for the smaller boats that may be either commercial or non-commercial is in the city's small boat harbor on the north side of Expedition Inlet (figure 2-

2). The moorage capacity for 65 boats in this small, natural inlet is fully utilized now and additional boat owners want moorage there.

The need for additional protected moorage at Unalaska is explored in detail in the Economic Appendix to this report (Appendix B). Needs and opportunities that may contribute to national economic development can be roughly divided into three categories as follows:

- While commercial fishing boats can survive waves in the natural harbors at Unalaska, they suffer damage that could be avoided with better mooring and mooring protection.

- Protecting fishing boats from wave damage and shifting rafted, crowded vessels to use existing moorage requires substantial labor and time by harbormaster staff, boat crews, and others. Less need to shift moored boats also would mean less potential for injury, damage to boats, and petroleum spills as boats were moved.

- Many fishing boats are returned to homeports or other harbors during extended fisheries closures. Fuel, crew time, and other travel expenses could be reduced or avoided if commercial fishing boats could be left in Unalaska for extended periods without crews.

Federal navigation projects constructed under the Principles and Guidelines for Water Resource Development are studied and constructed by a partnership of Federal and non-Federal interests. The principal Federal interest under these guidelines is to further National Economic Development (NED) goals. Local interests would expect the port to make navigation more useful to their users, less expensive, and/or to generate additional income. Needs of both the Federal and non-Federal interests must be met for a project to be funded and constructed.

During public scoping and analysis of navigation needs for Unalaska, the Corps found that vessel owners needed protected moorage at Unalaska for the full range of boats that are used in the area. There was strong demand for protected moorage for smaller boats used locally for recreation, personal-use harvest, charter, and limited commercial needs. There also was substantial demand for medium and large fishing boats that are almost entirely employed for commercial fishing or other commercial uses.

A harbor designed to protect boats ranging from less than 8 meters to more than 80 meters in length would meet at least some of the moorage needs at Unalaska. Federal interest requirements for harbors, under current policies and guidelines, can be met only by improvements that would benefit commercial vessels. Corps of Engineers recommendations to Congress for authorization of new harbors can only be for harbors that would produce more benefits to commercial navigation than they would cost to construct and maintain. In a practical sense, this means that the partnership between Unalaska and the Corps is only able to recommend a harbor that would be designed to serve primarily commercial vessels. Sixty percent of the vessels that would use a harbor at Unalaska are commercial fishing and other vessels 24 to 45 meters long, so Corps studies for a harbor at Unalaska focused on providing protected moorage for commercial vessels in that size range. Constructing a harbor for

vessels 24 to 45 meters long also would produce the most national economic development benefits, and a harbor for boats in that size range would meet an important segment of Unalaska's harbor needs. A harbor designed for boats in that size range could, however, be operated to also meet local needs for mooring smaller boats.

2.4. Issues and Concerns

2.4.1 Categorizing Concerns

Public involvement and agency coordination processes (described in Section 9) identified social and environmental resource concerns. Issues related to moorage needs, project siting, and other project needs and constraints were identified through consultation with the City of Unalaska, boat owners and users, and interested State and Federal resource agencies.

The issues, needs, concerns, and constraints identified during public involvement, economic analysis, agency coordination, and partnering with the City of Unalaska can be roughly grouped as follows:

Concerns that moorage should be safe, usable, and maintainable
Concerns about harbor effects on people and their use of the land
Concerns about harbor effects on natural resources

Specific concerns, issues, and constraints related to moorage construction and operation in Unalaska are discussed in the remainder of this section. Concerns and constraints related to the construction and function of a harbor are used to formulate project objectives and alternatives in Sections 3 and 4. Issues and concerns related to potential for a project to adversely impact people, cultural resources, and natural resources were used to identify the parts of the affected environment that receive the most attention in Section 6 and in the evaluation of environmental consequences in Section 7.

2.4.2 Concerns that Moorage Should Be Safe, Usable, and Maintainable

The non-Federal sponsor and the people of Unalaska expressed concerns that a harbor should be safe, usable, and maintainable. These needs also are inherent in Federal planning goals for harbors.

Harbor siting concerns focused on construction and operational safety, and compatibility with surrounding land uses and other marine transportation uses.

Harbor usability concerns were important to both the City of Unalaska and potential users. Users were especially concerned that any new harbor be reasonably convenient to use for crews of boats that moored there and that it be constructed so that activities necessary to operate a harbor can be accessed and used safely and efficiently.

Constructibility concerns were related to contractor access to and within the site. Those concerns also were related to safety, timing windows, and site conditions that might unduly affect construction cost or schedule.

Construction risks associated with unexpected conditions are always a concern. Some sites and construction methods are more likely to encounter unanticipated conditions that require expensive modifications to construction plans.

2.4.3 Concerns About People and Land Use

Personal use of resources may include harvest of plant leaves, stems, and berries; mussels, chitons, and other intertidal invertebrates; fish, king crabs; and other plant and animal material for non-commercial use. This harvest may be more generally termed "subsistence" in Alaska.

Cultural and historic resources include archeological and historical sites and properties. They also include cultural and tribal identities and traditions. Pre-contact and historic sites and properties are abundant in and near Unalaska. A Federally recognized tribe, the Qawalangin Tribe, is at Unalaska. Both Alaska Native and non-Native community members expressed concern about effects of development on traditional resource uses.

Recreational uses may be particularly important in remote communities with limited road systems and infrastructure. Public comment identified concerns that a harbor project might lessen recreational experiences from hiking, bird watching, picnicking, beachcombing, and other non-consumptive uses. Other scoping comments supported the harbor as a means to promote recreational opportunities. Ounalashka Corporation owns most of the land within the city limits and along the road system. Use of their land is allowed through a permitting process.

Executive Orders give minority populations and children special consideration in Federal decision making. Potential for project alternatives to adversely affect Native-owned property and economic development were of particular concern.

Non-commercial moorage needs were identified as a particular concern among public comments about additional Unalaska moorage. Boating for recreation, personal use harvest, and personal transportation is important to people in Unalaska, and both moorage and boat launching facilities to support those uses is inadequate.

Community benefits and costs were identified as concerns during scoping. Particular concerns were that the harbor should generate income to pay for its construction and operation, that it should support the economy of Unalaska by increasing sales and income, and that it should be an attractive facility that reflects well on the city and the people who live there.

2.4.4 Natural Resource Concerns

Water Quality. This was the principal abiotic resource of concern. Water quality is impaired in some marine waters around Unalaska. Regulatory agencies and others were concerned that harbor construction and use could cause further adverse effects.

Marine Habitats, Algaes (seaweed), and Invertebrates. These are important for human use and are essential for marine fish, birds, and mammals. Some biological communities were identified as particularly valuable.

Fish. Salmon and other anadromous fish important in commercial and local personal use fisheries move through inshore waters during their life histories and can be adversely affected by harbors and other construction. Marine species also may be affected.

Marine Mammals. Marine mammals are given special consideration and protection under Federal law. The animals and their critical habitats are of particular concern.

Birds. Bald eagles, short-tailed albatross, and Steller's eiders are given special consideration and protection under Federal law and are of particular concern. Other marine waterfowl, seabirds, and birds that inhabit or use the uplands near potential harbor sites also could be affected.

3.0 PLAN FORMULATION

3.1 Planning Criteria and Objectives

Planning criteria and objectives are derived from the principles and guidelines that guide Federal water resources development projects and from the issues, concerns, and needs described in Section 2.4. Planning for a harbor, as with any community planning, requires balancing varying needs and objectives. No harbor plan would be expected to fully meet all the objectives discussed in this section, but each objective is part of the overall planning and evaluation process.

3.1.1 National Economic Development Objective

The Federal objective of water and land resources planning is to contribute to the National Economic Development (NED) in a manner consistent with protecting the nation's environment. NED features increase the net value of goods and services provided to the economy of the United States as a whole. Only benefits contributing to the NED may be claimed for Federal economic justification of the project. For Unalaska navigation improvements, NED features include breakwaters, channels, basins, and float system.

Water resource planning must be consistent with the NED objectives and must consider engineering, economic, environmental, and social factors. The following objectives are guidelines for developing alternative plans and are used to evaluate those plans.

Federal Engineering Objectives. The plans should be adequately sized to accommodate user needs and provide for development of harbor-related facilities. They should protect against wind-generated waves and boat wakes. The Alaska District plans and designs boat harbors to attenuate waves to no more than 0.3 meter in the moorage area. Information from a number of harbors protecting a range of boats has shown that reducing waves to this height will allow little potential for wave damage to moored boats. Adequate depths and entry channels are required for safe navigation. The plans must be feasible from an engineering standpoint and capable of being economically constructed.

Federal Economic Criteria. Principles and guidelines for Federal water resources planning require identification of a plan that would produce the greatest contribution to the NED. The NED plan is defined as the environmentally acceptable plan providing the greatest net benefits. Net benefits are determined by subtracting annual costs from annual benefits. Corps of Engineers policy requires recommendation of the NED plan unless there is adequate justification to do otherwise.

All alternatives that would meet project needs must be presented and should be described in quantitative terms if possible. Benefits attributed to a plan must be expressed in terms of a time value of money and must exceed equivalent economic costs for the project. To be economically feasible, each separate portion or purpose of the plan must provide benefits at least equal to its cost. The scope of development must be such that benefits exceed project costs to the maximum extent possible. The economic evaluation of alternative plans is on a common basis of October 2003 prices, a project life of 50 years, and an interest rate of 5-5/8 percent.

3.1.2 Moorage Safety, Usability, and Maintainability Planning Objectives

A harbor that effectively serves both Federal and non-Federal interests must be sited, planned, and operated so that it safely and efficiently meets user needs. The following goals and objectives, based on the needs described in Section 2.4, are related to providing a harbor that is safe, usable, and maintainable.

- Safe from excessive hazards from avalanche, landslide, icing, severe wind, excessive current, incompatible industry, shipping lanes and other heavy waterborne traffic, and onshore surface traffic that would present undue hazards during operation.

- Compatible with surrounding land uses, including zoning, and with consideration for residential areas, hospitals, certain designations of public use lands, and other uses that might be adversely affected by noise and activity associated with harbor operation.

- Within walking distance of at least limited commercial facilities for travelers, including restaurants, stores, laundries, showers, and public facilities, or at least reasonably available public transportation.

- With sufficient uplands to allow safe, efficient operation. Upland area is required for harbor facilities, access to docks, staging for operations, parking, and other on-land activities required to operate any commercial venture or public facility. The Alaska Department of Transportation and Public Facilities recommends 4 hectares of uplands for every 6 hectares of harbor area. Minimum requirements may vary depending upon how the harbor is used, but at least a limited area is required immediately adjacent to the harbor for a harbormaster's office, waste disposal receptacles, emergency response vehicles, spill response equipment, restrooms, loading, short-term parking, and at least one place to purchase food and incidentals. About 1 hectare of uplands immediately adjacent to and at an elevation not much higher than the highest tides is required for efficient operation, with an additional 0.4 hectare needed if a boat launch ramp is constructed. Longer term parking and storage for fishing gear and other materials used in the fishing and water transportation industry can be farther from the harbor, but still should be within reasonable walking distance. An additional 3 hectares within 0.5 km of the harbor are needed for longer term parking and storage. Without this parking and storage capacity, the usability of the harbor suffers and the time and costs to reach required facilities could reduce net economic benefits.

- Keep harbor activities clear of roadways for safety and so transportation is not impeded. Such congestion should be avoided at a new harbor.

- Siting should allow the harbormaster's office to view the entire harbor. This is important for safety and efficiency.

- Harbor siting and operations should avoid conflicts with current marine operations.

- Site should be reasonably accessible, with at least enough adjacent uplands for equipment access and operation. Access to the site should not expose workers to undue hazards from slope gradients, rock fall, or other hazards.

- Site selection, project layout, and data about site conditions should be factored into decision making to minimize risks of encountering unexpected site conditions that would greatly increase construction costs.

- Approximate uplands requirements for the 75-boat design fleet are estimated as follows:

Harborsmaster office	600 m^2
Short-term parking	420 m^2
Gangway access and loading areas	580 m^2
Staging for supplies and gear	4,500 m^2
Emergency response equipment storage	50 m^2
Minimum concessionaire space	200 m^2
Information kiosk(s)	100 m^2
Trash and disposal collection points	180 m^2
Restrooms	150 m^2
Boat Ramp, queuing area, short-term trailer parking	3,900 m^2
Upland roadways	3,000 m^2
Total	13,680 m^2
Hectares	1.37

Differences in access, size, and configuration of available land areas will determine how uplands can be developed.

3.1.3 People and Land Use Planning Objectives

- Construct any harbor in a location compatible with local land-use plans and zoning.

- Construct a boat launch and other facilities for local small boat operators.

- Avoid locations that would increase road traffic to more than capacity of access roads.

- Make the harbor attractive to users and to people of the community.

- Avoid/minimize effects on recreational land use, including birding, picnicking, bird watching, hiking, and other non-consumptive uses.

- Avoid/minimize impacts to collection of plants and animals for local non-commercial consumption (subsistence). Improve access to those resources if possible.

- Improve or at least maintain existing protected moorage for smaller boats and provide additional moorage for medium and larger commercial vessels.
- Avoid/minimize effects to historical properties and sites
- Avoid disproportionate adverse effects on minority populations
- Avoid/minimize adverse effects on children
- Generate income from both harbor and adjacent uplands to pay for harbor operation and maintenance and to improve the economy for the people of Unalaska.

3.1.4 Natural Resource Planning Objectives

- Protect Steller's eiders and other threatened and endangered species and their habitats.
- Avoid environmental impacts and mitigate for unavoidable impacts to the extent justified.
- Construct in areas already disturbed or contaminated to the extent feasible.
- Avoid especially valuable habitat.
- Avoid/minimize effects to migrating anadromous fish.
- Incorporate feasible environmental restoration opportunities into the feasibility report and in recommendations to Congress.
- Minimize adverse water quality effects from harbor construction and operation.

3.1.5 Mitigation Implementation Objectives

Mitigation regulations for Corps of Engineer Civil Works projects (in ER-1105-2-100) require the recommended plan to include justifiable mitigation. The regulations require that, during the feasibility phase, Corps planners must "...justify mitigation and restoration features being recommended." Planners also are required to "... ensure that project-caused adverse impacts to ecological resources have been avoided or minimized to the extent practicable, and that unavoidable impacts have been compensated to the extent justified." Measures that enhance environmental resources (i.e. do more than replace lost or diminished resource values) are not mitigation features under water resource development policy or Corps regulations. The Corps can include environmental enhancement features in Civil Works projects, but those features must be specifically identified, are subject to different planning and cost sharing requirements, and cannot be accounted as mitigation.

Regulations do not specifically define how mitigation justification is to be determined, but guidance from Corps policy-level reviewers and comments from Office of Management and Budget on past projects are useful. That guidance indicates that justification of mitigation features recommended for inclusion in projects may take into account a number of factors, which may include the following:

- Value or importance of the affected resources (including economic, social, and biological community considerations).
- Value or importance of mitigation feature outputs.
- Comparative abundance of the affected resources. Resources that are regionally or nationally uncommon or rare may receive additional consideration.
- Proximity of the potential mitigation feature to the affected resources. Mitigation features adjacent to resources that would be lost or affected as a result of a Corps action are more readily justified than mitigation features intended to compensate for losses by restoring values in a regional or national context, which may be termed "off-site" mitigation.
- Comparability of affected resources with resources restored or replaced by mitigation. Mitigation features that would restore the same types of resources that would be affected by the project are likely to be more readily justified than mitigation features that would restore or create some other resource. Replacing lost sockeye spawning habitat with sockeye spawning habitat generally would be considered more justifiable than replacing the lost habitat with coho salmon spawning habitat or even sockeye rearing habitat, which might be termed "out-of-kind" mitigation.
- Potential for the mitigation to achieve and sustain the predicted or desired results. Mitigation features that have worked in the past in similar situations and that can be implemented and sustained by the non-Federal sponsor with commonly available and understood technology are more readily justified than features that are relatively untried, or where there is uncertainty about site or resource conditions, or where there are other factors that may cause doubt that the mitigation feature will achieve the desired results.
- Effects of the mitigation feature on other resources, including cultural and social/economic resources. Features that have little effect on other habitat, biota, historic sites, people, and economic activities may be more readily justified than those that have adverse effects on the surrounding biological or human communities.
- Cost, both as total cost and costs in units of output. A mitigation feature or the units of a feature (e.g. acres of habitat, numbers of fish produced, etc.) may be so expensive that the Federal decision maker is unlikely to find the feature is justified. Conversely, a feature with relatively modest outputs may be justifiable if unit costs are low.
- Cost uncertainty. Civil works feasibility reports must include estimates of mitigation feature costs, which are part of the total estimated project cost. The project cost, in turn, is used to determine Federal interest in constructing the project. Uncertainties about site conditions, objectives, methodology to be employed, acquisition of regulatory permits, land ownership or land costs, construction access to mitigation site, and other unknowns can affect the ability of decisionmakers to select and approve an action. A high degree of uncertainty about cost may prevent a mitigation feature from being considered justifiable.

3.2 Views of Other Agencies

Other agencies, both State and Federal, contributed their perspectives to the planning process for a harbor at Unalaska. Some agencies stated a preference for one alternative site over another, while

other agencies expressed more general concerns about potential effects or resource protection. Their views, as we understand them, are presented in the remainder of this section.

U.S. Fish and Wildlife Service (USFWS). The draft biological opinion (USFWS, Appendix I), contained a draft determination that a harbor can be constructed as recommended in Section 5 of this report without jeopardizing species listed as endangered or threatened by the USFWS. The USFWS has stated repeatedly that extensive compensatory mitigation should be incorporated into the recommended plan to compensate for effects of the LSA-South alternative. Their views are expressed in the revised Fish and Wildlife Service Coordination Act Report (Appendix H). Compensatory mitigation recommended by the USFWS is much greater in scope and cost than can be justified under Corps planning regulations.

U.S. Environmental Protection Agency (USEPA). After review of the draft FR/EIS, USEPA requested additional information about existing water quality, other affected resources, effects of the proposed action, and mitigation alternatives. They recommended additional compensatory mitigation.

National Marine Fisheries Service (NMFS). The USFWS reported the following views from National Marine Fisheries Service Anchorage Field Office, Habitat Conservation Division, Review of the February 2004 revised draft Fish and Wildlife Coordination Act report (USFWS 2004a):

> "From the information you provided and from our own knowledge of the resources in the area, any of the alternatives identified, beyond the No-Action alternative, would equally impact resources of our concern. Therefore, we do not recommend one alternative over another."

NMFS review comments for the draft Unalaska FR/EIS stated that they are generally satisfied with the report and the endangered species coordination. The presentation of essential fish habitat information in the final report has been revised in response to their comments.

National Park Service (NPS). Much of the area around Unalaska is a National Historic Landmark. Linda Cook, Special Assistant to the Regional Director, Aleutian World War II National Historic Area reviewed the Corps' 2000 draft environmental assessment and the *Cultural Resources Impacts of Three Proposed Navigation Improvement Sites in Unalaska, Alaska* prepared by Dr. Richard Knecht (2000). She emphasized the need to address impacts to the landmark and stated that construction in the Little South America area has the potential to affect historical artifacts and underground structures. Cook added that mitigation of construction at Little South America should include a plan for a visitor or user information center. In comments for the draft FR/EIS, the Park Service indicated the need for completion of the coordination process, measures to protect historic resources, and additional information in the FR/EIS. That additional information has been incorporated and mitigation measures are being coordinated.

Alaska Department of Environmental Conservation (ADEC). The ADEC is responsible for issuing water quality certificates of reasonable assurance under Section 401 of the Clean Water Act. They are particularly concerned about water exchange from the harbor and about activities during construction and operation that could degrade water quality. ADEC has conducted a preliminary review of circulation in South Channel and potential circulation and water quality characteristics of

the LSA-South alternative, which is the NED plan. They have indicated that, pending review of the final report and EIS, they expect to issue a Certificate of Reasonable Assurance for the NED plan.

Alaska Department of Fish and Game. No views have been expressed.

Alaska Department of Natural Resources. The Alaska Department of Natural Resources does not object to the proposed action and will continue to work with the Corps to implement mitigation measures.

Alaska State Historic Preservation Officer (SHPO). The Corps identified sites that are within the area of potential effect, and determined that a prehistoric site (UNL-047) eligible, and pilings from a saltery UNL-0291) are not eligible for the National Register of Historic Places in a letter sent July 19, 2000. The remains of a barge nearby was also found not eligible. The Corps concluded that the construction of a harbor at Unalaska would cause an adverse effect to the Dutch Harbor Naval Operating Base and Fort Mears, U.S. Army National Historic Landmark (UNL-0120). The Alaska State Historic Preservation Officer did not respond to the letter and the Corps assumes she agrees with the determinations and assessment of effect to the National Historic Landmark per (36 CFR 800(c)(1). The Corps will assess the effects on UNL-047 and continue consultation to mitigate the effects on the National Historic Landmark with the State Historic Preservation Officer as required by the National Historic Preservation Act.

Qawalangin Tribe of Unalaska. The Qawalangin Tribal Council supports the recommended plan.

4.0 ALTERNATIVES

4.1 No Action and Nonstructural Alternatives

The existing harbor facilities would remain as they are and would continue to be used at more than design capacity. Severe overcrowding in the existing harbor, lack of sufficient mooring space, and excessive wear and tear on the float system would continue. Potential users would continue to be turned away due to insufficient mooring space. Damage to vessels and docks from rafting would continue. Vessels would continue to operate in crowded conditions with insufficient facilities and at docking facilities without adequate protection from waves. Boats would continue to be moved to other harbors to wait for the fishing season, with attendant costs to vessel owners.

No nonstructural measures would meet project objectives or satisfy the need for additional protected moorage at Unalaska. The vessels that need protection are too large to be economically removed from the water during periods when they are not in use and cannot be economically moved to another site that would offer protection. No other potential non-structural alternative could be identified during this study.

4.2 Alternative Sites Initially Considered

Early in the planning process the project sponsor identified a site near the southern end of Little South America on Amaknak Island as the site they preferred for a new harbor. Concerns about the potential of a harbor to adversely impact natural and human resources at that site led to a thorough search for other sites that might meet harbor needs at Unalaska. A number of sites were examined in the early screening of alternatives. Eight of those sites were screened more carefully to determine whether they could be developed and operated economically for the design fleet. Sites where it might be possible to develop a harbor to produce positive NED benefits, the no-action alternative, and the potential for a non-Federal entity to construct a harbor are considered in detail in Section 4.3.

Three of the eight sites evaluated are in or adjacent to Iliuliuk Bay, three are in Captains Bay or South Channel (which connects Captains Bay and Iliuliuk Bay/Iliuliuk Harbor), and two are in naturally protected Dutch Harbor (figure 4-1). Following is a brief discussion of each alternative site.

4.2.1 Iliuliuk Bay Sites

Margaret Bay. Margaret Bay is a small, undeveloped bay connected to the natural waterbody of Iliuliuk Harbor. The entrance to the bay is narrow (about 15 meters wide) and shallow. The natural harbor basin is a maximum of about 4.5 meters deep and covers an area of about 2.8 hectares.

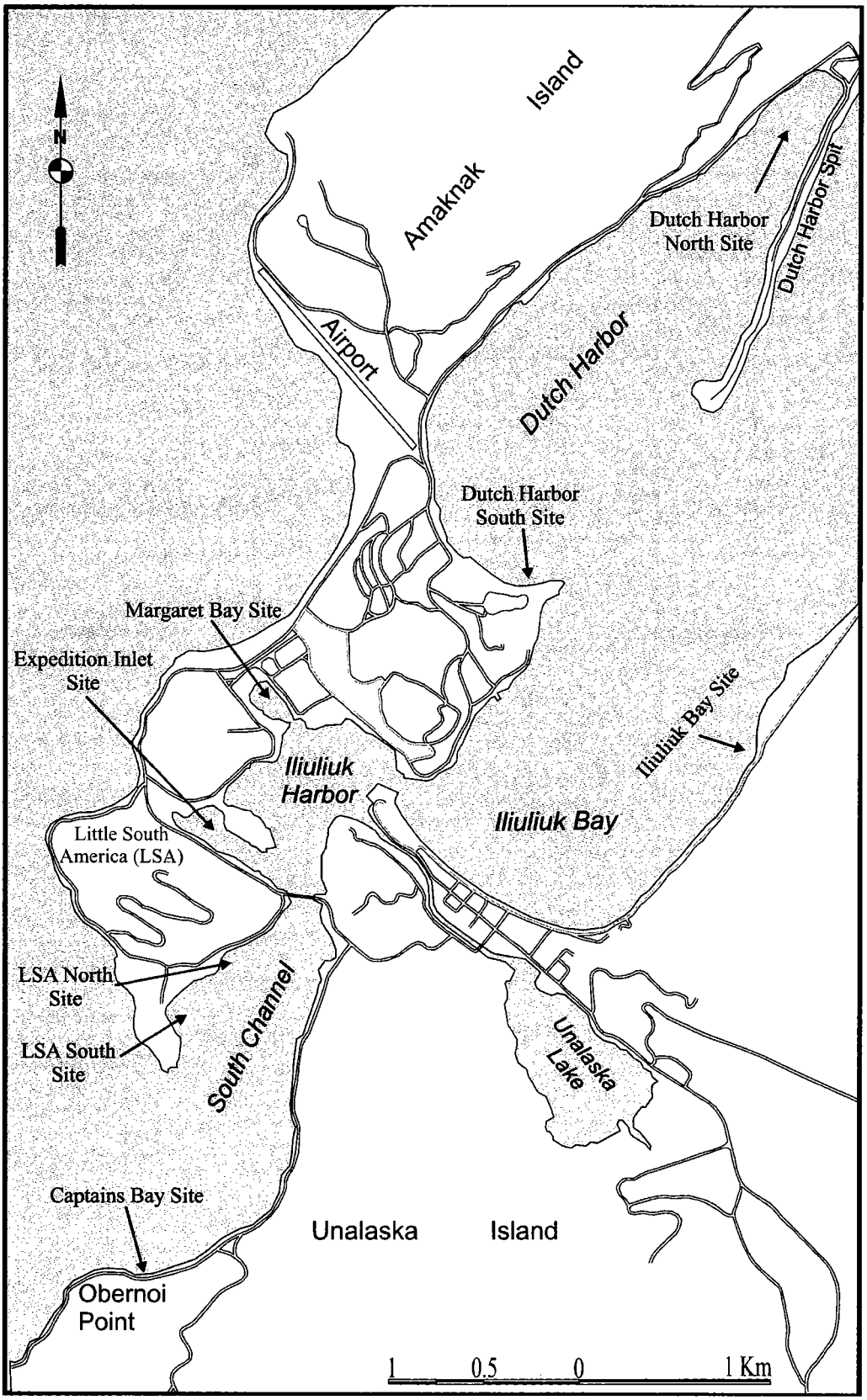

Figure 4-1. Harbor sites initially considered

The harbor could be enlarged by dredging into the adjacent uplands (part of which were created by filling in Margaret Bay and adjacent natural water bodies during World War II) and by dredging the bay deeper. The entrance channel also could be widened and deepened for boat access. Margaret Bay could accommodate less than half of the 75-boat design fleet.

Development would be expensive because a long, wide channel about 6.1 meters deep would be required to allow full-tide access by the design fleet. Although the entrance channel was not tested sufficiently to thoroughly define geophysical conditions, available data indicate that part of the entrance channel excavation would be through bedrock or large rock that would require blasting to create the necessary 45-meter-wide entrance channel. Approximately 100,000 m^3, some of it rock, would be dredged for the entrance channel and mooring basin. Some of the dredged material would be soft, fine material high in organics and expensive to treat and discharge. Additional costs would be incurred from relocating sewage lines that cross the entrance to the bay. Land acquisition and impact mitigation costs would be high because the action could be expected to impact diverse and productive habitat in Margaret Bay and existing structures and sites near the bay. The Grand Aleutian Hotel, the Museum of the Aleutians, Ounalashka Corporation Offices, contractor's camp, archeological sites at the entrance to the bay, and potential archeological resources in the bottom of the bay all could be impacted by a harbor at this location.

Total excavation costs for the channel and mooring basin would, based on available information, exceed $12 million. Accounting for mooring facilities and benefits for the smaller number of boats results in a benefit-to-cost ratio less than 1.0. Mobilization, demobilization, land acquisition, archaeological studies, mitigation, and other construction costs will further reduce the benefit-to-cost ratio.

Developing Margaret Bay as a harbor for vessels in the target range of 24 to 45 meters would not be economically feasible, although it might be feasible to develop it for smaller, shallower-draft boats.

This alternative was eliminated from detailed consideration by its cost, limited size, and the risks of cost escalation during construction.

Iliuliuk Bay Site. This site, south of the landfill in Iliuliuk Bay (figure 4-1), was briefly considered because it is in relatively low-value marine habitat, is in an area that already has been partially developed, and it is close to other port facilities and shipping. The site is so deep that it would require very little dredging and could be developed to protect the entire design fleet.

The site is fully exposed to swell and large waves from the Bering Sea to the north. Floating breakwaters would not be feasible to protect a harbor at the site because the waves are too large and the wave period is too long. Rubblemound breakwaters would require massive armor stone (up to 25,000 kg) to withstand the wave climate. Water depth (over 22 meters) would make rubblemound breakwaters uneconomical.

Average water depths are similar to the Captains Bay site and would also result in a benefit-to-cost-ratio less than 1.0 based on the cost of breakwaters alone. As in the Captains Bay site analysis, other construction costs must be added. This site was eliminated from further study.

Expedition Inlet. The existing small boat harbor in Expedition Inlet (figure 4-1) provides moorage for 65 commercial and recreational boats. A refurbished World War II submarine dock and marine ways used for ship repair services is also in the inlet. There are no other protected moorage facilities for small longliners, draggers, gillnetters, and recreational vessels in Unalaska.

Additional moorage could be added to the protected inlet to accommodate 15 to 20 of the smaller vessels of the 24 to 45-meter design fleet without dredging, and about 31 smaller vessels with some dredging. More extensive dredging could increase the numbers of boats from the design fleet, but at costs that would exceed economic benefits. Available information indicates that dredging the shallower near-shore bottom to the –5.5 meters MLLW required for moorage would encounter bedrock or large rock masses that would require extensive blasting.

There are a number of operating problems with this site: maneuvering space would be tight, and ships using the repair facilities at the head of the bay would compound maneuvering problems.

This site does not have enough space to stand alone as an alternative harbor site for the design fleet, but it might meet some part of the identified harbor needs. This site is not considered further as a stand-alone project for large vessels, but it is carried into detailed consideration as part of a combination harbor alternative that might fully meet harbor needs by protecting some boats in Expedition Inlet and protecting the remainder at a site identified as Little South America-North. That site is a short distance southeast of the existing harbor and is discussed later in this report.

4.2.2 Dutch Harbor Sites

Dutch Harbor North. This site is at the head of the natural water body of Dutch Harbor, which is protected from most directions (figure 4-1). Natural land features that form an acute angle protect two sides of this site. Wave protection could be constructed across this acute angle to provide protected moorage that would not require dredging. The new harbor created by this construction would be confined to a new harbor to an area that already is substantially affected by development. Existing docks, moored vessels, warehouses, and processors would surround the harbor and other structures and activities related to fisheries and marine transportation. A harbor sized primarily for Bering Sea commercial fishing vessels would be compatible with existing activities at the site.

This site is usually protected from large waves, and vessels moor along some of the docks without protection. Waves of 1 meter can be expected at least once during most years, however, and wave heights of 1.9 meters or more have been reported

occasionally. This indicates that without additional wave protection, boats could not be moored in Dutch Harbor and a float system could not be constructed and economically maintained. Water at the harbor site along the most practical breakwater alignment is -22 to -35 meters MLLW, too deep for an economically feasible rubblemound breakwater.

Several breakwater layouts were evaluated to identify the least expensive alternative for Dutch Harbor that would protect the majority of the design fleet. The best of those appeared to be a breakwater with two legs that would form a roughly rectangular harbor. Breakwater materials are estimated at 18,000 m^3 of armor rock, 30,000 m^3 of secondary rock, and 371,000 m^3 of core rock. Preliminary cost evaluation, without including costs of mobilization or demobilization, estimated that a harbor protected by a rubblemound breakwater for 52 vessels in Dutch Harbor would cost about $40 million to construct. This would result in a benefit-to-cost ratio of about 0.6.

Alternative layouts that would move the breakwater alignment into shallower water also were evaluated during alternative development. Deep water is close to shore, even at the head of Dutch harbor, so the breakwaters would have to be moved much closer to shore to be constructed at a cost that would economically harbor the design fleet. Producing enough area for a harbor inside that closer breakwater would require extensive dredging into the uplands at the head of the bay and would likely encounter rock. Dredging into the uplands would be expensive as would land acquisition and mitigation or protection of historic sites. None of the alternative layouts in shallower water at Dutch Harbor would substantially reduce harbor construction costs or produce a higher benefit-to-cost ratio.

Pile-supported wave barriers and floating breakwaters also were considered as alternative construction approaches that might reduce costs and produce an acceptable benefit/cost ratio. Wave barriers along the same alignment as the rubblemound breakwater alternative would be difficult and expensive to construct in the deep water. They would not be less expensive or produce a higher benefit/cost ratio over the life of the project.

Floating breakwaters work well to attenuate smaller waves that reach the breakwater at relatively short intervals (termed "wave periods"). An economically feasible floating breakwater might be constructed to handle the design wave at the Dutch Harbor site (about 1.9 meters) if the wave period were short. A floating breakwater to attenuate the longer wave periods that sometimes occur in Dutch Harbor, however, would have to be very wide (about 30 meters) and deep (about 1.8 meters) to meet project objectives for reducing wave heights in the protected areas of the harbor. A floating breakwater of this size would cost more than a rubblemound breakwater to construct and maintain for the life of the project.

None of the alternative wave protection alternatives or harbor layouts evaluated for the Dutch Harbor site would be economically feasible for a Federal project at that site. This site alternative was not considered in additional detail.

Dutch Harbor South. This site is 500 meters from the end of the Dutch Harbor Airport (figure 4-1). It was initially investigated because a harbor at the site would be compatible with surrounding land use, use of the site appeared unlikely to cause significant environmental impacts, and because the surrounding land offered some wave protection to a limited area at this location. The site was eliminated from detailed consideration because it is in the extended centerline clear zone of the only runway at the Dutch Harbor airport. The Corps of Engineers consulted with the Federal Aviation Administration regarding airport criteria and acceptability of a harbor at this location from an aircraft operations perspective. The airport already operates under special criteria because normal approach standards do not allow commercial aircraft service at Dutch Harbor. If a harbor was constructed at this location, the superstructure and masts of boats moored there would reach upward into the mandatory clear zone for approaching aircraft. Federal Aviation Administration regulations would prevent commercial aircraft from conducting instrument flight at the Dutch Harbor runway if the minimum clear zone was violated. No other alternatives for commercial aircraft service to Unalaska that could be developed to make this site available were identified during planning. Wave heights and water depths at this site also would make construction expensive. Preliminary estimates indicate that a harbor for the design fleet at this site would be too costly to be constructed as a Federal project.

4.2.3 Captains Bay Sites

Three sites in Captains Bay, including South Channel, were considered in the initial evaluation of potential harbor sites. One site is on the east side of Captains Bay. The other two are on the eastern shoreline of the Amaknak Island peninsula locally known as "Little South America" (figure 4-1).

Captains Bay Site. This site (figure 4-1) is just southwest of the existing Westward Seafoods dock in Captains Bay. Natural depths in the area range from -9 to -42 meters MLLW. The site was suggested because a harbor at the site would be compatible with surrounding land use, because use of the site appeared unlikely to cause significant environmental impacts, and because the surrounding land offered some wave protection to a limited area at this location. This site is the only potential site for harbor development along Captains Bay Road.

The area available for harbor development is limited on the east by the Westward Seafoods dock. Deep water offshore and to the west also would limit harbor area and configuration. A harbor plan was drafted for this site to compare costs of construction at this site with costs at others. Only a rubblemound breakwater was considered; the water is too deep for a wave barrier, and the wave environment would not allow a floating breakwater to effectively protect a harbor.

Material for a breakwater in the water depths at this site would be prohibitively expensive. An estimated 28,000 m^3 of armor rock, 75,000 m^3 of secondary rock, and 1,200,000 m^3 of core material would be required for breakwater construction to

protect the 75-boat design fleet at this site. Breakwater construction would cost an estimated $50 million. This would produce a benefit-to-cost ratio of 0.6 based on the cost of the breakwaters alone. Mooring facilities, mobilization, demobilization, land acquisition, and other construction costs would increase total costs substantially. The benefit-to-cost ratio would be lowered further by other construction costs.
This alternative was eliminated from detailed consideration because construction costs would make it economically infeasible.

Little South America–North. This site avoids some of the more valuable marine habitat near Little South America (LSA) farther south, but poses several construction and operations problems. Most significantly, a harbor capable of protecting the 75-boat design fleet (figure 4-1) would extend well into South Channel, potentially affecting boats passing through the area. The bridge connecting Unalaska and Amaknak Islands would be very close to the harbor, so it could be damaged if a boat entering or leaving the harbor lost steering or power. Uplands to support harbor operations would be expensive (possibly prohibitively expensive) to develop. Site conditions, particularly water depth, would make rubblemound breakwater construction relatively expensive at this site. Preliminary cost estimates indicated a harbor at this site could produce at least small net National Economic Development benefits. This site is considered in detail in Section 4.3 of this report as a stand-alone alternative and as a combination alternative with the Expedition Inlet site.

Little South America-South. The southern end of the Little South America peninsula of Amaknak Island curves into Captains Bay and protects an area of the bay from long-period waves from the Bering Sea (figure 4-1). Further protection could be developed in this area to protect the 75-boat design fleet by constructing a combination of a rubblemound breakwater to attenuate longer-period waves from the south and floating breakwaters in deeper water to attenuate the short-period waves generated locally. The site is compatible with land-use planning in the area, but would impact an area valued by some community members . Preliminary cost estimates indicated that a harbor constructed for the 75-boat design fleet at this site could produce positive National Economic Development benefits. This site and alternatives for developing it are considered in more detail in Section 4.3 of this report.

4.3 Alternative Sites Considered in Detail

The no-action alternative and three of the eight sites initially considered in Section 4.2 are considered in more detail in this section. They also are the basis for later discussions of plan optimization and environmental impacts. There is no indication that any of the sites eliminated would be developed by a non-Federal agency or non-government entity in the foreseeable future.

The three site alternatives selected for detailed consideration were the only sites that appeared to have characteristics that might allow development of a harbor that would

produce a net benefit-to-cost ratio greater than 1.0. The three sites are shown in figure 4-2 and are as follows:

The Little South America (LSA)-North site
The combination of LSA-North and Expedition Inlet
The LSA-South site.

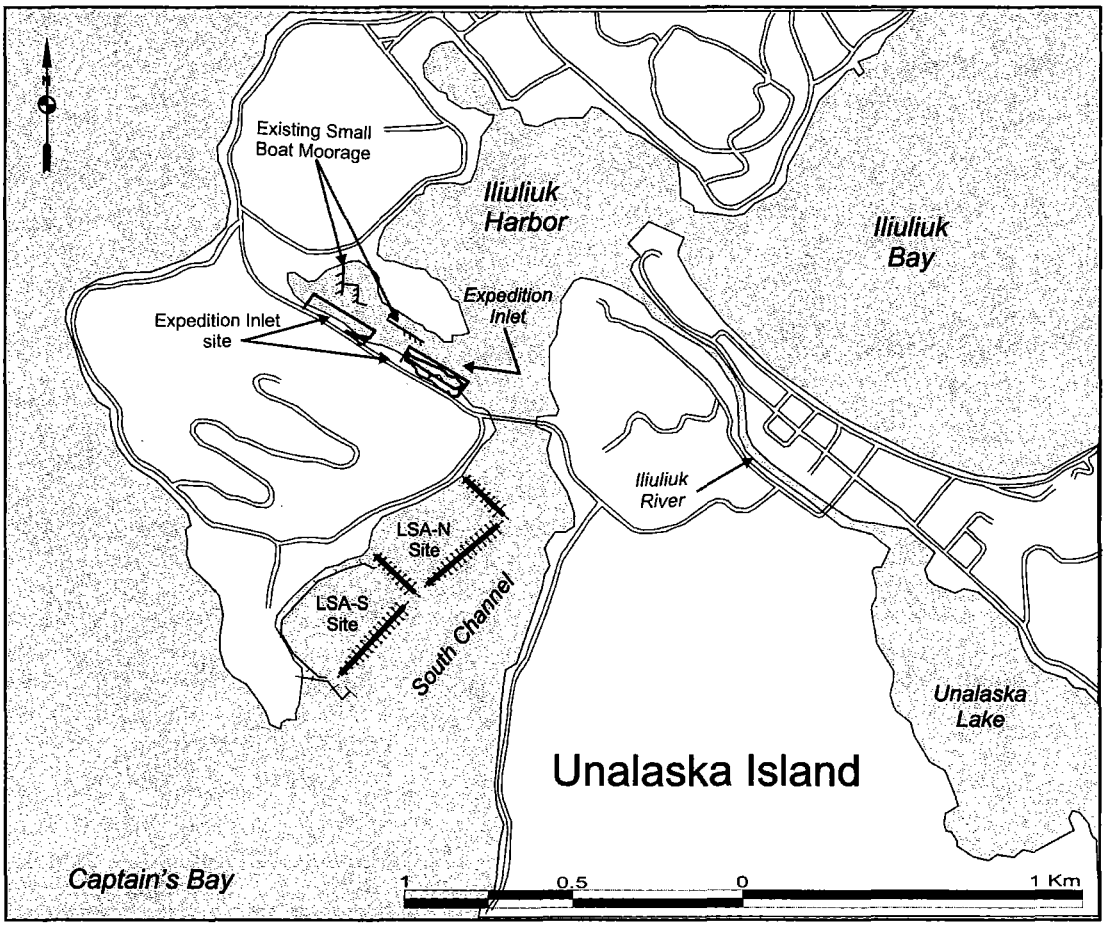

Figure 4-2. Alternative sites considered in detail.

The remainder of this section presents plans and information about how a harbor might be designed at each alternative site and examines how well alternatives at each site would meet the planning goals, objectives, and criteria that are identified in Section 3.

4.3.1 The No-Action Alternative

The no-action alternative would leave the issues and concerns for the public and environmental welfare unchanged unless a non-federal entity elected to construct a harbor. The identified purpose and need would not be met. Mooring facilities at Unalaska would continue to be used beyond their design capacity. Damages to

vessels and docking facilities from overcrowded conditions would continue. Economic benefits to the fleet from improved and expanded harbor facilities would not be achieved. Vessels unable to secure moorage in the existing harbor would continue seeking refuge at other ports, or would travel long distances to homeports between fishing seasons.

State agencies, tribal entities or private industries have the potential to build new protected moorage at Unalaska. None of the non-federal agencies are likely to construct a project without assistance from the federal government. Private investment would produce a very low rate of return, and investors would not receive any returns from some benefit categories (e.g. reduction in travel costs). The City of Unalaska might be able to construct a harbor at the LSA-South site if there was no Federal project. Earlier planning by Unalaska indicates that any city-sponsored harbor would be similar to the LSA-South alternative described in this report.

4.3.2 LSA-North Site

This site could be developed to moor the 75-boat design fleet by constructing two breakwaters into South Channel from the shores of LSA and a third breakwater across the seaward opening between the first two.

Figure 4-3 shows this concept in a configuration that takes advantage of a rocky point and marginally shallow water at the southern end of the harbor site. The south breakwater would be of rubblemound or wave barrier construction to minimize wave energy from the south. The shallow water at the alignment shown would require less breakwater quantity or less wave barrier depth than any other alignment for the south breakwater.

The northern end of this conceptual harbor would be limited by the narrowing of South Channel and by the bridge connecting Amaknak and Unalaska Islands (figure 4-3). An avenue must be maintained for boats transiting between Iliuliuk Harbor and Captains Bay through South Channel. The existing bridge is expected to be replaced by a slightly higher bridge just south of the existing bridge. The northern breakwater would be configured to leave room for both the new bridge and for its construction. Additional clearance between the harbor and the bridge would be preferred to reduce the risk that a boat using the harbor would lose power and damage the bridge.

The cost of constructing the southern breakwater would escalate rapidly in the deeper water offshore. Harbor configuration would be a tradeoff between the need to keep the southern breakwater short and on the shallower bottom off the point, the need to stay clear of the bridge, the need to allow room for boats to pass through South Channel, and the need to meet project mooring objectives by creating protected moorage (about 6.4 hectares) for 75 boats 24 to 45 meters long.

The configuration in figure 4-3 balances those needs by placing the northern breakwater closer to the bridge (and an important archeological site) than would be preferred by the Alaska Department of Transportation and by narrowing South

Channel more than might be preferred by boat operators using the channel in adverse weather. Floating breakwaters would be used to protect the northern and eastern perimeters of the harbor. They would be less expensive to construct than rubblemound breakwaters or wave barriers in the deeper water along those alignments and would offer enough protection from waves generated in the short fetches east and north of this harbor site.

The water deepens quickly off the shoreline at this site, so little dredging would be required to construct this harbor. The 5,200 m^3 dredged to construct this alternative could be used to produce a 0.11-hectare sea-side staging area at the southern end of the harbor. The plan would not dredge more area because producing the comparatively small amount of additional mooring area would be too expensive even if relatively little rock were encountered. The non-Federal sponsor could elect to expand the staging area later, but there are no plans to do so.

Henry Swanson Drive traverses the hillside above the coastline at the south end of the LSA-North site and drops to about 3 meters above MHHW along most of the site. The road is paved adjacent to this site and is capable of handling the existing light traffic volume, including the heavy trucks that deliver materials from the quarry just south of this site. The existing road system could handle the additional traffic for a harbor at this site without substantial improvement.

Utilities could be extended to this site from existing electric, water, and communication lines. Connection distance would be less than 0.5 km to the northern end of the harbor site. A live-crab on-shore holding facility is adjacent to the LSA-North site. This plant uses untreated seawater from South Channel a short distance offshore to maintain the crabs. Used water from the holding tanks is discharged back into the waters of South Channel. The seawater intake and discharge lines would be relocated outside the harbor. Harbor operations in the limited uplands space adjacent to this harbor site could, at least occasionally, adversely affect plant operations.

Staging, parking, office space, and access to the mooring floats would be difficult and expensive to provide at this site. Longer term parking and storage could be developed at the quarry site, but there appears to be no cost-effective way to provide for working space at the harbor itself for a harbormaster's office, restrooms, short-term parking for load transfer and maintenance vehicles, and other on-land functions required to operate a functional harbor. Figure 4-4 shows the steep terrain adjacent to the LSA-North harbor site.

Access from Henry Swanson Drive to the harbor could be over a short ramp from the road to docks or floats. Delivery, service, and emergency vehicles would block the road, as would vehicles of boat operators dropping off supplies and passengers. The tight access would not allow construction of a boat launching ramp at this site.

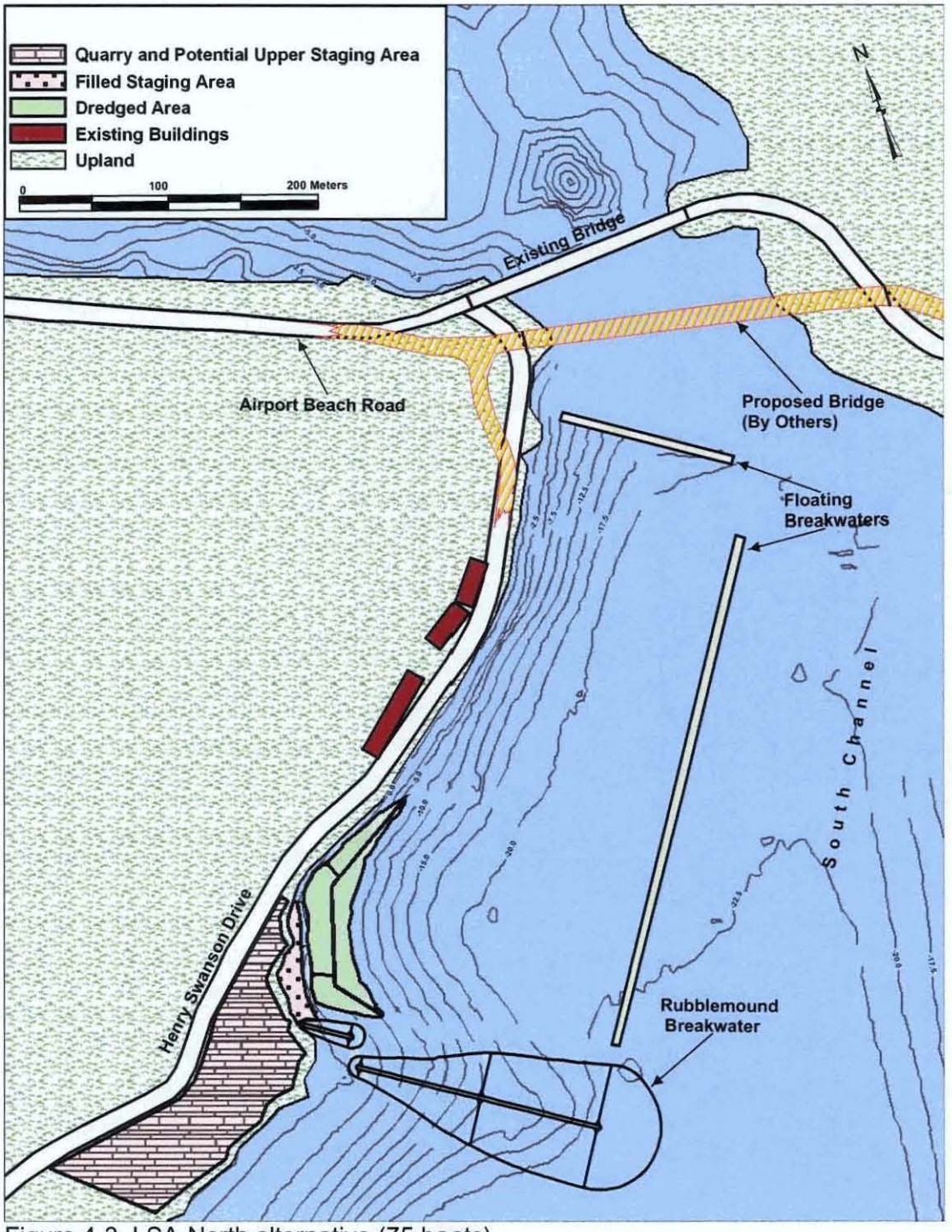

Figure 4-3. LSA-North alternative (75 boats).

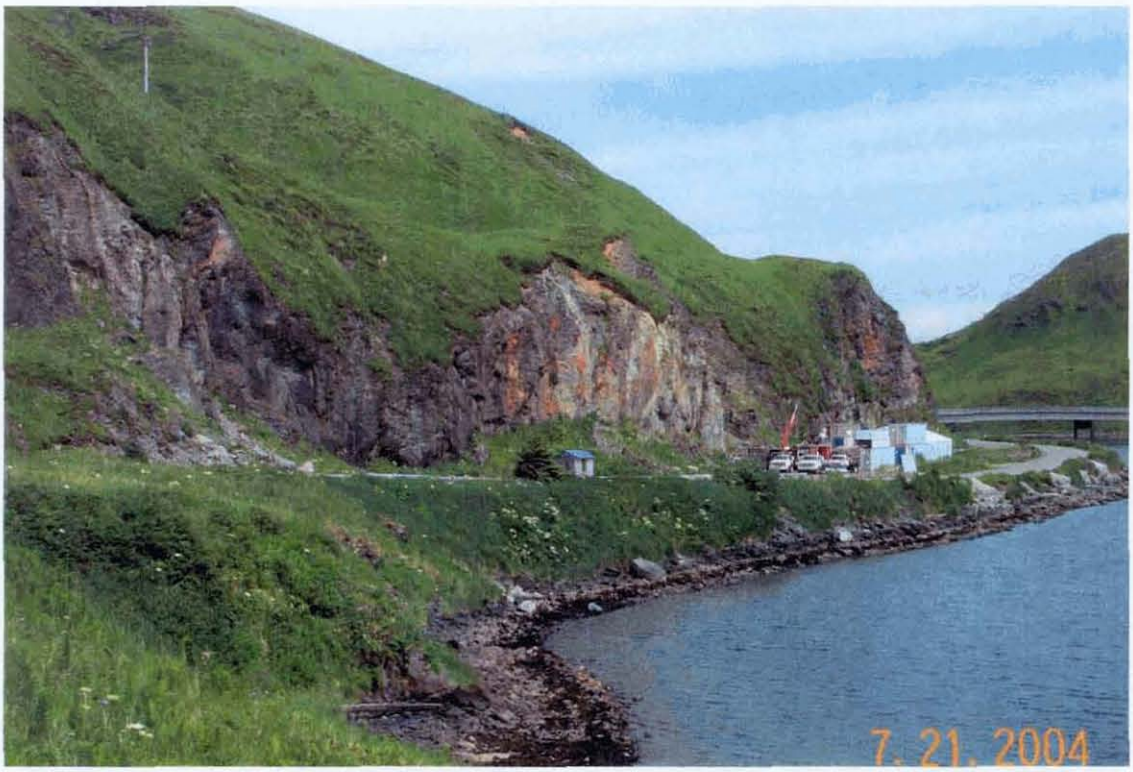

Figure 4-4. LSA-North site. View from the south looking north showing steep cliffs and limited potential staging area.

The high, rocky point that separates the LSA-North site from the potential staging area in the existing quarry could be blasted and removed during construction to improve access for staging and parking. This would be expensive, but material might be used for additional fill or breakwater construction. The excavation would create a narrow throat of flat land along the existing road that would help relieve traffic congestion and improve safety. Developing the quarry could largely accommodate longer term parking and storage needs for harbor operation. A store or other harbor support business also could be developed in the quarry site.

The estimated uplands required for support of harbor operations, based on criteria in Section 3 of this FR/EIS, is 0.62 hectare. This assumes the harbormaster office would be located in the quarry and the harbor did not have boat launch facilities. The most effective way to develop potential uplands at LSA-North would be to demolish existing structures (a commercially valuable crab holding facility) at the base of the hill and relocate Henry Swanson Drive back against the hill. This cost is not included in the cost estimate for the LSA-North alternative. This upland combined with intertidal fill would provide 0.42 hectare.

The cost estimate for this alternative is presented in table 4-1. Construction cost for the LSA-North alternative is estimated at $30,123,000, with $18,115,000 as the Federal share and $12,008,000 as the local share. The Federal costs for construction would be for breakwater construction. The non-Federal sponsor would bear 20

percent of the cost of the Federal project and costs of all inner harbor facilities, including dredging and development of staging areas from dredged material. The estimate does not show costs to develop access and staging areas in the steep terrain at the site. That additional development would be required for a functional harbor. The annual benefit is estimated at $2,152,000. The estimated benefit-to-cost ratio (BCR) is 1.1.

Optimization. No alternative configuration or construction approach that would moor most of the design fleet at less cost could be identified for this site.

4.3.3 LSA-North and Expedition Inlet (Combination Alternative)

In screening alternative sites, it was determined that Expedition Inlet could not be economically developed to moor the majority of the design fleet. It could, however, be developed to moor part of the fleet. If another site was developed to moor the remainder of the fleet, most of the project objectives might be met. The shallower water and restricted space of Expedition Inlet would be best suited for mooring the smaller boats of the design fleet, while the LSA-North site would be constructed concurrently as a smaller harbor than is described in Section 4.3.2. It would moor and protect the remaining larger boats of the fleet.

The concept is illustrated in figures 4-5 and 4-6. Moorage would be added along the south shore of Expedition Inlet, across from the existing moorage. The new moorage would be capable of harboring the 31 boats of the design fleet that are less than 30 meters long. Moorage for the other 44 larger boats would be protected by a smaller harbor at the LSA-North site. This use of two alternative sites would avoid, or at least reduce, some of the disadvantages associated with each site as a single alternative.

Using only part of Expedition Inlet for moorage would allow the plan to minimize expensive dredging in rocky near-shore bottom material at that site. This site is protected by surrounding lands (figure 4-5a) and would require no constructed wave protection. Constructing this part of the combined alternative would require dredging the areas indicated in figure 4-5, installing a mooring system, and connecting the mooring system to a staging area on the adjacent uplands.

Table 4-1. LSA-North, 75-Boat Plan

	Qty	Units	Unit Price	Contingency	Amount
Mobilization & Demobilization	1	LS*	1,180,000	15%	1,357,000
Breakwater and Seawall Construction					
Floating Breakwater					
East – Floating Breakwater	350	m	13,940	20%	5,855,000
North - Floating Breakwater	120	m	13,497	20%	1,944,000
			Total Floating Breakwaters		7,799,000
Rubblemound Breakwater					
Core Rock	115,000	m^3	60.12	20%	8,297,000
B-Rock	14,700	m^3	93.07	20%	1,642,000
Armor Rock	7,700	m^3	135.80	20%	1,255,000
Hydrographic Survey	1	LS	26,100	20%	31,000
Navigation Foundation	1	LS	9,800	20%	12,000
			Total Rubblemound Breakwater		11,237,000
Dredging					
Sand/Gravel	5,200	m^3	8.22	20%	51,000
Rock		m^3	140.38	20%	-
Upland Disposal (City Landfill Cover)	2,300	m^3	16.55	20%	46,000
Hydrographic Survey	1	LS	31,100	20%	37,000
Silt Barrier	1	LS	155,800	20%	187,000
Water Quality Analysis	1	LS	109,100	20%	131,000
				Total Dredging	452,000
Constructed Staging Area					
Intertidal Fill	2,900	m^3	22.13	20%	77,000
Slope Armor	250	m^3	60.12	20%	18,000
			Total Constructed Staging Area		95,000
Inner Harbor Facilities	1	LS	5,780,600	20%	6,937,000
Construction Contract Cost					27,877,000
Lands & Damages	1	LS	230,000	20%	276,000
PED	1	LS	750,000	20%	900,000
Construction Management	1	LS	875,000	20%	1,050,000
Aids to Navigation (U.S. Coast Guard)	1	LS	20,000	N/A	20,000
				Total Project Cost	30,123,000
Interest During Construction					1,694,000
NED Investment Cost					31,817,000
Annual NED Cost (50years @ 5-5/8%)					1,914,000
Annual OMRRR					82,000
Total Annual NED Cost					1,996,000
Average Annual Benefits					2,152,000
Benefits to Cost Ratio (BCR)					1.1
Net Annual Benefits					156,000

*Lump Sum

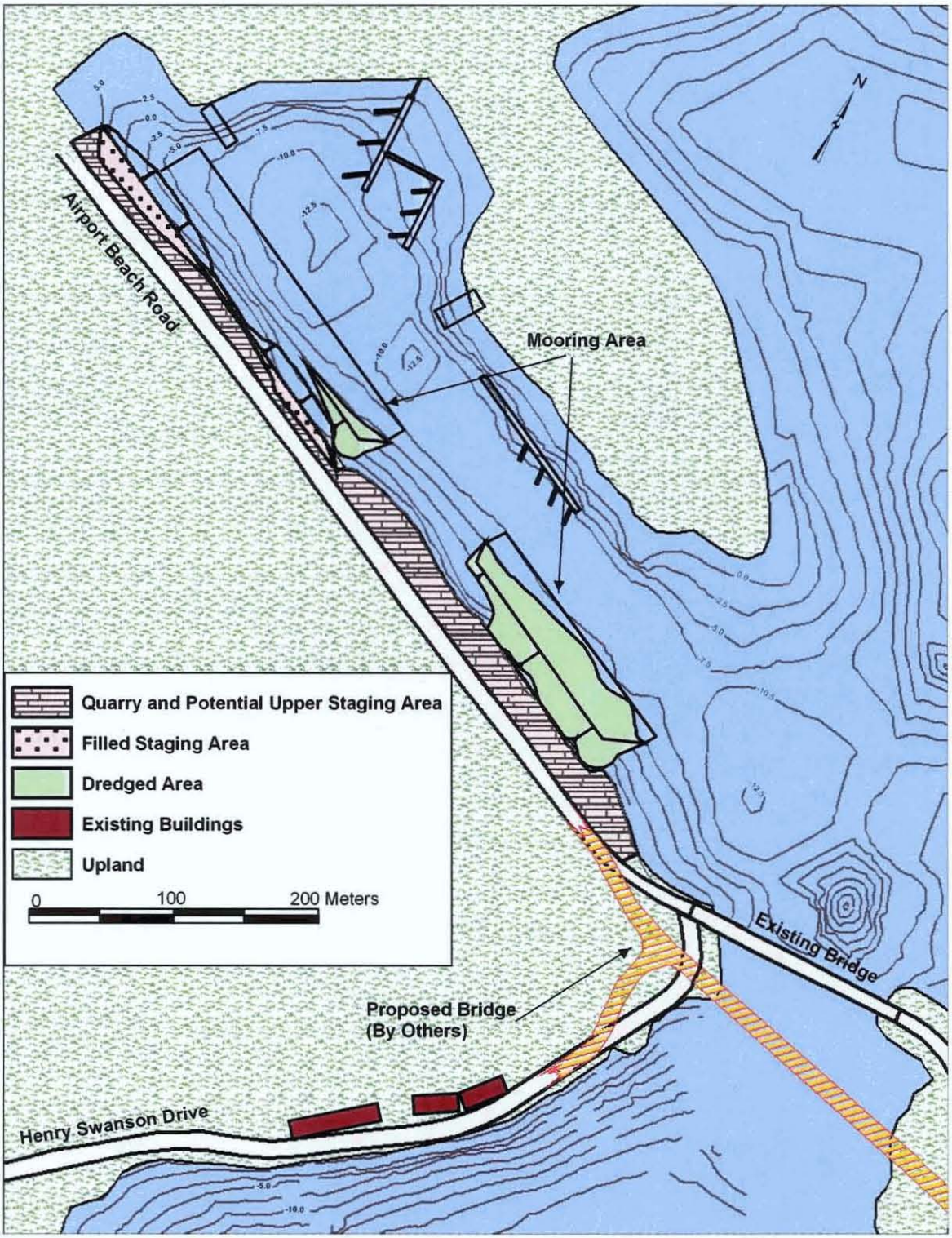

Figure 4-5. LSA-North Combined Alternative – Expedition Inlet section.

This configuration would allow boats to continue to reach the marine repair service at the head of the harbor and would place the facilities in an area where there appears to be less objection based on environmental or cultural resource concerns.

Construction at this site (Expedition Inlet) would present some problems. Dredging would likely be expensive. Existing information from other construction work in the area indicates that a large percentage of the dredged material (18,600 m^3) would be rock outcroppings that would require blasting. Local knowledge tells us that the harbor site has stronger winds than many surrounding areas, which could increase maintenance costs and could damage boats. Data are not available and could not be collected to quantitatively compare wind speeds at this site with other locations under a reasonable range of conditions.

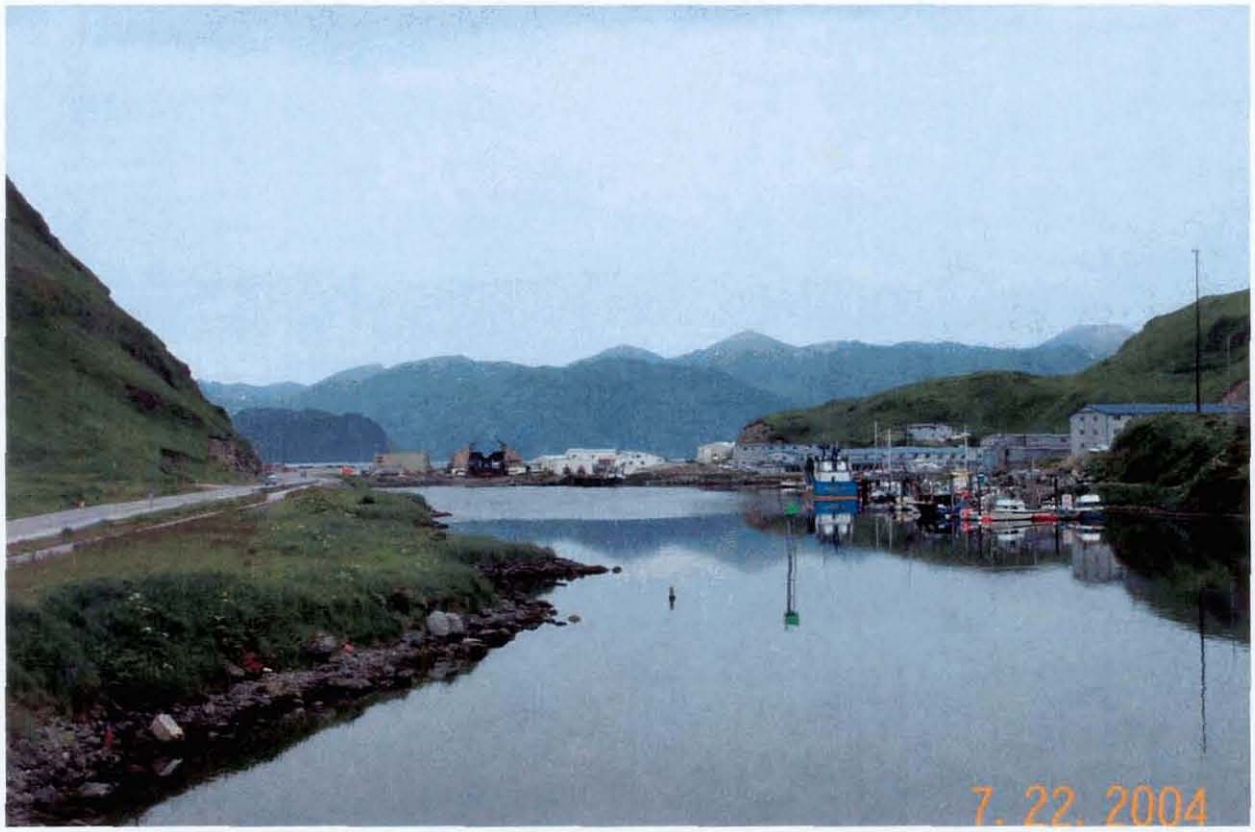

Figure 4-5a. Expedition Inlet.

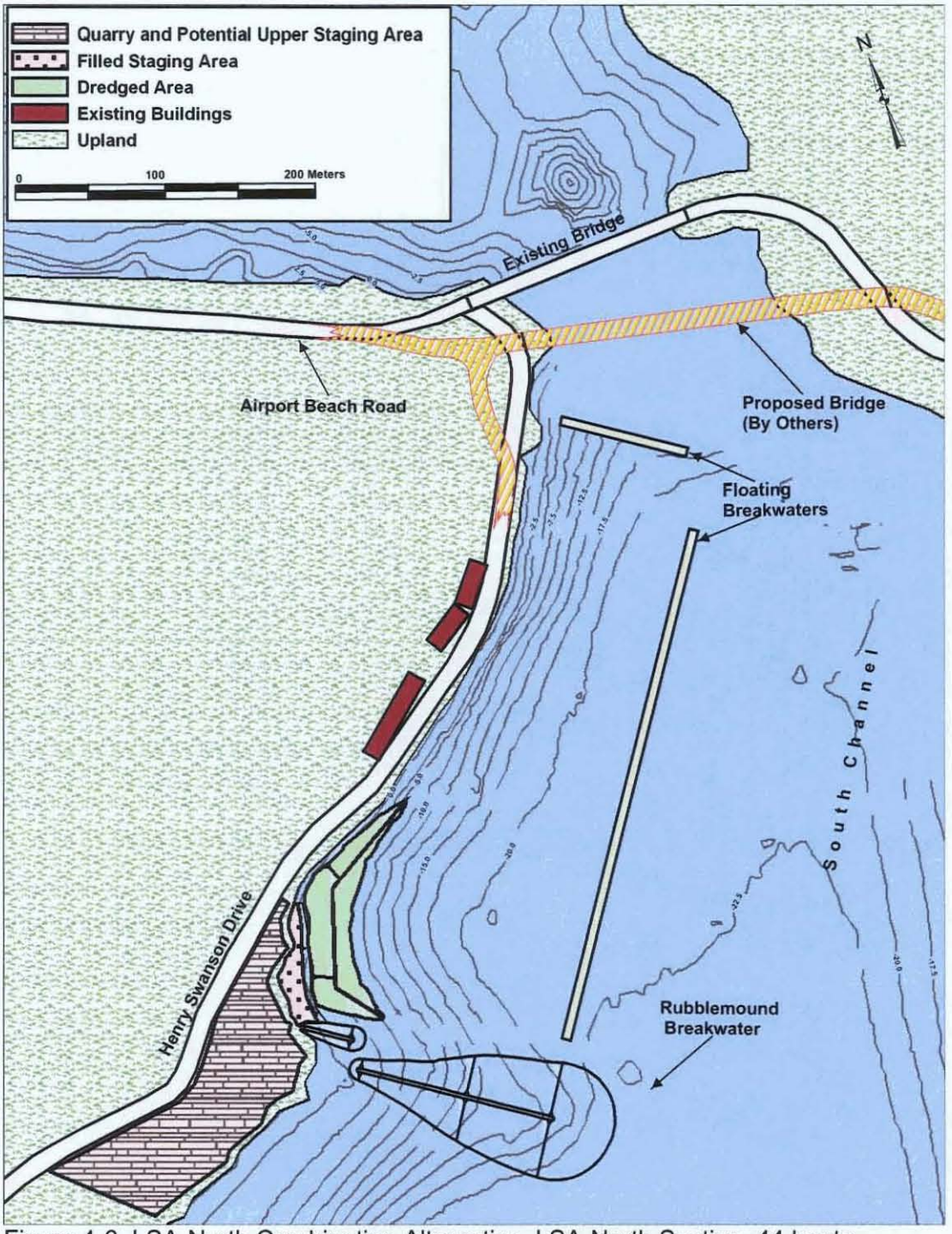

Figure 4-6. LSA-North Combination Alternative. LSA-North Section, 44 boats.

The smaller LSA-North part of this alternative would be constructed at the same location as the full-sized LSA-North alternative. The southern breakwater would be of the same construction and would be on the same alignment, but would be shorter and less costly. The northern floating breakwater also would be shorter (figure 4-6), but the longer floating breakwater across the eastern side of the harbor would be the same length as the full LSA-North alternative.

The LSA-North and Expedition Inlet combination alternative has a larger combined upland requirement than any single alternative. This is because some upland features such as emergency spill response equipment storage, parking, and disposal collection points must be duplicated at both sites of the combined alternative. The combined alternative assumes the harbormaster office would be located in the quarry and boat launch facilities would not be provided. The estimated uplands required at LSA-North and Expedition Inlet is 0.50 hectare and 0.87 hectare, respectively. The most effective way to develop potential uplands at LSA-North would be to demolish existing structures (a commercially valuable crab holding facility) at the base of the hill and relocate Henry Swanson Drive back against the hill. The required area at Expedition Inlet would be required to have a traffic separator/access road along the entire length of the harbor to prevent harbor activities from conflicting with traffic on Airport Beach Road. The existing sidewalk would be relocated from adjacent to Airport Beach Road to the waters edge adjacent to the harbor. The cost for relocations is not included in the cost estimate for the LSA-North and Expedition Inlet combination alternative. The available uplands combined with intertidal fill at LSA-North and Expedition Inlet would provide 0.42 hectare and 0.77 hectare, respectively.

Optimization. Reducing the size of the LSA-North alternative to moor 44 boats, as shown in figure 4-6, would reduce the length of the expensive south rubblemound breakwater and would reduce construction costs by about $6,317,000. It also would reduce impacts of the project to boat traffic through South Channel between Captains Bay and Iliuliuk Harbor.

The same amount of dredging would be required as for the full LSA-North alternative, and the same amount of staging area would be produced with dredging material in the southwest corner of the harbor. The same access problems would affect both plans, and the same staging areas might be developed.

Table 4-2 presents the cost estimate for the Expedition Inlet/LSA-North alternative. Project cost is estimated at $27,433,000. The Federal share would be limited to the breakwaters at the LSA-North site and is estimated at $14,666,000. The non-Federal sponsor would pay $12,767,000 for 20 percent of the Federal project and for all inner harbor facilities. All dredging for the mooring basin and fairways at both sites are included in the non-Federal costs. The annual benefit and cost are estimated at $2,152,000 and $1,825,000, respectively. The estimated benefit-to-cost ratio would be 1.2 and the net benefit would be $327,000.

Table 4-2. LSA-North and Expedition Inlet Combination Plan

	Qty	Units	Unit Price	Contingency	Amount
Mobilization & Demobilization	1	LS	1,180,000	15%	1,357,000
Breakwater and Seawall Construction					
Floating Breakwaters					
East - Floating Breakwater	350	m	13,940	20%	5,855,000
North - Floating Breakwater	87	m	13,497	20%	1,409,000
			Total Floating Breakwaters	**Error!**	7,264,000
Rubblemound Breakwater					
Core Rock	71,400	m^3	60.12	20%	5,151,000
B-Rock	11,400	m^3	93.07	20%	1,273,000
Armor Rock	6,100	m^3	135.80	20%	994,000
Hydrographic Survey	1	LS	26,100	20%	31,000
Navigation Foundation	1	LS	9,800	20%	12,000
			Total Rubblemound Breakwater		7,461,000
Dredging					
Sand/Gravel	18,600	m^3	8.22	20%	183,000
Rock	4,900	m^3	140.38	25%	860,000
Upland Disposal (City Landfill Cover)	11,900	m^3	16.55	20%	236,000
Hydrographic Survey	1	LS	31,100	20%	37,000
Silt Barrier	1	LS	155,800	20%	187,000
Water Quality Analysis	1	LS	109,100	20%	131,000
				Total Dredging	1,634,000
Intertidal Fill	11,600	m^3	22.13	20%	308,000
Slope Armor	1,450	m^3	60.12	20%	105,000
			Total Constructed Staging Area		413,000
Inner Harbor Facilities	1	LS	5,881,500	20%	7,058,000
Construction Contract Cost					25,187,000
Lands & Damages	1	LS	230,000	20%	276,000
PED	1	LS	750,000	20%	900,000
Construction Management	1	LS	875,000	20%	1,050,000
Aids to Navigation (U.S. Coast Guard)	1	LS	20,000	N/A	20,000
				Total Project Cost	27,433,000
Interest During Construction					1,543,000
NED Investment Cost					28,976,000
Annual NED Cost (50years @ 5-5/8%)					1,743,000
Annual OMRRR					82,000
Total Annual NED Cost					1,825,000
Average Annual Benefits					2,152,000
Benefits to Cost Ratio (BCR)					1.2
Net Annual Benefits					327,000

4.3.4 LSA-South Site

The southeastern shore of Little South America is a broad embayment that is largely protected from strong waves. The plan for this site would use the natural landform and a rubblemound breakwater to attenuate waves from the south and floating breakwaters to protect the moorage from waves from the north and east (figure 4-7).

The rubblemound breakwater would be aligned on a natural reef extending eastward from Amaknak Island. The shallower water over the reef would substantially reduce both the breakwater footprint and the volume of material required for construction. Wave protection could be placed at less cost along this alignment than at any other location along this coastal reach.

The natural point on the north side of this site would minimize the length of the northern floating breakwater.

Alternative configurations for a harbor at the LSA-South site were examined. Moving the eastern floating breakwater seaward to harbor more boats would extend the southern breakwater into much deeper water, with rapidly escalating construction volumes, footprint, and cost. Moving the southern breakwater alignment south any substantial distance would rapidly increase costs, would cause more damage to environmental resources, and would still require extensive rock excavation and dredging to increase the mooring area. Moving the northern floating breakwater farther north to increase mooring area would increase costs for the additional breakwater length without a commensurate increase in mooring area. This also would incorporate shallower water into the harbor, which could require additional dredging to prevent damage to boats.

Principal construction requirements for a harbor at the LSA-South site would be the breakwaters; dredging; dredged material disposal; and harbor access, mooring, and operating facilities. Harbor access, mooring, and operating facilities are the responsibility of the non-Federal sponsor and are addressed here only to the extent required to ensure the harbor could be operated efficiently and to ensure that the public and decision makers can consider the full potential of the harbor to meet public needs and to impact environmental resources. Dredging and dredged material disposal would be entirely paid for by the non-Federal sponsor because no dredging would be required for the Federal parts of the project.

Figure 4-7 shows a least-cost concept layout of a harbor at LSA-South. It shows a basic breakwater alignment and the area that would be dredged for a mooring basin. It would provide protected moorage for 75 boats in the 24 to 45-meter range. The two floating breakwaters would be 6.4 by 1.83-meter concrete box structures moored by concrete anchors and chains. The rubblemound breakwater would be placed

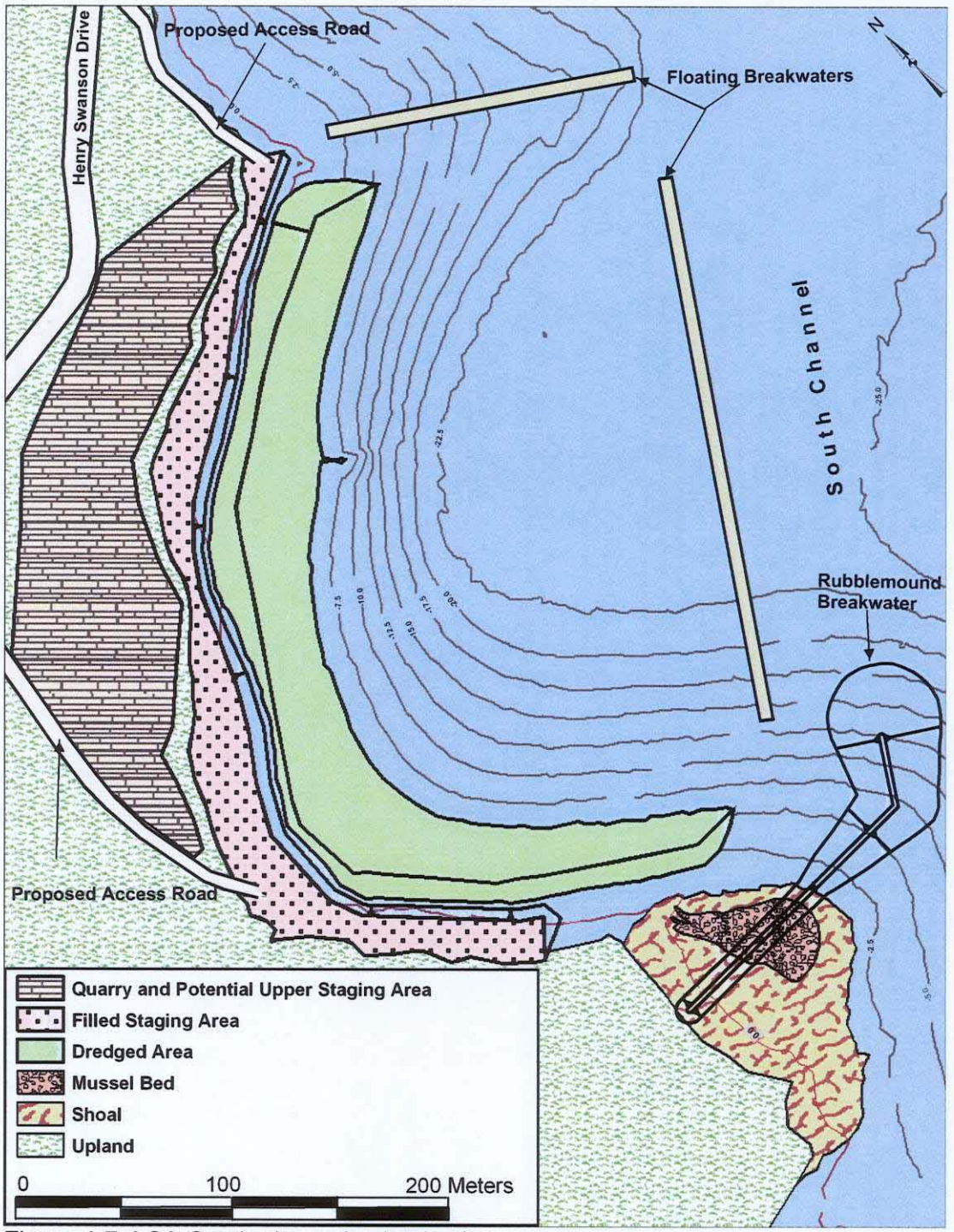

Figure 4-7. LSA-South alternative basic plan.

either from barge or from shore and would be armored with 1,500-kg rock. The breakwater would curve at the seaward end to protect the harbor entrance, but otherwise would be a straight structure with simple lines that would be comparatively easy to construct. The contractor would select the dredging method, but some form of clamshell or bucket dredge would be best adapted to the varying bottom conditions at this site. This basic concept would place dredged material in the least expensive disposal area or would use the material for an economically beneficial purpose.

A World War II-era road cut could be improved for construction access to the harbor site (figure 4-7). Quarrying for materials to construct the south breakwater could be conducted to further improve this road for access to the harbor after construction. The quarry site has been worked for previous projects and contains about 1.5 hectares of relatively flat land that could be used for staging.

Figure 4-7a. Elevation (approximately 15 meters) above the beach at the LSA-South site.

The two-lane Henry Swanson Drive, originally constructed during World War II, connects the quarry to the rest of the Unalaska road system. Electricity, water, and communications lines could be run to the project site from existing utilities about 0.8 km away.

This alternative would need a calculated area of 1.31 hectares near water level to operate efficiently, assuming the harbor-master office would be located in the quarry. The harbor does include boat launch facilities and upland space for short-term

boat parking and access, turning, and loading/unloading area. Road and sidewalk space is included and assumed to be at the base of the hill. The intertidal fill area would provide 1.10 hectares of staging area about 3 meters above MLLW.

Project costs for this basic LSA-South harbor concept were estimated at $22,144,000, with annual costs of $1,489,000 and annual benefits of $2,152,000 (see table 4-3).

Optimization of Basin Size. Four variations of this concept were considered to optimize basin size. The optimum basin size would maximize net annual NED benefits. Three variations evaluated smaller basins and one variation evaluated a larger basin. These attempts to optimize the harbor concept are summarized in table 4-4 and are discussed in the remainder of this section.

Mod 1 – Reduce Eastern Breakwater Length. The long, floating breakwater at the eastern perimeter of the harbor could be shortened about 100 meters by moving the northern floating breakwater south. This would reduce the initial construction cost by $4,660,000, but would reduce the number of boats that could be moored to 60. Table 4-4 shows the costs and benefits associated with this plan. This plan was not developed further because it would produce less net NED benefits than the basic concept plan.

Mod 2 – Reduce Rubblemound Breakwater Length. The rubblemound breakwater that would form the south boundary of the harbor would extend into deep water where construction is more expensive. Shortening the rubblemound south breakwater would reduce cost. A harbor at this site to moor 50, 24 to 45-meter boats would cost about $3,818,000 less than the basic 75-boat concept. The loss of benefits would be disproportionately high for cost savings that would be realized. Table 4-4 shows the costs and benefits associated with this plan. This plan was not developed further because it would produce less net NED benefits than the basic concept plan.

Mod 3 – Reduce Dredging. The basic concept plan for the LSA-South alternative would dredge about 36,600 m^3 for mooring area. Reducing the dredging to 14,600 m^3 would lower construction costs by $2,692,000 and would moor 60 boats. The loss of benefits would be disproportionately high for cost savings that would be realized. Table 4-4 shows the costs and benefits associated with this plan. This plan was not developed further because it would produce less net NED benefit than the basic concept plan.

Table 4-3. LSA-South Basic Plan

	Qty	Units	Unit Price	Contingency	Amount
Mobilization & Demobilization	1	LS	1,180,000	15%	1,357,000
Breakwater and Seawall Construction					
Floating Breakwaters					
East - Floating Breakwater	253	m	13,940	20%	4,232,000
North - Floating Breakwater	145	m	13,497	20%	2,348,000
			Total Floating Breakwaters		6,580,000
Rubblemound Breakwater					
Core Rock	14,900	m^3	60.12	20%	1,075,000
B-Rock	5,900	m^3	93.07	20%	659,000
Armor Rock	5,400	m^3	135.80	20%	880,000
Hydrographic Survey	1	LS	26,100	20%	31,000
Navigation Foundation	1	LS	9,800	20%	12,000
			Total Rubblemound Breakwater		2,657,000
Dredging					
Sand/Gravel	31,800	m^3	8.22	20%	314,000
Rock	4,800	m^3	140.38	20%	809,000
Upland Disposal (City Landfill Cover)	-	m^3	16.55	20%	
Hydrographic Survey	1	LS	31,400	20%	38,000
Silt Barrier	1	LS	155,800	20%	187,000
Water Quality Analysis	1	LS	109,100	20%	131,000
				Total Dredging	1,479,000
Constructed Staging Area					
Intertidal Fill	36,600	m^3	22.13	20%	972,000
Slope Armor	1,600	m^3	60.12	20%	115,000
			Total Constructed Staging Area		1,087,000
Inner Harbor Facilities	1	LS	5,615,100	20%	6,738,000
Construction Contract Cost					19,898,000
Lands & Damages	1	LS	230,000	20%	276,000
PED	1	LS	750,000	20%	900,000
Construction Management	1	LS	875,000	20%	1,050,000
Aids to Navigation (U.S.Coast Guard)	1	LS	20,000	N/A	20,000
				Total Project Cost	22,144,000
Interest During Construction					1,246,000
NED Investment Cost					23,390,000
Annual NED Cost (50years @ 5-5/8%)					1,407,000
Annual OMRRR					82,000
Total Annual NED Cost					1,489,000
Average Annual Benefits					2,152,000
Benefits to Cost Ratio (BCR)					1.4
Net Annual Benefits					663,000

Table 4-4. LSA-South Basic Plans Summaries.

	Basic Plan	Mod 1	Mod 2	Mod 3	Mod 4
Mobilization & Demobilization	1,357,000	1,357,000	1,357,000	1,357,000	1,357,000
Breakwater and Seawall Construction	9,237,000	8,374,000	7,522,000	9,237,000	13,188,000
Dredging & Constructed Staging Area	2,566,000	2,202,000	2,251,000	1,240,000	2,727,000
Inner Harbor Facilities	6,738,000	3,305,000	4,950,000	5,372,000	7,891,000
Construction Contract Cost	19,898,000	15,238,000	16,080,000	17,206,000	25,163,000
Lands & Damages	276,000	276,000	276,000	276,000	276,000
PED	900,000	900,000	900,000	900,000	900,000
Construction Management	1,050,000	1,050,000	1,050,000	1,050,000	1,050,000
Subtotal	2,226,000	2,226,000	2,226,000	2,226,000	2,226,000
Aids to Navigation (U.S. Coast Guard)	20,000	20,000	20,000	20,000	20,000
Project Cost	22,144,000	17,484,000	18,326,000	19,452,000	27,409,000
Interest During Construction	1,246,000	983,000	1,031,000	1,094,000	1,542,000
NED Investment Cost	23,390,000	18,467,000	19,357,000	20,546,000	28,951,000
Annual NED Cost (50yrs @ 5-5/8%)	1,407,000	1,111,000	1,164,000	1,236,000	1,741,000
Annual OMRRR	82,000	82,000	82,000	82,000	82,000
Total Annual NED Cost	1,489,000	1,193,000	1,246,000	1,318,000	1,823,000
Vessels Accommodated	75	60	50	60	91
Average Annual Benefits	2,152,000	1,722,000	1,435,000	1,722,000	2,213,000
Benefits to Cost Ratio (BCR)	1.4	1.4	1.2	1.3	1.2
Net Annual Benefits	663,000	529,000	189,000	404,000	390,000

Mod 4 – Enlarge Basin. The basic concept plan accommodates 75 vessels. Enlarging the basin to accommodate an additional 16 vessels would increase costs by $5,265,000 for an added annual benefit of $61,000. Moving the east floating breakwater seaward would enlarge the basin and result in large increases to rubblemound breakwater rock quantities. Also floating breakwater length and dredging quantities would increase. This plan was not developed further because it would produce less net NED benefit than the basic concept plan.

Optimization of Channel Depth. The harbor would have a south entrance and a north entrance. The south entrance would be between the rubblemound breakwater and floating breakwater. The north entrance would be between the two floating breakwaters. The channel depth based on engineering criteria for access of the design vessel under lowest predicted tide and design wave condition is –6.1 meters MLLW.

The south entrance channel natural depth ranges from –6.1 meters MLLW to –14.5 meters MLLW toward the South Channel. The shallow depth is close to the moorage area, which would be dredged to –5.5 meters MLLW. The north entrance is much deeper than the unconstrained access depth of –6.1 meters MLLW.
There is no channel depth optimization possible for depths less than the unconstrained channel depth of –6.1 meters MLLW because there is no channel dredging required.

Therefore, project entrance channel depths are selected at –6.1 meters MLLW, which is the design depth needed to safely accommodate all the vessels expected to use the harbor.

4.3.5 Breakwater Material Sources

The Alaska District Corps of Engineers does not designate breakwater material sources (quarry sites). The contractor would be responsible for selecting a quarry site and providing rock to meet design specifications. Pre-project planning, including National Environmental Policy Act investigations and documentation, assumes that the construction contractor would use one or more existing quarries as a rock source for the breakwater and other project features requiring rock. A rock quarry is considered to exist if there has ever been mining at the site and the site has not been restored. An existing quarry may be "operating" or "non-operating" (abandoned, idle, not currently used).

The contractor would submit a quarry development plan to the Corps of Engineers for the site they select. A coordinated agency review of the plan would be conducted to determine whether further documentation and review would be required to meet National Environmental Policy Act and Coastal Zone Consistency requirements. The development plan would define limits of construction, disposal of quarry waste, necessary access roads and traffic routes, quarry rock stockpile areas and other stockpile areas for material to be used-for quarry restoration. The plan would also present a blasting plan, an outline of excavation methods, and a restoration plan. Any action required to avoid or otherwise mitigate effects to cultural resources also would be included in the plan.

While this FR/EIS does not designate a specific site for breakwater material, a site may be examined for potential use and to determine potential impact of its use. The existing quarry owned by the Ounalashka Corporation adjacent to the LSA-South site is likely to be used to produce the bulk of the rock for breakwater construction at any of the alternatives considered in detail. The rock has not been tested to determine whether it could yield the large rock needed for breakwater armor, but it is likely to be a suitable source for the core material and "B" rock that comprises the bulk of breakwater material required for any of the alternatives. The total amount of core and "B" rock required would range from about 130,000 cubic meters for the LSA-North alternative to about 21,000 cubic meters for the LSA-South alternative.

If the existing quarry was used, quarry development could be coordinated between the owners, the contractor and the City of Unalaska so that staging areas, access roads, and other upland features could be developed concurrently.

4.4 Alternative Plans Considered in Detail

The three sites that Section 4.3 considered in detail could be developed as harbor sites for a Federal project if they were determined to be economically feasible. Various configurations were considered for each site to determine whether they might be optimized to produce greater net NED benefits. This optimization process identified one basic concept plan that would produce optimum net NED benefits at each site before environmental impact mitigation costs. Further detailed consideration of plans would be related to non-monetary objectives to develop plans that better suited the non-Federal sponsor or that reduced potential for environmental impact.

Because the significant environmental impacts, the locally preferred site, and the greatest NED benefits were all associated with projects that would be at the LSA-South site, the only additional alternatives to be considered in detail are plans for the LSA-South site. Section 4.5 evaluates alternative LSA-South plans that might be designated as the "environmentally preferred plan."

4.5 Mitigation Alternatives

This section examines mitigation alternatives that would avoid, minimize, or compensate for adverse project effects. It focuses on mitigation measures for a project at LSA-South because the recommended harbor plan and the locally preferred plan are at that site and because the other sites are considered to have less of an effect on resources of concern. The following were identified as resources of concern associated with the LSA-South site during scoping for this project:

Pre-contact and historic properties
Personal use harvest of resources
Picnicking, bird watching, and other recreational opportunities
Water quality
Intertidal and subtidal habitat
Mussel-rockweed community on reef at south breakwater alignment
Salmonid young and sub-adults
King crab
Benthic invertebrate communities
Marine mammals
Ducks and seabirds
Steller's eiders

4.5.1 Mitigation Objectives

Mitigation objectives were identified for those resources as follows:

Pre-contact and historic properties:

1. Configure project and uplands features to avoid/minimize impacts on World War II and pre-contact properties near the harbor site.

2. Mitigate losses by preparing a memorandum of agreement and by installing signs and making available other interpretive material regarding the affected resources.

Personal use harvest of resources:

1. Minimize impacts on affected resources.
2. Provide access to other subsistence opportunities and resources on land and by providing better, safer boating facilities.
3. Provide interpretative information about traditionally used foods and their importance.

Water quality:

1. Minimize sediment dispersion during dredging and dredged material disposal.
2. Maintain water quality or minimize effects on exchange of harbor water.
3. Prepare a harbor management plan incorporating best management practices and operate the harbor in accordance with that plan.
4. Have adequate spill containment and cleanup equipment and materials on site or readily available.
5. Train spill response personnel and have them available for rapid deployment to spills.
6. Install signs and other visual aids to promote good water quality practices.
7. Provide waste receptacles for oils and other potential contaminants.
8. Prohibit fish waste and other waste disposal in the harbor.
9. Aggressively enforce spill and contamination regulations.

Intertidal and subtidal habitat:

1. Minimize project footprint and disturbance during construction.
2. Avoid contamination with disposed dredged material.
3. Improve off-site intertidal and/or benthic habitat.
4. Increase intertidal habitat.

Mussel-rockweed community on reef at south breakwater alignment:

1. Avoid/minimize project footprint and construction impacts to the reef.
2. Maintain flows across the habitat to avoid sediment buildup.

Salmonid young and sub-adults:

1. Avoid/minimize structures that impede juvenile fish movement or force movement into deeper water.
2. Minimize habitat loss.
3. Improve spawning and rearing habitat to compensate for incidental losses.

King crab:

1. Avoid activities that would disrupt/displace mating pairs.
2. Minimize habitat loss.

Benthic invertebrate communities:

1. Minimize project footprint.
2. Minimize contamination and waste during project operation.
3. Construct replacement habitat for key species.

Marine mammals:

1. Avoid blasting when it would injure marine mammals.
2. Avoid harassment.
3. Minimize/contain petroleum spills

Ducks and seabirds:

1. Minimize/contain petroleum spills.
2. Configure lighting to minimize attraction and disorientation.
3. Minimize activities affecting resting and feeding areas.

Steller's eiders:

1. Minimize/contain petroleum spills.
2. Configure lighting to minimize attraction and disorientation.
3. Minimize activities affecting resting and feeding areas.

Mitigation measures can be roughly divided into two groups: (1) those that avoid or minimize adverse effects and (2) those that compensate or partially compensate for losses. This section addresses avoidance and minimization alternatives first, then addresses compensation alternatives.

4.5.2 Avoidance and Minimization Alternatives

Mitigation measures that avoid or minimize harbor impacts may involve any of the following strategies:

1. Incorporate mitigation into project planning and design
2. Limit or modify construction activities
3. Establish standards or procedures for operation and maintenance

The USFWS draft biological opinion for Steller's eiders affected by the Unalaska Boat Harbor (Appendix I) presented a series of measures to minimize impacts to environmental resources. Principal mitigation measures that also are listed as terms and conditions (T&C's) in the draft biological opinion have largely been incorporated in this section and noted with a T&C followed by the corresponding number in the draft Biological Opinion. All T&C's agreed to by the project sponsor, the Corps of Engineers, and the USFWS and identified in the final biological opinion would be incorporated directly or by reference into the plan recommended to Congress. Those T&C's would apply to each of the three phases referred to above: planning, construction, and operations.

Planning and Design Mitigation Alternatives.

Breakwater Structure. The south breakwater in the basic LSA-South plan would be a rubblemound structure. It could be replaced with a sheet-pile wave barrier to reduce the project footprint. A sheet-pile wave barrier would require drilling into bedrock for each piling along the entire alignment and for anchors on one or both sides of the structure. Placement would become expensive in deep water toward the seaward end of the alignment, and even with protective anodes, maintenance is likely to be more expensive than for a rubblemound breakwater.

From an environmental standpoint, a sheet-pile wave barrier offers some advantages. The wave barrier would reduce the breakwater footprint (about 0.55 hectare) to only 0.02 hectare, which would reduce the area of bottom it would directly impact. The solid panels on the structure might not extend to the bottom in deeper water, which could allow freer movement of fish in deep water.

While they reduce project footprint and may be more readily adaptable for fish passage, sheet-pile wave barriers present some disadvantages. They reflect more wave energy than rubblemound breakwaters, which could damage adjacent reef communities. They also typically support much smaller and less diverse colonies of macrophytes (seaweeds), invertebrates, and fish.

The trade-offs between breakwater and wave barrier protection alternatives depend upon the value placed on different environmental attributes. The wave barrier would cover less bottom, but would host less biological colonization and could threaten the nearby reef community. From the standpoint of harbor users, sheet-pile would reflect more wave energy inside the harbor. This might be of little consequence to the larger boats using the harbor, but smaller craft could be affected, and it also might make for a confused sea for boats entering the harbor. Preliminary estimates of construction and maintenance costs indicate that a sheet-pile wave barrier to protect the south end of the harbor would be more expensive than a rubblemound breakwater. This alternative was dropped from detailed consideration due to wave reflection potential and risk of cost escalation related to placing wave barriers in rock and in deep water.

Breakwater Alignment and Breaching. The basic LSA-South plan would align the south breakwater where construction costs would be the lowest, along the spine of a reef. Part of the reef hosts a rich and diverse intertidal assemblage referred to as the "Blue mussel bed," (Section 6.3). The breakwater along the basic LSA-South alignment would destroy most or all the intertidal reef community. Figure 4-8 shows an alternative alignment that would move the breakwater to the north, far enough off the intertidal levels of the reef to fully avoid the area defined as the blue mussel bed.

The western end of the breakwater alignment would parallel the southern shoreline at about the 0 MLLW elevation. This would leave a passage or breach around the western end of the breakwater. The breach would be about 9 meters wide at MHHW and would be totally exposed at about 0 MLLW. The floor of the breach would retain

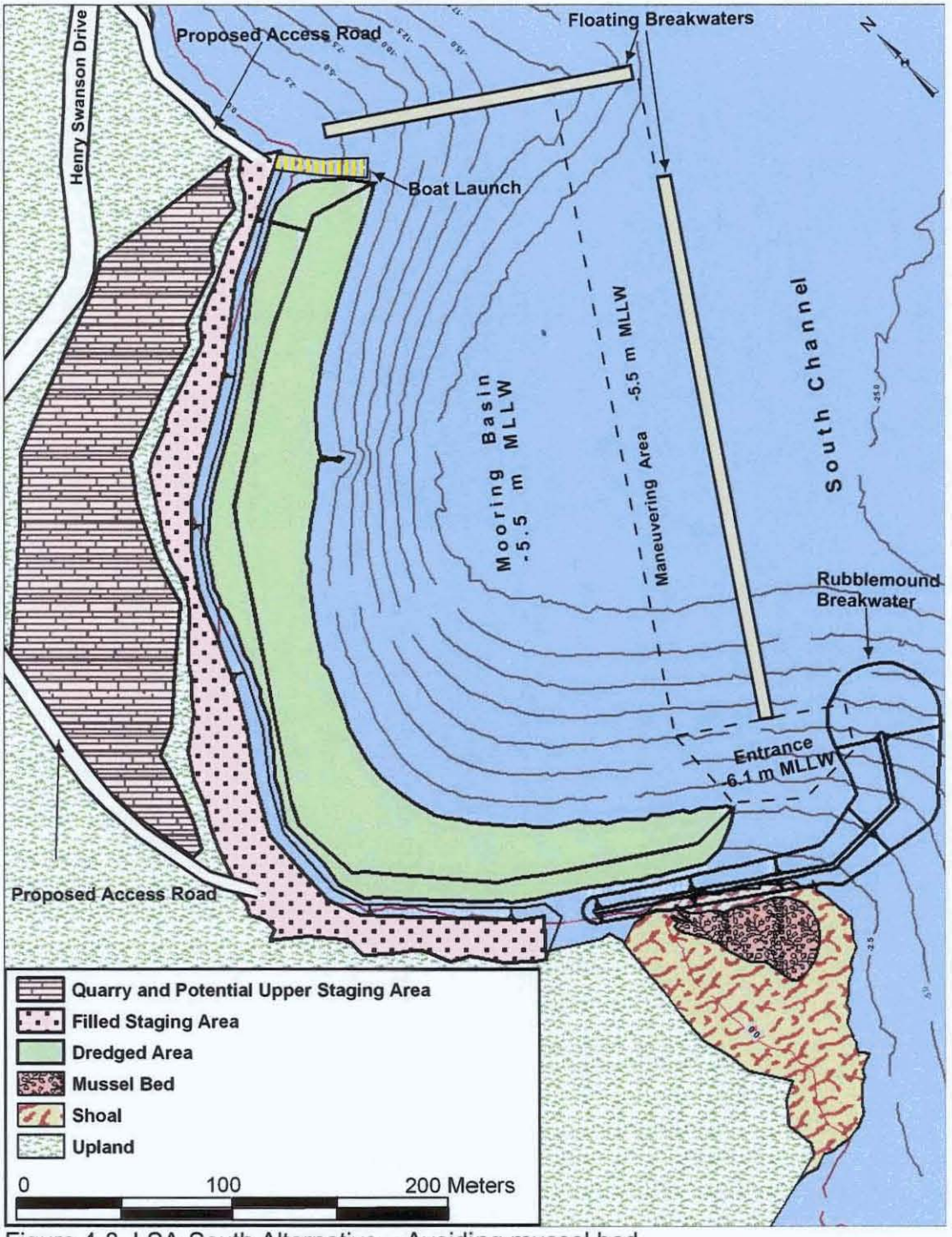

Figure 4-8. LSA-South Alternative – Avoiding mussel bed.

natural contours and would retain or facilitate recolonization of the mussel, barnacle, and rockweed assemblages at that site. The breach would allow juvenile salmon and other fish to pass easily between the harbor and the open waters south of the breakwater during about 80 percent of the tidal period and would help maintain water flow over the reef. The breach could help reduce predation of smaller and less mobile fish that would otherwise go into deep water to pass the breakwater. More information about potential benefits of a fish passage breach to fish movement and predation reduction is presented in the USFWS Coordination Act reports of 2001 and 2004 (appendix H) and in Section 7 of this report.

Realigning the breakwater to create a fish passage breach and avoid the reef community would put the eastern section of the breakwater into deeper water, which would increase the area of bottom affected by the breakwater. The environmental trade-off of benefits from the breach versus additional impacts from a larger breakwater footprint appears to favor the breach. The benthic community that would be affected by the larger breakwater is less diverse, contains far less biomass, and has habitat more common than the reef habitat (Section 6.3).

The breakwater realignment and breach would add $210,000 to project construction costs and would minimize or avoid effects to 0.15 hectare of the intertidal reef habitat. This amounts to $1,400,000 per hectare of reef protected, if all costs of breaching and realignment are used in the calculation. The breakwater alignment could be moved a shorter distance to the north to reduce project costs, but would irretrievably damage part of the reef. Aligning the breakwater to protect only half the reef would cost about the same as the basic alignment and would not be a feasible solution because wave action might destroy habitat on the remainder of the reef. Incremental apportionment of values and costs does not appear to be a useful analysis tool for this measure. Unit costs appeared to be optimized by aligning the breakwater to avoid the important intertidal reef habitat at a project cost of about $210,000. This alignment is used in the recommended plan (Section 5).

Other alternative layouts were examined to see if a wider or deeper full-tide breach could be developed at reasonable cost to improve fish passage. Moving the breakwater eastward to open a larger breach would allow too much wave energy into the harbor. A stub breakwater to keep waves from the breach would directly impact the blue mussel bed. The small gains in breach width would be at the cost of valuable habitat. Aligning the breakwater farther to the north into deeper water would increase breach depth, but would substantially increase breakwater footprint and approximately double the cost of the breach to more than $400,000. A larger full-tide breach is not recommended because it would add to impacts on other resources and because a full-tide breach has not been shown to provide significantly better survival of juvenile fishes than a partial-tide breach in harbors that are not adjacent to important spawning habitat.

Dredging. The LSA-South basic plan would dredge 36,600 m^3 of material from 1.85 hectares of the bottom along the shoreline at the harbor site to provide mooring for 15 of the 75 boats the harbor would be sized to accommodate. Reducing

the dredged area might reduce impacts to habitat and organisms between –0.5 to –5.5 meters MLLW depth range. Each 850-m^2-area that was not dredged to preserve habitat would eliminate one boat that could be moored in the harbor, at a cost of $28,000 in annual benefits. Over the project life, this would equate to $1,600 for each square meter that was not dredged in the mooring basin. Mitigating project impacts by reducing dredging would be expensive for the relatively minor environmental benefits that might be achieved.

Dredged Material Disposal. The LSA-South basic plan would place dredged material along the shoreline between elevations of 0 MLLW and +3.0 meters MLLW to construct a staging area. The staging area would cover 1.1 hectares, of which about 0.65 hectare is intertidal. Harbors require an area immediately adjacent to the mooring area to operate efficiently, so at least some of the basic plan staging area would be required to make the harbor even marginally operable, and all the staging area would contribute greatly to safe and efficient harbor operations. The staging area could be reduced by placing dredged material in deeper areas in the harbor at about the same cost as placing it in the staging area. Dredged material also could be barged to the city landfill site to be used for covering material. Barging it to storage at the landfill would cost about $17 per m^3. Each square meter of staging area that was not constructed with fill would reduce the operability of the project by some undefined amount. Reducing the staging area adjacent to dredged subtidal habitat would achieve some unquantified habitat gains at the expense of harbor functionality. As the USFWS reported (appendix H), the value of intertidal habitat that was not filled for staging area would be substantially diminished by harbor construction and operation even if they were not directly impacted by harbor construction.

Boat Ramp. Facilities for boats to be launched and recovered could be incorporated into project design. The ramp could be located south of the proposed staging area where it could be reached if the proposed access road (figure 4.8) was constructed. Boaters in Unalaska generally use two launch sites now. One is the seaplane ramp at the end of the airport runway. The other is on the intertidal reach of the lower Iliuliuk River. The seaplane ramp can be used by most trailerable boats, but is exposed to a long fetch and sometimes waves that make launching and recovery hazardous or impossible. The Iliuliuk River site is protected. It can be used at most tide ranges to launch smaller skiffs and at high tide to launch somewhat larger trailerable boats. Larger returning boats must wait for the higher periods of the tidal cycle to be recovered. This is a marginally acceptable site that does not reliably support the use of larger boats.

A boat ramp at the LSA-South site would allow residents to safely and dependably launch and recover larger boats that could safely reach resources and opportunities farther from Unalaska and provide better access to local marine resources for people with trailerable boats. King crabs, fish, and shellfish generally used in local subsistence practices and for personal use could be reached more safely, more often, and by more users if boats could be launched from a protected ramp that could be used by trailerable boats of all sizes and during all tide ranges. This would provide an

increment of mitigation for project impacts on traditional subsistence and personal use harvest of coastal resources. A constructed ramp at the LSA-South harbor site would likely be used by some of the boaters who now use the lower Iliuliuk River as a launching site. Any reduction in traffic at Iliuliuk River would lessen impacts in that estuarine habitat and to the salmon that use the habitat. This feature would benefit many users besides people harvesting food for subsistence and personal use, so only a part of the total costs could be attributable to mitigation for project impacts to personal use harvest of marine resources. Project cost: $460,000.

Precontact site in the quarry. A site was reported by Rick Knecht to be within the margins of the quarry at the Little South America site. The quarry will be surveyed during the pre-construction engineering and design (PED) phase within the area identified by Dr. Knecht to determine if the site is still present and to define the boundaries of the site. It will then be evaluated to determine if it is eligible for the National Register of Historic Places. If the site is present, and if it is eligible for the National Register the Corps will begin consultation with the SHPO, the Qawalangin tribe, the landowner, the city, and other interested parties per 36 CFR 800. This same procedure will take place for any other sites not yet identified.

Permanent Eyebolts: (T&C 1.2) Permanent eyebolts or other devices would be installed to armor stones or other structures at any breaches or entrance channels in the harbor perimeter. The sponsor would provide the containment booms.

Mitigation During Construction.

Avoid Important Habitat. Construction would impact habitat on the shoreline, in the quarry adjacent to LSA South, and in the intertidal and subtidal marine environment off the shores of LSA. One option to minimize effects would be to close important areas to all activity during construction. The intertidal area of the reef adjacent to the south breakwater at LSA-South would be closed to construction personnel and vehicles for the entire construction period. Project cost to fence habitat and to maintain the fencing during all adjacent construction activity: $25,000.

Breakwater and Breach Monitoring. The breach would be created by leaving a gap between the western end of the rubblemound south breakwater and the natural rocky, sloping shoreline at that point. The breach would be about 9 meters wide at high tide, and would gradually narrow as the tide receded. This concept would retain the natural intertidal community, which might encourage breach use by small fish. Function of the breach for fish passage might be improved by altering bottom contours or by making other changes in configuration. Monitoring would determine what, if any, alterations should be considered. Monitoring would be scheduled to coincide with principal salmon out-migration. Monitoring would be conducted for 3 years after breakwater construction.

The rubblemound and floating breakwaters would be expected to support recolonization by algae and invertebrates. Surveys of natural recolonization during breach monitoring would determine whether any corrective measures should be recommended. Project cost: $50,000.

Avoid Important Cultural Resources Sites. The contractor would be restricted from activities that would cause effects to cultural sites unless those effects had been coordinated with the State Historic Preservation Officer (SHPO) and other interested parties. Any areas not surveyed by a qualified archeologist before contract award would be closed to contractor activities until the area had been surveyed and the survey results had been coordinated with the SHPO and other interested parties. If cultural material was encountered during construction, work would stop at the affected site, and the Corps would complete consultation before construction continued. Project cost: $15,000 for archaeological survey, report preparation, and agency coordination.

Timing Windows (T&C 1.1). Activities could be halted or modified to prevent disturbance to animals. Construction activities would be limited from mid-November through March to avoid disturbing Steller's eiders wintering in the LSA-South area. Dredging would not be allowed in open water during April and May to avoid impacts to mating Tanner and red king crabs and to avoid impacts to out-migrating juvenile salmon. Dredging would be allowed during April and May if isolated from open water by silt curtains. Dredging would be halted when Steller's sea lions were in a protection zone to be established in cooperation with the National Marine Fisheries Service. Project cost: $200,000.

Silt curtains. Sediment suspended during dredging or other in-water work could be dispersed over a wide area by currents. During some life-history periods, the suspended material can adversely affect fish and other marine organisms. Silt curtains could be employed at the dredging sites and at the dredged material disposal area. Silt curtain deployment would be reviewed by and would be consistent with industry standards current in western Alaska during the dredging period. Project cost: $187,000.

Uplands Runoff Filter. The contractor would be required to prepare and meet requirements of a water runoff plan for areas disturbed during construction. The contractor also would be required to place filters in drainages to collect sediment from runoff water. Project cost: $10,000.

Blasting Plan and Monitoring Plan. The contractor would be required to provide a blasting plan for review and concurrence before blasting for harbor construction and any blasting would be monitored to protect marine mammals. Project cost: $20,000.

Quarry Development Plan. The contractor would select and operate a quarry to produce rock for the project or would purchase the rock from a commercial, operating quarry. If the contractor, or a subcontractor, operated a quarry, they would be required to prepare a quarry operating plan for agency review before beginning operations. The plan would include measures for identifying environmental and cultural resources affected by quarry development, consultation with other agencies and interested parties, and mitigation of impacts. Project cost: $10,000.

Establish Standards or Procedures for Operations.

Harbor Management Plan (T&C 2.5). A plan incorporating industry best management practices could be written, adopted, and enforced to minimize potential environmental damage from spills, improper waste disposal, and other practices.

Provide and Maintain Waste Receptacles (T&C 2.5.1 and 2.5.10). Oil disposal, trash receptacles, battery disposal sites, and net disposal procedures could be made available for harbor users and their use could be a mandatory element of a harbor management plan.

Exclusion Zone at Tip of LSA. (T&C 2.4) Buoys or institutional measures would be used to keep boats from traveling through eider wintering habitat in the waters of the southern tip of Amaknak Island. This could reduce disturbance and stress to Steller's eiders. The controls would be needed from November through

March each year, and could be expected to reduce traffic by skiffs and other smaller vessels near the wintering habitat.

The effectiveness of this action is questionable because smaller craft that would use this area are not very active in the winter, but cost would be low and the measure appears to be implementable. Project cost: $40,000.

Control Fish Cleaning Waste. Prohibit cleaning of fish or disposal of fish waste in the harbor. This would avoid a major cause of low dissolved oxygen levels in Alaska harbors and would avoid a source of attraction to sea lions.

Lighting (T&C 2.1). Install and operate lighting that uses best management techniques and technology to avoid attracting ducks and seabirds.

Oil Spill Response: (T&C 2.2, T&C 2.5.2, T&C 2.5.3, T&C 2.5.4, T&C 2.5.5, T&C 2.5.6) The sponsor would develop a geographic strategy for Dutch Harbor/Unalaska and an oil spill response plan. This plan would include a protocol for handling sick, injured, and dead spectacled eiders and Steller's eiders. It should explore potential economic venues to assist with funding for oil spill response equipment and one qualified oil spill response individual. The sponsor would contract with an oil spill response organization prior to commencing operations.

Environmental Education: (T&C 2.5.9, T&C 2.5.11, T&C 2.5.7, T&C 2.5.8) The sponsor would, jointly with other community organizations, develop information signs to educate harbor users on the effects of oil spills on the marine environment, as well as ways to prevent it. Similarly, an annual program to collect and dispose of discarded fishing gear would be put in place. Other activities to be included are pollution prevention measures such as encouraging the use of in-line bilge water filter systems and fuel collars. The sponsor and USFWS would explore potential sources of funding to implement these various programs.

Steller's Eider Monitoring: (T&C 3.1) Project construction funds would pay for biologists to monitor Steller's eider distribution and distribution of other waterfowl, seabirds, and marine mammals in the project area. Eiders and other animals of concern would be counted from mid – November through March during the year before construction and for 2 years after construction was completed.

4.5.3 Compensatory Mitigation Alternatives.

The following compensatory mitigation measures have been evaluated in detail. The recommended plan (Section 5.0) selects from these measures and incorporates the selected measures as part of the draft mitigation plan for practicable and justifiable mitigation to avoid, minimize, and compensate for project impacts.

Morris Cove Creek. This measure would restore stream alignment cut off by the U.S. military during World War II. The existing channel would be plugged with about 1,200 m^3 of gravel to rebuild the berm that was removed by the military, and the old stream channel would be restored. The reach of stream being considered for restoration originates in a small (15-hectare) lake and empties into Morris Cove. Morris Cove Creek is intermittently closed to returning salmon because a berm that keeps them from entering the creek sometimes forms on the beach at its mouth. This alternative would reroute the stream into the pre-World War II alignment and restore approximately 0.33 hectare of rearing habitat for salmon, but would not stop the formation of berms at the stream mouth or the loss of anadromous fish returns caused in some years by those berms.

Morris Creek is about 5 km from the proposed LSA-South alternative, so this action would be "out of place" mitigation. This mitigation work would have little effect on fish populations most directly affected by harbor construction. It would, however, provide a measure of in-kind compensation for any adverse effects a harbor might have on salmonids and a less direct measure of compensation for general habitat losses caused by the project. Because Morris Cove Creek is reasonably accessible from Unalaska, the resulting improvements to salmon returns would partially compensate for lost opportunities for salmon harvest at the LSA-South alternative site.

The only apparent potential for adverse impacts from the action would be to the landowner and to cultural resource properties. Several archaeological and historical sites are in the vicinity of Morris Cove and range from pre-contact Unangan sites to military sites associated with World War II. A pre-contact and Russian period Unangan site called *Imagnee* or *Imaginskoe* (UNL-00009) is at the breach in the natural creek channel to Morris Cove. The shortest and lowest overland trails to English Bay and Beaver Inlet originated at this community (Veniaminov 1984). Veniaminov estimated that during the Russian period 32 people lived there in four houses along the stream. Dr. Charles Mobley (1993:34-35) recommended that the site be determined eligible for the National Register of Historic Places under criterion D because of its potential to yield information important in prehistory. In 2001, the Corps determined that this site was eligible under criterion D based on Mobley's

(1993) conclusions. The Corps, in consultation with the SHPO, has determined that changes to the mouth of Morris Creek would impact UNL-00009 by redistributing cultural material originally disturbed during World War II by rechanneling the stream. Coordination, compliance with Section 106 of the National Historic Preservation Act, and monitoring during construction could add to project costs.

On the south side of the lake "overlooking poorly drained ground next to" the lake is UNL-0315, called the Morris Cove Lake Site (AHRS Card 2001). The site is on an 8-meter-high terrace and includes four house pits. This site has not been evaluated for eligibility for the National Register of Historic Places. Rebuilding the berm and routing the creek into its former channel would not be expected to affect cultural resource sites. No further evaluation would be required for this site.

Biological outputs from the plan are difficult to assess. The habitat created by this mitigation alternative would benefit coho salmon by improving rearing habitat and might provide marginal benefit to other salmonids. The natural stream closure caused by beach berming would lower the potential value of this alternative because in some years there would be no spawning coho salmon, and therefore, no progeny to use the habitat in those years. Frequency of these closures has not been thoroughly documented. Alaska Department of Fish and Game stream survey file records from 1975 to 2002 indicate the stream mouth was blocked and few or no sockeye or pink salmon were counted in the stream or lake in about half the years the surveys were conducted. Cohos arrive later, and late summer rains may open the stream to more frequent access to that species and to Dolly Varden char.

Land ownership at this site is an obstacle to stream restoration under Water Resources Development Act (WRDA) authorities. The stream bottom and the adjacent land is a privately owned Native allotment. The owner expressed willingness to allow mitigation on the allotment, but WRDA guidelines and Corps policy requires that project features be constructed on Federal land or land provided by the sponsor. For this mitigation alternative, the sponsor would have to purchase the stream bottom and other land required for the action from the Native owner with the assistance and concurrence of the Bureau of Indian Affairs. Sales of Native land to non-Natives typically require several years to complete and the outcome of the land transfer process is uncertain. The Corps generally avoids actions that require purchase of Native allotments unless there is no other feasible alternative. This alternative would not be recommended unless the landowner was willing to sell the lands at appraised value and there was reasonable assurance that the Bureau of Indian Affairs would approve the transfer.

The USFWS prepared a mitigation plan that identified specific requirements for this action (Appendix H). Cost estimates developed by the Corps assumed that quarried gravel would be transported to the site and that construction would cost about $250,000 plus the cost of real estate acquisition. The restructured stream would be monitored for three summers after construction to determine whether additional alterations would further improve stream habitat. Project cost: $50,000.

A less structured version developed by the Corps could be constructed by using local beach gravel and restoring streambank vegetation based on the judgment of a project biologist. This less-structured version could be constructed for about $100,000 (plus real estate acquisition costs), with an additional $50,000 for monitoring after construction.

Little South America Land Use Restrictions – Uplands and ATS 1396 Tract A Tidelands. The southern-most tip of LSA, including the uplands south of the existing, active quarry and the tidelands adjacent to those uplands, is important habitat for Steller's eiders (including some of the larger concentrations of that species counted during winter biological surveys at Unalaska) and several species of seabirds. A lower, intertidal reef has a dense and diverse assemblage of rockweed, small fish, and benthic epifauna. The community structure, diversity, and biomass of that reef are similar per unit of area (but about half the total size) to the unusually diverse and productive reef habitat at the southern boundary of the LSA-South alternative site. This site is not generally noted as being a regularly used subsistence and recreation area, but it contains the same species as at the LSA-South alternative site and might be of subsistence and recreational value if it could be protected.

Development in the intertidal or subtidal zones here could adversely affect benthic invertebrates, fish, ducks, seabirds, and other biological resources. Preserving intertidal habitat here and buffering Steller's eiders from disturbance while they are resting and feeding in the near-shore waters could be important conservation goals if the site was likely to be developed. Real estate restrictions could be instituted to prevent or limit construction or other activities in the tidelands owned by the City of Unalaska in Tract A.

An active quarry is about 300 meters north of this site, but there is no indication that the quarry would be expanded into this habitat. Ounalashka Corporation, the quarry owner and owner of all the uplands of Little South America, is a Native for-profit corporation. Ounalashka Corporation has stated they intend to leave the high ground south of the quarry in place to shield development in the quarry site from high winds. They also indicated they do not want to relinquish an easement or place other real estate restrictions on the uplands. The uplands might be obtained by condemnation, but the Corps would not ordinarily take Native corporation land in Alaska for any harbor project feature, including mitigation.

The City of Unalaska owns the intertidal and subtidal estate (ATS 1396 Tract A Tidelands; figure 4-9). There is no development in that tract and there apparently are no plans to develop it. As part of the terms and conditions in the USFWS draft biological opinion (Appendix I), the City of Unalaska has agreed to install markers to reduce potential for boat traffic in the waters over part of these tidelands.

There also is some question regarding the value of real estate restrictions or easement as mitigation because, in Corps policy, an easement has no accountable value unless development is likely without the easement. Development potential appears to be low at this site.

Little South America Tidelands Land Use Restrictions (Tracts ATS 1396 Tract B, ATS 1352, and ATS 1246). USFWS did not assign a specific value to this measure in Coordination Act recommendations (appendix H), but listed it among several measures that they believed would be required to fully mitigate effects of a harbor at the LSA-South site. An earlier draft of the Coordination Act report (USFWS 2004a) indicated that placing the entire LSA-North site into a conservation easement would compensate for less than 10 percent of the impacts of a project at LSA-South. This indicates the measure would be of relatively minor value, however it is examined in detail here.

During consultation regarding compensatory mitigation, the Ounalashka Corporation objected to mitigation that would prevent development of lands they received in trade with the USFWS. The corporation stated they made the trade with the clear understanding that LSA was to be developed for economic gain. Recent revisions to the draft Coordination Act Report do not advocate deed restrictions or mitigation easements to Ounalashka Corporation lands.

More recently, the USFWS revised draft Coordination Act Report (Appendix H) proposed real estate restrictions that would set aside tidelands and underwater lands owned by the City of Unalaska adjacent to Little South America. The USFWS recommends that if a harbor is constructed on the eastern coast of LSA, then the two tracts of tidelands and submerged land to the north, ATS 1396 and ATS 1246 (figure 4-9), should be placed in some form of restricted real estate status. USFWS did not propose specific requirements, but suggested that those requirements could be established in a later agreement. In the absence of any specific information, the costs and economic effects of this recommendation cannot be evaluated.

Real estate restrictions could protect the habitat and the biological resources at the LSA-North site. Those habitats and resources are identified in Section 6 and the losses from construction and operation are discussed in Section 7. In some respects, the LSA-North habitat is less valuable than at the adjacent LSA-South alternative site, but is habitat for ducks, seabirds, fish, and marine invertebrates. The degree to which tideland real estate restrictions would compensate for impacts of the LSA-South alternative cannot be estimated with any confidence.

There is a reasonable likelihood that the LSA-North alternative site would be developed for marine-related industrial or commercial use in the foreseeable future if development was not restricted by real estate action. The city is likely to develop the tidelands, in cooperation with the Ounalashka Corporation, for a harbor or other marine-related commercial and industrial activity. The city acquired the tidelands so they could be developed, and the development potential of the adjacent Ounalashka Corporation lands will largely be determined by whether the tidelands in ATS 1396 TR B and ATS 1246 can be developed.

Project costs for this mitigation alternative could be very low, or could be approximately equivalent to the total value of the real estate in the two parcels that would be restricted, depending upon the restrictions that were imposed.

The value of uplands adjacent to ATS 1396 TR B and ATS 1246 would be realized to the greatest extent by developing it as the shorefast parts of a marine-dependant facility. Any restrictions on the tidelands that prevented the Ounalashka Corporation from fully realizing economic benefits from their uplands could represent a disproportionate adverse effect to the racial minority population that owns the Ounalashka Corporation. Selection of this mitigation alternative could require evaluation of the action to meet requirements of Executive Order 12898 *Environmental Justice in Minority and Low-Income Populations*.

Development of marine facilities in Unalaska is severely restricted by steep topography, deep near-shore water, and exposure to severe waves. That is why construction during World War II involved an extensive road system over most of Amaknak Island and the adjacent shoreline of Unalaska Island. Existing shoreline development is in the limited areas where access to the coast is possible and where marine conditions are acceptable. Most of those sites have been developed, which is why the sites at LSA are the only locations, of the many examined during this study, that could be economically developed as a harbor under Federal water resource development criteria. If the City of Unalaska ever wanted to construct another harbor, with or without Federal participation, for the Bering Sea fleet, it would be far more economical to do so at least partially at the LSA-North site than at any other site examined during this study. Restrictions that would prevent harbor development would severely reduce the planning flexibility that this remote, fisheries-dependent community needs to survive. This mitigation feature is not recommended because specific mitigation measures have not been identified by the proponent agency, and costs, outputs, and risks cannot be evaluated. The action would have too much impact on the City of Unalaska and the fishing fleet that uses it to justify the relatively small increment of mitigation it would produce.

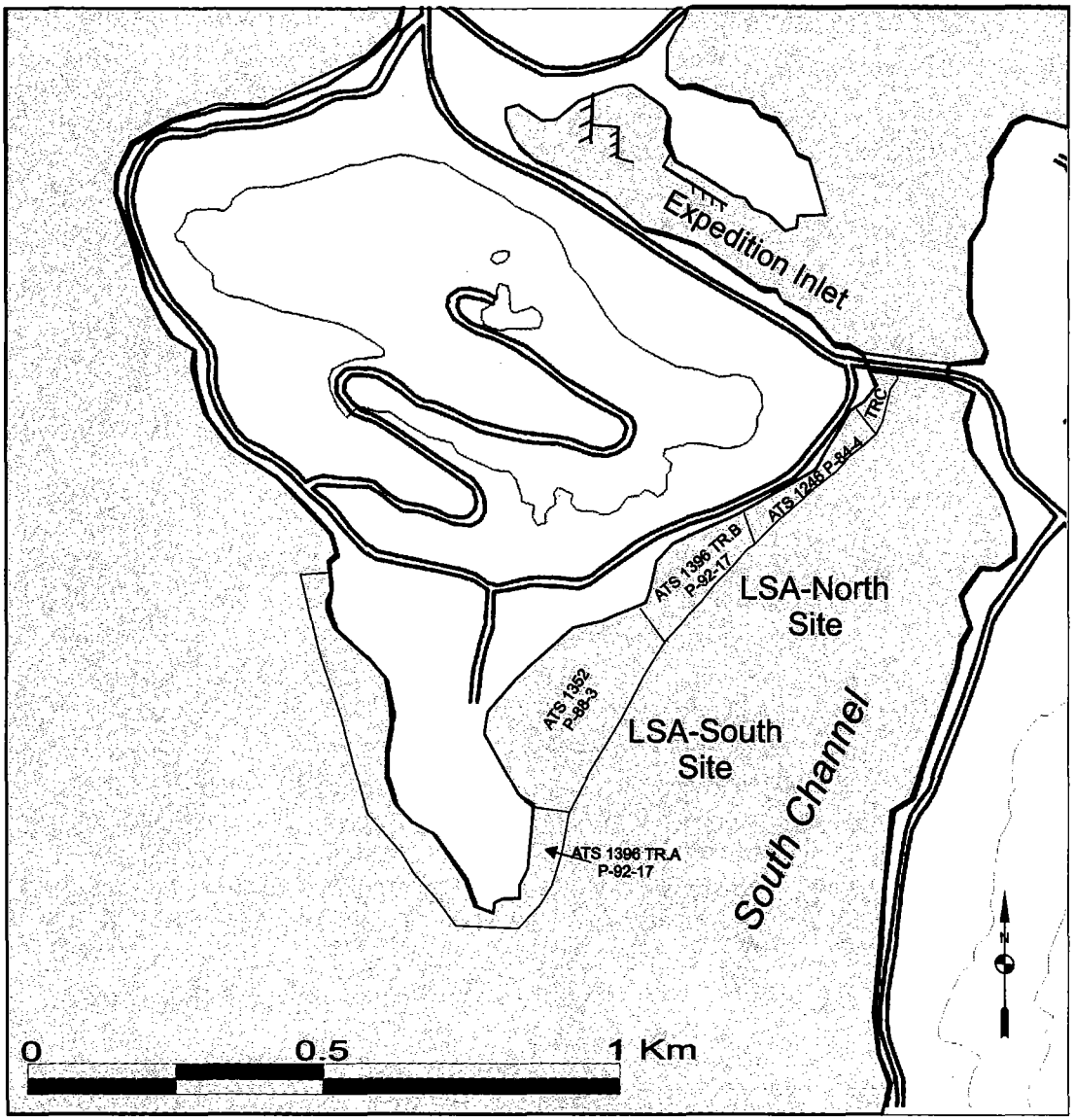

Figure 4-9. Little South America tidelands and tracts.

Wetland Acquisition. A large tract of wetlands at the head of Unalaska Lake could be protected from future development. This wetland has value in floodwater retention, water quality, and bird habitat. There is no certainty that the owner would be willing to sell the land, and no purchase price has been established. A harbor at any of the alternative sites considered in detail would have little effect on wetlands or most species using these wetlands. Wetland preservation could offer certain environmental benefits, but would do little to directly compensate for impacts of harbor construction or operation. Project cost: $1,300,000 per hectare based on present real estate values.

Restore Unalaska Lake Salmon Habitat. Spawning habitat used by sockeye salmon has been covered by silt in part of Unalaska Lake, with resulting loss of recruitment. Resource agencies and the Corps considered dredging this area during early plan development, but jointly decided not to consider it in more detail. The most recent

(April 2004) Coordination Act report (appendix H) suggests that this alternative be considered further. The April 2004 report did not recommend mitigation of a specific location or a specific total area. The report pointed out the need for additional data to develop a specific plan that could be incorporated into the recommended plan. Those data needs include a determination of present and potential future value of the habitat for sockeye spawning, correction of upstream sources of sedimentation, and determination of bottom material type and volume.

Restoring sockeye salmon spawning habitat at this site might produce appreciable benefits to a salmon stock that is important to the ecology of the lake and to local fishermen. The amount of spawning habitat that feasibly could be returned to productivity cannot be estimated with existing data and the data cannot be collected for inclusion in this report. Sockeye were not found in any abundance at any of the project sites considered in detail and there does not appear to be any strong potential for the recommended action to have much effect on sockeye salmon. This measure could be a useful restoration effort, but would be out-of-kind, out-of-place mitigation of uncertain benefit for mitigating effects of a harbor project recommended for Unalaska.

While this action does not appear to be suitable as part of the recommended plan for a harbor at Unalaska, it does show promise as a separate restoration project. The City of Unalaska has expressed interest in participating in data collection and evaluation that could lead to partnership between the City and the Corps to restore that habitat under Water Resource Development Act authorities.

Iliuliuk River Restoration. Skiffs are beached and moored at the mouth of the Iliuliuk River. Beaching, launching, and storing boats here has damaged aquatic vegetation and damaged near-shore habitat used by juvenile salmon and other fish. Elevated light-penetrating walkways could be constructed for access to fishing and moored boats. This mitigation would be expensive for the small amount of habitat that would be protected and restored (less than 400 m^2). Boats would still be moored at the site, so much of the damage would continue. This mitigation opportunity was not considered further because the amount of habitat potentially restored would be minor and the benefits would be uncertain. A boat launching ramp in a new harbor at Little South America would give small boat owners a better launch site and might do more to lessen impacts on the lower Iliuliuk River than direct restoration there.

Funding for Steller's Eider Conservation in the Region. This measure would gather information about Steller's eiders to determine their habitat needs and the effects that boat harbors have on this species as well as other sea ducks. This would be a research effort, which is not funded with appropriations under existing WRDA authorities.

Establish Trust Fund for Habitat Restoration in Unalaska Vicinity. Trust funds have been established in other areas for mitigation for Clean Water Act permit actions. The advantage of a trust fund is that money from several projects can be

combined to accomplish mitigation for losses of wetlands and other water resources. Funding placed in trust funds, however, is not earmarked for a specific part of a specific action. Putting money into a trust fund does not give the Federal decision maker and Congress the information or opportunity to decide whether the funds would be spent to provide meaningful and appropriate mitigation consistent with agency guidelines. Trust funds are not appropriate mitigation for projects recommended for development under WRDA authorities.

Remediate Margaret Bay. Margaret Bay is a 2.8-hectare marine water body that connects to Iliuliuk Harbor through a narrow, shallow channel (figure 4-10). The bay is a resting area (but not a foraging area) for Steller's eiders during the winter and supports salmon and char during the summer. Fine anaerobic silt and residues have substantially reduced habitat quality in deeper water and on the bottom of about a third of the bay. If the fine-grained bottom material could be covered or removed, then the bottom in the deeper water might recover to a condition more like the surrounding habitat. This affected area is in water about -4 meters MLLW and deeper. The source of the material is unknown. It may contain material from one or more of the following: run-off from fill placed in Margaret Bay and on the surrounding lands during World War II, decomposition of waste from fish processing, wind-blown material, waste discharged directly into the bay through outfalls, oil-based material discarded during and after World War II, and/or petroleum products that have seeped into the bay from surrounding lands that are known to be contaminated by petroleum products.

Testing of samples collected in March 2001 determined that 60 percent of the soft bottom material collected was finer than silt in grain size and that that diesel-range organic (DRO) material was present in concentrations ranging from 1,590 to 2,500 mg/kg. The samples were not tested to determine what portion of the elevated DRO results are the result of petroleum contamination and what portion are the result of other organic material co-eluting with the DRO during laboratory analysis.

Under Federal policies, the project sponsor would be required to obtain real estate for all project features, including mitigation. The Ounalashka Corporation, a for-profit Native corporation, owns the bottom of Margaret Bay and the surrounding lands. Corporation policy is to retain lands for future use by the Native people who own the corporation. Ounalashka Corporation has stated by letter (appendix E) that they do not intend to sell their land to be used for mitigation for a harbor at Unalaska. The Corps would not ordinarily require a sponsor to obtain land from a Native corporation by condemnation, so the Corps is unlikely to recommend mitigation that would require acquisition of Ounalashka Corporation land at Margaret Bay. There also are technical and environmental considerations that might make remediation of Margaret Bay impractical. They are discussed in the following text.

Four remediation strategies were examined: dredging a channel into the bay so that tidal action would dissipate the bottom material, capping the existing bottom, dredging the bottom material and discharging it without treatment, and dredging the

bottom material and discharging it after treatment. Ownership, cost, policy, and technical difficulties prevent the Corps from recommending Margaret Bay as compensatory mitigation for the recommended LSA-South alternative, but the City of Unalaska has expressed interest in working with the Corps to restore Margaret Bay under other Water Resource Development Act authorities. The following restoration alternatives were considered for implementation as mitigation for the LSA-South Alternative:

Dredging a Channel into Iliuliuk Harbor from Margaret Bay. This might allow the soft, organic bottom material to disperse into Iliuliuk Harbor if a channel could be dredged from deep water in Margaret Bay to deep water in Iliuliuk Harbor. Cutting a 5-meter deep channel from Iliuliuk Harbor into Margaret Bay might improve water exchange and circulation to some degree and might eventually allow the fine-grained material to disperse out of the harbor.

Several problems caused both the Corps and USFWS to drop this mitigation alternative from more detailed consideration. They are as follows:

- A channel dredged to project depth (-5 meters MLLW) with a bottom width of 5 meters, would need side slopes of 2 horizontal to 1 vertical from -2.5 to -5.0 meters MLLW and 3 horizontal to 1 vertical from MLLW to -2.5 meters MLLW. The side-slopes would be required to keep the channel walls from slumping into the bottom and closing the channel. This channel would be about 30 meters wide at MLLW. Figure 4-10 is a scaled drawing that shows the dimensions of a channel as described above. Opening the channel would require rerouting the sewer line that crosses the existing entrance to the bay at a cost of more than $100,000.

- The project sponsor would be required to provide the real estate for this project feature. The bottom of Margaret Bay, the uplands at the entrance of Margaret Bay, and the submerged lands off the mouth of Margaret Bay belong to the Native-owned Ounalashka Corporation. The corporation has notified the Corps that they do not intend to sell the land or allow it to be encumbered with real estate restrictions that would prevent later development or use.

- Some of the material in Margaret Bay and Iliuliuk Harbor was placed there by World War II construction activity. Much of the channel might be through this unconsolidated material. The surrounding topography and available geologic information, however, indicate that in the alignment there is likely to be substantial rock that would require blasting (which would greatly increase project costs). More specific information about site geology was not collected because other problems eliminated this measure from more detailed consideration.

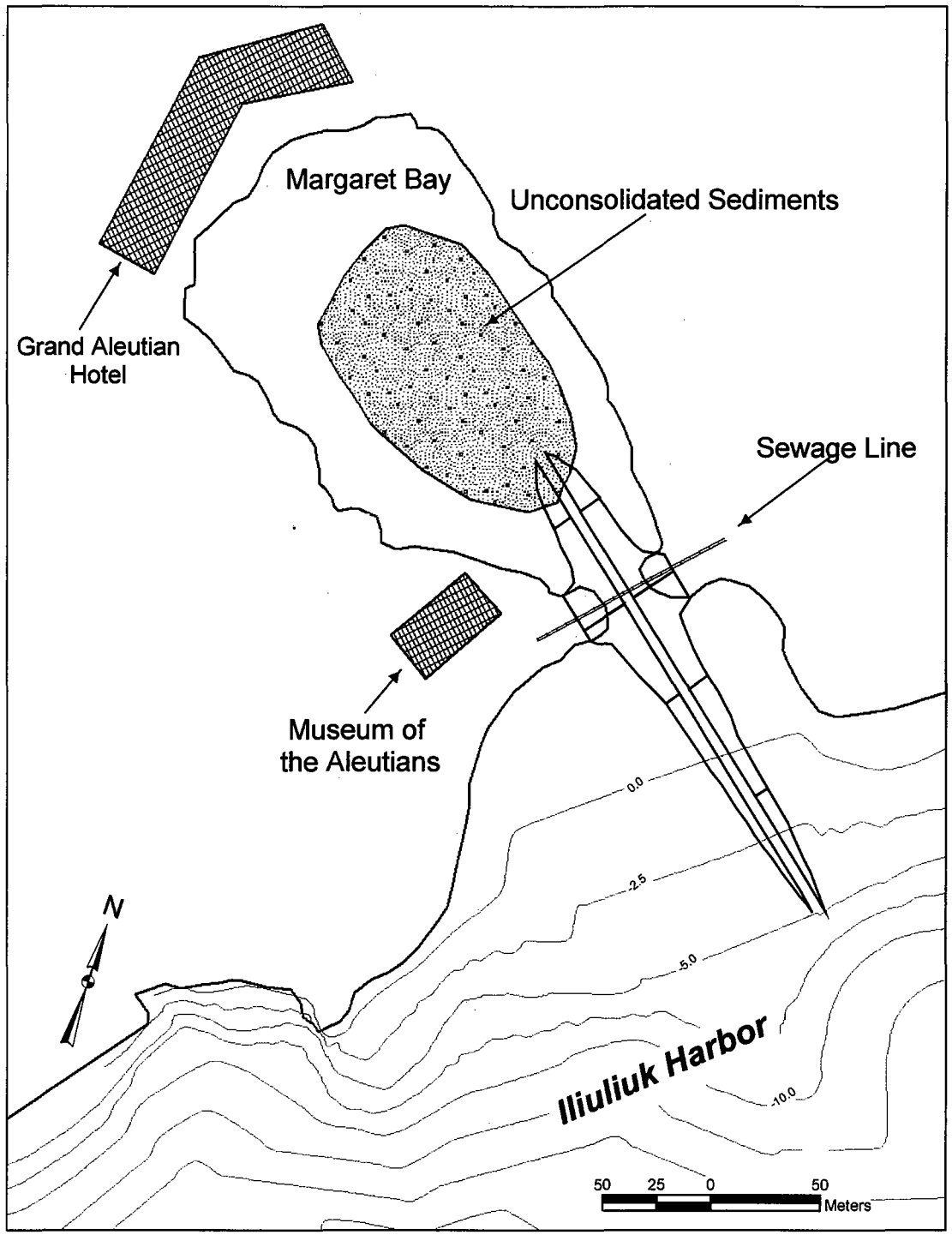

Figure 4-10. Margaret Bay mitigation alternative.

- A deeper, wider entrance channel to Margaret Bay would affect several cultural resources sites, including a World War II pillbox, adjacent to the channel that is a contributing feature of the World War II landscape and an archeological site at the entrance to Margaret Bay (UNL-00048). This site is eligible for the National Register of Historic Places. Evaluation of archeological midden deposits along the south shore of Margaret Bay would be required before construction. Dr. Richard Knecht (director of the Museum of the Aleutians at Unalaska) (letter to Dr. Diane Hanson, Alaska District Corps of Engineers, 2004) noted that the pre-contact people of Amaknak Island used the shoreline of Margaret Bay intensively and that there was a high likelihood that pre-contact cultural resources material would be encountered if the bottom were dredged. Pre-project underwater archeological surveys beneath the existing soft material would be required to assess potential impacts to cultural resources. Dr. Knecht also noted that Russian sealing sloops and other boats may have been moored in the present Margaret Bay site in the early 1900's. The pre-construction survey would be extremely expensive, and recovery would be much more expensive if cultural properties were found. Recovery would be necessary because dredging could not be conducted with enough precision to remove the soft, more recent material in the upper layer without also dredging into the older material beneath it.

If this mitigation measure was adopted, and if it was fully successful, it would restore about 1 hectare of marine habitat. Project costs are difficult to estimate because they would include unknown real estate costs, wide uncertainty regarding archeological survey and recovery costs, and uncertainty about excavation costs. Two major cost items could not be predicted with any confidence without additional data collection. Those items are dredging, which would require approximately $50,000 to define potential rock in the channel alignment, and underwater and surface preconstruction archeological surveys and coordination, which would cost approximately $85,000. Other preconstruction work would consist of sediment testing in the channel alignment and defining the nature of the residue in Margaret Bay (cost about $90,000) if conducted to Corps standards with proper custody chain, quality control, quality assurance, and laboratory reports. Disposal site selection would require coordination, evaluation, and monitoring before and after construction (cost about $30,000); and design (cost about $25,000). Altogether, preconstruction costs would total an estimated $280,000.

If preconstruction surveys, chemical testing, and coordination determined the mitigation project could be constructed, then costs for the following items would be incurred for construction: silt curtain, mobilization, and dredging. Cost estimates would assume that a silt curtain would be required at the disposal site because at least some of the material to be dredged would be very fine in grain size. The silt curtain for harbor dredging would cost almost $200,000, but the smaller silt curtain for this mitigation alternative might cost only about $30,000. Mobilization costs would be largely covered by the basic project. Dredging would cost about $660,000, assuming that 3,800 cubic meters of it was rock that required blasting. Total project costs

would total an estimated $1 million before real estate costs and there is no assurance that permits could be obtained to allow the fine, potentially contaminated material in Margaret Bay to dissipate in Iliuliuk Harbor.

Capping. As a mitigation alternative capping was eliminated from consideration soon after studies were initiated in 1999 because it might impact surrounding habitat, might not colonize well, and might not effectively cover the soft, fine, easily suspended bottom material.

Dredging the Material and Disposing of it Without Treatment. This would be the least-cost remediation method. Material could be removed from the bottom by suction dredge and transported by pipeline to nearby waters of Iliuliuk Bay. Total quantity of material to be removed would be relatively small, in the range of 10,000 cubic meters of the soft bottom, but the material is so fine that large volumes of water would be transported with it in the dredging process. At the disposal site, the discharged material would be a thin slurry containing highly organic unconsolidated clay-like material. Even with silt barriers, much of the material would be widely dispersed by currents in the bay and could be expected to remain in suspension almost indefinitely. Additional chemical testing would be required to determine if the material has become contaminated with petroleum from any of several nearby sources. Disposal site selection would be difficult and would have to consider not only effects to habitat and biota at the site, but down-current as well. Depending upon the results of chemical analysis and site evaluation, the material might or might not meet State and Federal standards for open disposal in marine waters.

The project sponsor would be required to provide the real estate for this project feature. The bottom of Margaret Bay belongs to the Native-owned Ounalashka Corporation. The corporation has notified the Corps that they do not intend to sell the land or allow it to be encumbered with real estate restrictions that would prevent later development or use. The Corps would not ordinarily attempt to construct a project feature that would require taking Native corporation lands.

The Corps and the USFWS evaluated this mitigation alternative early in the plan formulation process, in 2000 and 2001, and at that time jointly decided not to pursue it because there was a high probability that the material in the bottom of Margaret Bay could not meet water quality standards for in-water disposal. As noted in the earlier discussion of dredging Margaret Bay, cost to determine the chemical characteristics of the material would be about $50,000, with additional cost to evaluate disposal sites and coordinate with other agencies. The most recent revision to the draft USFWS Coordination Act report (April 30, 2004; appendix H) recommends reconsidering this alternative and conducting additional chemical sampling, evaluating mechanical removal options, and conducting additional coordination.

The Corps believes this alternative was mutually eliminated from detailed consideration for good reasons early in the Unalaska study and does not believe there

is sufficient reason to revive it. Evaluation of historical activities in the area around Margaret Bay and the known presence of petroleum contamination in soils and water at sites within 100 meters of Margaret Bay strongly suggests that the Margaret Bay sediments contain measurable amounts of petroleum contaminants. Consultation with the Alaska Department of Conservation (ADEC) indicates ADEC would not allow the discharge of material into Unalaska Bay or tributary bays if it contained any measurable levels of petroleum products. ADEC also indicated that even if the sediment were free of petroleum, they might not approve the discharge because the high biological oxygen demand of the sediment would exacerbate existing problems associated with seafood processing waste.

Dredging cannot be conducted economically with great precision. Depth and location could not be controlled well enough to ensure that most of the soft sedimentary material was removed, but the original bottom remained undisturbed. Any archeological resources on the bottom of Margaret Bay would be at risk, and a careful, detailed site survey would be required before dredging, similar to the preconstruction survey that would be required if a channel was dredged.

Dredging material known to cause water quality problems and habitat loss from one waterbody that is already severely impaired and discharging that material untreated into another waterbody in better condition does not appear to be a reasonable alternative. It appears to be an especially poor concept when the material to be dredged contains fine particles that could remain in suspension long after disposal.

Dredging the Material and Treating It Before Disposal. The fine, soft material at the bottom of Margaret Bay could be removed by suction dredge, treated by any of several means, and then disposed of on land or used for construction or to meet other local needs. Both the sediment and the water in the dredged material (typically about 60 to 75 percent of the material discharged by a suction dredge) would require treatment before discharge. Treatment of the dredged material and water would involve a relatively large treatment site. Flocculants probably would be required to remove suspended fine material and bioremediation or thermal treatment would be required to treat the material. Bioremediation would likely require several years and has produced mixed results with diesel-range organics at other sites in the Aleutians and on the Alaska Peninsula. Thermal treatment would be expensive and can be difficult to use in remediation of fine-grained highly organic material, but is effective.

This alternative was considered in during 2000 and 2001 in the early phases of this study and was dropped from further consideration because the cost would be too high to justify the gains that would be achieved.

Create Intertidal Habitat. Altogether, construction of the LSA-South alternative would destroy or substantially alter about 0.8 hectare of intertidal habitat between -0.5 and +1.5 meters MLLW. Corps biologists estimated that construction would destroy about 0.04 hectare of relatively densely populated mussel community in the intertidal habitat. USFWS included less densely populated habitat and estimated the

loss at 0.1 hectare of the assemblage of mussels, algae, and associated species. These and other species could be expected to colonize the floating breakwater and floating docks and finger floats in the LSA-South harbor, but they might be less available as food to seabirds and other organisms that feed on them. Clams and other burrowing invertebrates in the lower intertidal also may be valuable components of the system at LSA-South and those in the excavated or filled areas would be lost to the animals that forage on them.

New intertidal habitat could be constructed in Iliuliuk Harbor as direct in-kind compensatory mitigation to replace intertidal habitat lost at the LSA-South site. There is no certainty that the created intertidal habitat would host an equally diverse and ecologically important assemblage as at the LSA-South sites, but other habitat in Iliuliuk Harbor supports dense mussel-rockweed-barnacle assemblages. The created habitat could be brought to the optimum elevation to support assemblages found at the LSA-South site and could be constructed of material selected to favor mussels or other especially important species.

USFWS (appendix H) recommended creation of intertidal habitat in two locations totaling about 0.6 hectare. One recommendation was to slope about 200 meters of the northeastern shoreline of Margaret Bay to create a wider intertidal area to support a diverse intertidal community of about 0.2 hectare. The other was to fill shallow subtidal waters just south of the entrance to Margaret Bay to create about 0.4 hectare of habitat for mussels. The Native-owned Ounalashka Corporation owns both locations. The corporation has declined to sell the land at these sites, and the Corps will not ask the project's non-Federal sponsor to attempt to acquire those lands against the wishes of the corporation. Project features, including mitigation features, are to be constructed on Federal lands or lands provided by the project sponsor. Mitigation would not be developed on Ounalashka Corporation land at either location recommended in the Coordination Act report unless the corporation decided to transfer or grant a long-term restriction on lands they own.

Intertidal habitat could be developed on nearby submerged lands owned by the City of Unalaska, the non-Federal sponsor. Several sites around Iliuliuk Harbor could be developed to provide the amount (0.8 hectare) of intertidal habitat to match the area lost or highly modified by harbor construction at the LSA-South site. It could be constructed with material from excavation of the LSA-South alternative or from another nearby material source and would be in-kind compensatory mitigation intended to directly replace part of the habitat values diminished by construction and operation of the LSA-South alternative.

The habitat could be constructed by transporting material by truck from the LSA-South alternative construction site over existing roads or with material from another source transported by truck or barge. Material grain size could be specified to achieve substrate conditions specified during the project pre-engineering design phase through consultation with interested resource agencies. The entire site could be constructed with material of the same grain size, or different grain sizes could be used at specific locations to achieve different habitat objectives (e.g. to establish habitat

favorable to mussels in one area and sand lance in another). Most of the lost intertidal habitat would be beach consisting largely of sand and fine gravel, so this probably would be the principal habitat type established at the mitigation site. At least 0.2 hectare would be designed to serve primarily as habitat for a mussel-rockweed-barnacle community. For cost estimating and planning purposes, final elevations of the created habitat would be assumed to be between 0.0 and 1.0 meter MLLW.

Construction of 0.8 hectare of the intertidal habitat would require 8,000 cubic meters of material for every meter added to the bottom elevation. Fill would be placed in water no deeper than 2.5 meters below MLLW (at the toe of the fill), and the estimated total volume for 0.8 hectare would be about 16,000 cubic meters.

The first truckloads of material could be used to construct a temporary road to the mitigation site. Construction, whether using truck or barge, would observe the same seasonal timing restrictions as the harbor construction. The contractor would be allowed to work in the water, but access could be restricted during part of the tidal range to avoid unnecessary risk or dispersion of materials. Grain size specification would limit fine material placed at the site, so a silt curtain might not be necessary. Work would be completed in a single construction season.

Raising shallow subtidal sea bottom to create intertidal habitat could, at least in part, replace habitat for algae, mussels, and other common intertidal invertebrates in an area where they could be reached by feeding seabirds and other marine animals. The intertidal area also would provide habitat for salmon out-migrants and other small fish that typically inhabit near-shore waters.

Placing 16,000 m^3 of specified fill material to replace 0.8 hectare of lost intertidal habitat would cost about $490,000 or about $610,000 per hectare. Establishing baseline conditions before construction, plans and specifications, and monitoring colonization after construction could be accomplished for an additional $100,000.

Captains Bay Barge Removal. Two barges are grounded and abandoned in highly productive intertidal and shallow subtidal habitat near the head of Captains Bay (figure 4-11). One is a steel barge deck-loaded with a World War II Landing Craft Utility (LCU) vessel, a tracked crane, a wheel crane, a dump truck, and other materials and equipment. The other is a small and much older wooden barge with two fuel storage tanks and several cod pots on its deck. Figure 4-12 shows both barges. The wooden barge has deteriorated to the point that it cannot be moved as a unit, but crab pots, fuel tanks, and other materials presenting hazards to wildlife could be removed. The newer, larger steel barge could be repaired and towed off the beach. Removing the newer barge, its deck load, and equipment from the old wooden barge would allow the near-shore habitat to restore itself.

If allowed to remain in place, the larger steel barge and the equipment on it will corrode and deteriorate into a mass of rusted iron and debris that will disperse into the surrounding intertidal and subtidal environment. Particles and pieces of rusted steel

and other debris will alter substrate material size, chemistry, and suitability as benthic habitat. The deteriorating barge would cause long-term damage to the site and the surrounding intertidal and near subtidal environment. The steel barge occupies a relatively small area of near-shore habitat, about 450 square meters, but as the barge

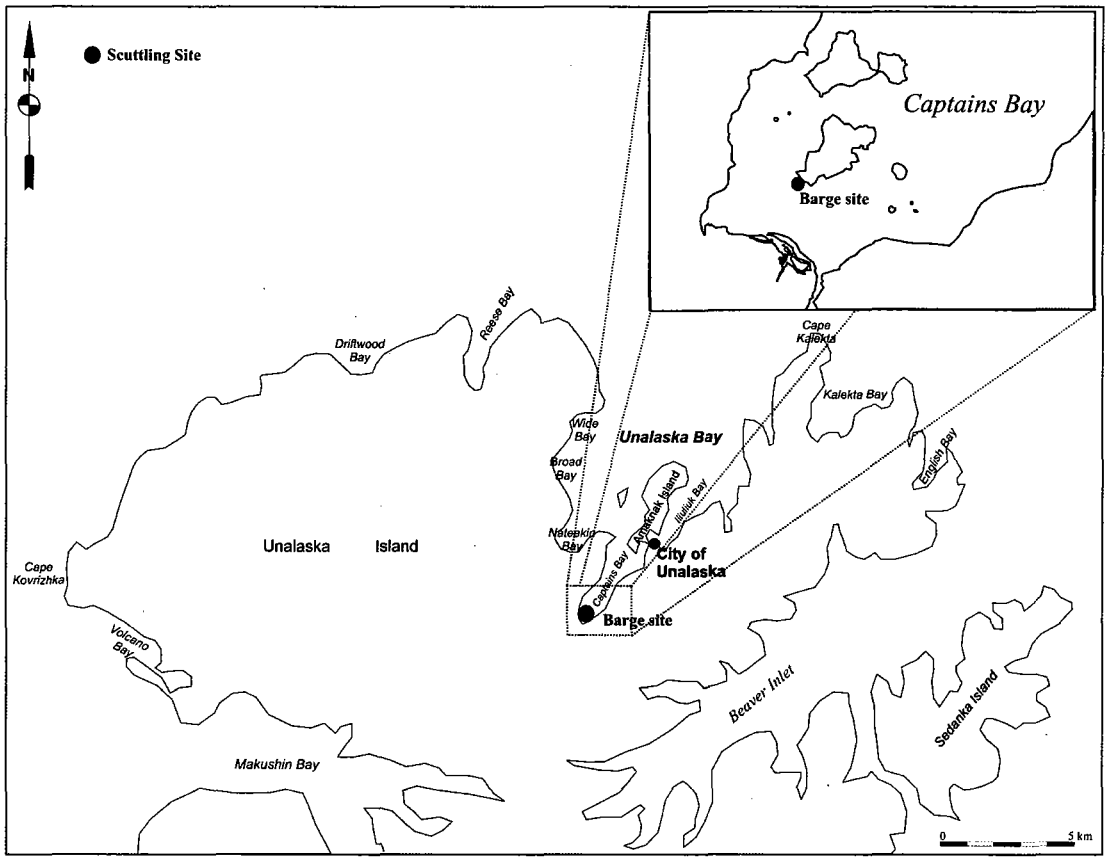

Figure 4-11. Barge scuttle sites.

and its deckload deteriorate, it will likely be spread over a larger area. If the pieces of the barge and effects of ferrous material on sediment composition and chemistry spread only 10 meters in all directions around the barge, then it would eventually impact about 1,800 square meters of intertidal and near-shore subtidal habitat in an area rich in mussels and other benthic invertebrates and important to wintering waterfowl.

The steel barge is approximately 120 feet long and about 40 feet wide with a flat bottom. The LCU on its deck is 115 feet long. It was used to recover the capsized LCU that now rests on its deck but has been beached at the site for approximately 15 years. A recent inspection indicates that its present condition would allow it to be repaired and floated off the beach. However, it is rapidly deteriorating and will soon be degraded to a condition that will not allow it to be moved without dismantling it. Other vessels have been scuttled at a site north of Amaknak Island (figure 4-11) in water approximately 2,000 meters deep. If the steel barge could be towed to the scuttling site, it could be used to create habitat in another deep-water location where its structure would be a benefit to crabs and fish that use vertical structures.

The smaller wooden barge is approximately 80 feet long and about 30 feet wide. It is older and has deteriorated to the point that it is covered with vegetation and cannot be floated off the beach. It will continue to collect detritus from the air and water and will decay until it is a low mound of decaying wood, metal, and accumulated sediment. The metal tanks and fish pots (traps) on deck might become adrift in some future storm, with the potential that they would spread debris to another area where they would cause minor effects as debris or might inadvertently capture fish, crabs, or other sea life.

The fluids were removed from the vessels approximately 10 years ago via a U.S. Coast Guard contract with Magone Marine, of Unalaska.

The barges are eyesores that occupy space within valuable habitat, and modify natural circulation patterns on the beach. Additionally, the netting on the cod pots and the physical nature of other equipment and material on the barges presents hazards to birds and possibly marine mammals that frequent the area.

The removal action would enhance the quality of the habitat in the immediate vicinity of the barges, eliminate physical hazards associated with equipment abandoned on the barges, and return the landscape to more natural conditions. It would allow about 450 square meters of near-shore bottom habitat to naturally recolonize and would prevent long-term impacts to a substantially larger area.

The LSA-South alternative breakwater would cover about 0.55 hectare of intertidal and subtidal habitat. This mitigation action would partially compensate for that loss by removing an existing cause of habitat loss and removing potential for future effects. Altogether, the action would restore or prevent impacts to less than 0.1 hectare of marine benthic habitat and reduce potential for additional impacts to surrounding habitat and biota.

Potential risks with this action are associated with obtaining the necessary permits from the Environmental Protection Agency (EPA) to dispose of the vessels at the scuttle site; the possibility that the barge cannot be repaired to a condition that will allow it to be floated and towed to the scuttle site; and that the vessel once floated, might sink before it reaches the designated scuttle site. Coordination would be conducted with the State Historic Preservation Officer to determine whether the barge, the deck-loaded LCU, or any of the other deck-loaded equipment were eligible for the Federal Register of Historic Places. If eligible, appropriate documentation or other mitigation would be conducted before the removal action.

A thorough inspection would be performed to identify any remaining chemical or physical hazards and define appropriate actions to be taken to remove them. EPA would review all actions associated with the scuttling of the vessels. The Marine Safety Detachment of the U.S. Coast Guard would inspect the barge and all repairs made to it prior to allowing it to be towed to the scuttle site. The towing and scuttle operation would be limited to periods of favorable weather and sea conditions.

The costs of removing the hazardous equipment and materials and scuttling the steel barge and LCU includes information gathering, planning and construction.

Information Gathering		$10,000.00
Planning		$60,000.00
Construction	Permitting Actions	$10,000.00
	Mobilization	$10,000.00
	Removal of hazardous equipment	$15,000.00
	Removal of non-hazardous debris	$15,000.00
	Repairing Steel Barge	$25,000.00
	Storage and Protection	$15,000.00
	Towing/Scuttling	$50,000.00
	Cleanup/Demobilization	$10,000.00
Total		**$220,000.00**

The USFWS has determined that removing the barges would have little benefit to the habitat or other resources at this location and has recommended against implementing this measure.

Interpretive Signs at Hill 400 and at the Harbor. Two signs would be placed at the harbor to complement the natural resource interpretive signs at the harbor site. An additional 3 signs would be placed on Hill 400 with at least one at the top of the hill near the bunker overlooking the World War II landscape. These signs would be designed to provide visitors and residents information about the events that took place in the area during World War II and describe the National Historic Landmark. The signs are designed to mitigate of the harbor's intrusion on the landscape of the Dutch Harbor NHL, a contributing aspect of the landmark. This mitigation measure would be contingent on the landowner, Ounalashka Corporation, allowing access without charging a fee to view the signs paid for by public money. Estimated cost $90,000.

Reprint the World War II Driving Guide. The Corps produced a driving guide called, *View to the Past: A driving guide to World War II Buildings and Structures on Amaknak Island and Unalaska Island.* The driving guide describes the World War II structures within the National Historic Landmark and events that took place during the war in Unalaska and on Amaknak Island. The guide has been given to veterans, visitors, school children, and residents of Unalaska. It has proved so popular a resource that there are few available for distribution. The guide will provide partial mitigation to impacts to the National Historic Landmark. Estimated cost $5,000.

Create and Populate a Website about World War II in Unalaska. Create a site that focuses on World War II in Unalaska, including the NHL, using resources from Unalaska with links to other sites. Population of the website can include creating databases of information from museum archives or collections. The website would

be developed with, and maintained by the Museum of the Aleutians. It would reach veterans, the interested public, and schools on a worldwide basis. This would mitigate impacts to the Dutch Harbor NHL by providing the public information about the events led to this nationally significant site. This website is contingent on the Museum of the Aleutians agreeing to maintain the website after it has been created. Estimated cost: $25,000.

Summary of Compensatory Mitigation Alternatives. Table 4-5 summarizes the compensatory mitigation measures evaluated for the alternatives considered in detail.

4.6 Comparison of Alternatives

This section compares alternatives at three sites (LSA-North, Expedition Inlet, and LSA-South) against the planning criteria in Section 3.0 Plan Formulation and Section 3.1 Planning Criteria and Objectives. It also discusses the environmental impacts of the alternatives considered in detail, which are the LSA-North plan, the Combined LSA-North/Expedition Inlet alternative, and the LSA-South Mussel Bed Avoidance alternative. Table 4-5 compares impacts of alternatives considered in detail.

All three plans would moor 75 boats from 24 to 45 meters in length and provide protection from wind and boat-generated waves. The plans provide National Economic Development (NED) benefits with benefit/cost ratios (BCR) greater than 1.0. These alternatives are compatible with local zoning and adjacent commercial/industrial land uses. Effects on children and minority populations would be insignificant because access to the harbor sites are away from residential areas and public clinics, schools, and other public facilities used disproportionately by children. All the sites are within the boundaries of the Dutch Harbor Naval Operating Base and Fort Mears, U.S. Army, National Historic Landmark (NHL).

Table 4-5. Compensatory Mitigation Alternatives*

Mitigation Feature	Resources to be Mitigated: Impacted Resouce	Resources to be Mitigated: Other Resources Benefited	Resources to be Mitigated: Importance of Impacted Resource	Resources to be Mitigated: Scarcity of Impacted Resources	Potential Mitigation Outputs (Benefits): Proximity to Impacted Resources	Potential Mitigation Outputs (Benefits): Similarity to Impacted Resources	Potential Mitigation Outputs (Benefits): Value of Outputs	Potential Mitigation Outputs (Benefits): Potential to Achieve Outputs	Potential Mitigation Outputs (Benefits): Area or Units of Outputs	Costs and Potential Impacts of Mitigation: Potential Impacts to Other Biological Resources	Costs and Potential Impacts of Mitigation: Potential Impacts to Cultural/Social/Economic resources	Costs and Potential Impacts of Mitigation: Cost	Costs and Potential Impacts of Mitigation: Cost Uncertainty	Costs and Potential Impacts of Mitigation: Legal and Land Ownership Barriers	Notes
1) Iliuliuk Bay Intertidal Habitat Construction	Intertidal habitat	Juvenile fish/ waterfowl	High	Moderate	High	High	High	High	0.8 ha	Low to Mod	Low	$500k/ ha.	Low to Mod	Low to Mod	Recommended action--1 for one area replacement for intertidal habitat lost in proposed action
2) Margaret Bay Intertidal Habitat Construction	Intertidal habitat	Juvenile fish/ waterfowl	High	Moderate	High	High	High	Mod to High	0.2 ha	Low	High	$500k or more per ha	High	High	Not recommended--Would serverely impact Native Corp. economic potential; construction could encounter spilled petroleum; benefits can be achieved with less cost with feature 1
3) Tideland Deed Restriction ATS 1396 Tract A	Stellers Eiders	Waterfowl marine mammals	High	High	High	High	Low	High	Approx 4 ha	Low	Low	Low	Low	Low	Not recommended--Low potential for future development at this site
4) Tideland Deed Restrictions ATS 1396 Tract B & ATS 1246	Benthic Inverts Juv. Fish	King crabs	High	Moderate	High	Moderate	Moderate	Moderate		Low	Unknown	Unknown	High	Moderate	Not recommended--USFWS proposed this measure, but has not identified specific measures or conditions of restrictions. Costs, outputs, and effects cannot be estimated.
5) Morris Cove Creek Restoration	salmon rearing habitat	Pink & sockeye Salmon	High	Moderate	Moderate	Low	Mod. to Low	Moderate	0.33 ha	Low	Mod. to High	$150k= 450K/ha	High	High	Not recommended--Low correlation with affected resources, would require acquisition of land in the heart of a 160 acre Native Allotment. Landcosts unknown.
6) Unalaska Lake Spawining Habitat Restoration	Sockeye salmon	Waterfowl	High	Moderate	Moderate	Low	Unknown	Unknown	Unknown	Low	Low	Unknown	High	Low	Not recommended--Low correlation with affected resources. USFWS proposed this late in the study as a concept. Defining costs & outputs would delay project at least two years.
7) Wetland Acquisition	Waterfowl	Fish, wetland values	Mod to High	Moderate	Moderate	Moderate	Moderate	Mod to High	Unknown	Low	Mod to Low	Est. $1.3 million/ ha	Moderate	Low	Not recommended--Very high cost to preserve waterfowl nesting habitat where most regional lands are in protected status
8) Iliuliuk River Remediation Dredge Channel	Salmon rearing	Aquatic habitat	Mod to High	Moderate	Moderate	Low	Low	Mod to High	0.04 ha	Low	Low	Unknown High/unit of habitat	Moderate	Low	Not recommended--No longer recommended by any resource agency
9) Margaret Bay Remediation Dredge Channel	Benthic Marine	Waterfowl, Juv. Fish	High	Moderate	High	Mod to High	High	Moderate	1 ha	Low	Hogh	mil + real estate cost	High	High	Not recommended--No longer recommended by USFWS
10) Margaret Bay Remediation Dispose Material w/o treatment	Benthic Marine	Waterfowl, Juv. Fish	High	Moderate	High	Mod to High	High	Moderate	1 ha	Moderate	High	$800k + real estate costs	High	High	Not recommended--Requires taking land from Native corporation with potentially severe effects on future land use. High potential for impact to archeological resources and uncertainty method would be permitted by state. Supported by USFWS. Resolving uncertainties would cost est. $150k and delay project at least two years.
11) Barge Removal	Marine benthic habitat	Intertidal habitat	High	Moderate	Moderate	High	Moderate	High	0.05 ha	Low	Low	$220k= $5 mil/ha	Low	Low	Not recommended--High cost per unit of output.
12) Eider Conservation Funding	Stellers Eiders	Unknown	High	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Low	Unknown	Unknown	Unknown	High	Not recommended--Not appropriate under Corps policy for water resources development proposals.
13) Trust Fund for Habitat Restoration	Stellers Eiders	Unknown	High	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Low	Unknown	Unknown	Unknown	High	Not recommended--Not appropriate under Corps policy for water resources development proposals.
14) Interpretive Signs-Hill 400	Cultural		High	High	High	High	High	Moderate	N/A	Low	Positive	$90K	Low	Moderate	Recommended
15) Reprint driving guide	Cultural		High	High	Moderate	Moderate	High	High	N/A	Nil	Positive	$5K	Low	Low	Recommended
16) Create World War II Website	Cultural		High	High	Moderate	Moderate	High	High	N/A	Nil	Positive	$25K	Low	Moderate	Recommended

*Based on information in Section 4.5.3. Alternatives in this summary represent those supported by the USFWS (appendix H) and by other agencies and individuals interested in this action. This table is not intended to be a comprehensive presentation of the many possible mitigation measures evaluated for the Unalaska Navigation Improvement study. Values presented in this table are those of the Corps of Engineers and may not represent those of other agencies. This table was not presented in the draft Unalaska report and was not renewed as part of that report. This table does, however, summarize the same alternatives and information that were reviewed in the draft report.

Table 4-6. Comparison of impacts, alternatives considered in detail.

	No Action	LSA-North	Combination	LSA-South
Marine Mammals	No Effect	Loss of sea otter and sea lion foraging opportunity in 6.9 ha. Closer proximity to seal and sea lion habitat. Possible increased potential for petroleum exposure.	Loss of sea otter and sea lion foraging opportunity in 9.6 ha. Closer proximity to seal and sea lion habitat . Possible increased potential for petroleum exposure.	Minor loss of sea otter and sea lion foraging opportunity in 9.3 ha. Closer proximity to seal and sea lion habitat. Possible increased potential for petroleum exposure.
Steller's Eiders (listed population)	No Effect	Displacement by vessel traffic, potential oiling from spills, potential strikes to vessels and harbor features.	Displacement by vessel traffic, potential oiling from spills, potential strikes to vessels and harbor features.	Estimated 2 killed, 4 harmed in 50-year project life.
Sea birds	No Effect	27 ha. foraging habitat moderately to severely impacted. Closer vessel proximity increases petroleum for exposure potential. Protected moorage reduces potential for fuel spills and oiling.	50 ha. foraging habitat moderately to severely impacted. Closer vessel proximity increases petroleum for exposure potential. Protected moorage reduces potential for fuel spills and oiling .	Estimated mortality of 2 per year, harmed by displacement up to 12 per year.
Intertidal Community	No Effect	0.1 ha. moderately diverse and productive community lost. 0.1 ha. rocky habitat constructed.	0.2 ha. moderately diverse and productive community lost.	0.8 ha. moderately to highly diverse and productive community lost.
Subtidal Community	No Effect	6.5 ha. habitat moderately to severely impacted. 20 ha. chronic mild and occasionally severe effects.	8.6 ha. habitat moderately to severely impacted. 28 ha chronic mild to severe effects.	8.4 ha. habitat moderately to severely impacted. 20 ha. chronic mild and occasionally severe effects.
Fish	No effect	6.9 ha. habitat moderately to severely impacted. 20 ha. chronic mild and occasionally. severe effects	9.6 ha. habitat moderately to severely impacted. 20 ha chronic mild to severe. effects	9.3 ha. habitat moderately to severely impacted. 20 ha. chronic mild and occasionally. severe effects.

Table 4-6. Comparison of impacts, alternatives considered in detail (continued).

		LSA-North	LSA-North and Expedition Inlet	LSA-South
King Crab	No Effect	Displacement from about 1.0 ha. habitat.	Displacement from about 0.7 ha. habitat.	Displacement from about 0.4 ha. habitat.
Essential Fish Habitat	No Effect	6.5 ha. habitat moderately to severely impacted. 20 ha. chronic mild and potential occasionally severe effects.	9.6 ha habitat moderately to severely impacted. 20 ha chronic mild to severe effects.	9.3 ha habitat moderately to severely impacted. 20 ha. chronic mild and occasionally severe effects.
Water Quality	No Effect	Moderately to severely impacted in 6.5 ha. 20 ha. chronic mild and occasionally severe effects.	Moderately to severely impacted in 9.6 ha. 20 ha. chronic mild and occasionally severe effects.	9.3 ha habitat moderately to severely impacted. 20 ha. chronic mild and occasionally severe effects.
Recreation/Subsistence Uses	No Effect	Visual properties lost, minor or negligible loss of resource harvest.	Visual properties lost, minor or negligible loss of resource harvest.	Visual properties lost, minor to moderate loss of resource harvest.
Cultural Resources	No Effect	Potential effects to cultural properties	Potential effects to cultural properties	Potential effects to cultural properties

Note: This table incorporates habitat impact information from table 7.3, estimates from the USFWS biological opinion

4.6.1 Little South America-North (LSA-North) Alternative

LSA-North alternative has limited potential for development of adjacent uplands required for efficient harbor operation (figure 4-3). Henry Swanson Drive fronts the small amount of flat space between the water and adjacent mountainside along the harbor site's west boundary. Existing buildings housing a live crab holding facility occupy the remaining small area of flat space. Equipment working on harbor activities would be in the roadway and restrict traffic. Minimal uplands for a harbor master office and response equipment storage could be developed at the south end of the project area, but only after extensive rock excavation that is not reflected in project cost estimates. There would be limited space for emergency vehicles and pickup/drop-off parking. Additional upland and services could be developed in the existing quarry south of the harbor site, but all facilities would be away from the harbor. No boat ramp or other boat launching facilities would be feasible. Lack of immediately adjacent staging area would require waste disposal receptacles and cleanup equipment to be placed away from the harbor. Lack of adjacent flat working area would impede oil spill recovery and other emergency operations. The floating breakwaters would restrict boat traffic through South Channel at the existing bridge. The problem would increase with construction of the proposed new bridge.

4.6.2 Combined Little South America-North (LSA-North)/Expedition Inlet Alternative

The LSA-North/Expedition Inlet Combined alternative would be split between two sites (figures 4-5 and 4-6). For the LSA-North site, see LSA-North plan (above). The potential uplands that could be used as staging areas for harbor operations at the Expedition Inlet site are immediately adjacent to Airport Beach Road. Even with some constructed uplands from disposal of dredged material in intertidal fill, the relatively level ground that might be developed for harbor support would total only about 0.77 hectare.

Airport Beach Road is the only traffic link between the Dutch Harbor Airport/commercial/industrial area and the City of Unalaska downtown/residential areas (figure 2-1). Harbor activities involving people and equipment, entering and leaving the staging area along the shoreline of Expedition Inlet could conflict with a public thoroughfare, but road widening and upgrading along with lower speed limits could protect users. Expedition Inlet has marine facilities and docks. New moorage could interfere with existing activities, particularly access to the head of Expedition Inlet where a ship repair business provides marine services. Existing survey and geotechnical information indicates there is risk of cost overruns for rock excavation.

4.6.3 Little South America South (LSA-South) Alternative

LSA-South alternative (figure 4-7) is at the site preferred by the sponsor (City of Unalaska) and the adjacent Native landowner (Ounalashka Corporation). This alternative would produce the greatest net NED benefits, would be constructible with the least potential of cost over runs or engineering problems, and would be the easiest, most efficient, and safest harbor to operate. It also would be the best choice to meet local boating needs. This site would, however, have the greatest impact on sea ducks and marine invertebrates. The LSA-South

site would have upland staging area constructed adjacent to the harbor through disposal of dredged material as intertidal fill. These constructed uplands would be able to accommodate a harbormasters office, response equipment storage, access for emergency vehicles and short term parking for public transportation and drop-off/pickup service. Additional uplands could be developed in the existing quarry above the harbor site within a short walking distance. The LSA-South site would not impact existing marine activities in the Unalaska area.

4.6.4 NED Plan

The NED plan is the plan with the greatest net annual benefits, which are defined as annual benefits minus annualized costs. Ranking the plans in order of increasing net annual benefits shows the LSA-South Mussel Bed Avoidance Plan with mitigation is the NED plan.

Little South America North (LSA-North) Plan	$156,000 net annual benefits
Combined Plan LSA-North/Expedition Inlet	$327,000 net annual benefits
LSA-South Mussel Bed Avoidance Plan	$553,000 net annual benefits

4.7 Environmentally Preferred Plan

The environmentally preferred plan, as recommended by the USFWS Coordination Act Report (Appendix H), is the LSA-North alternative.