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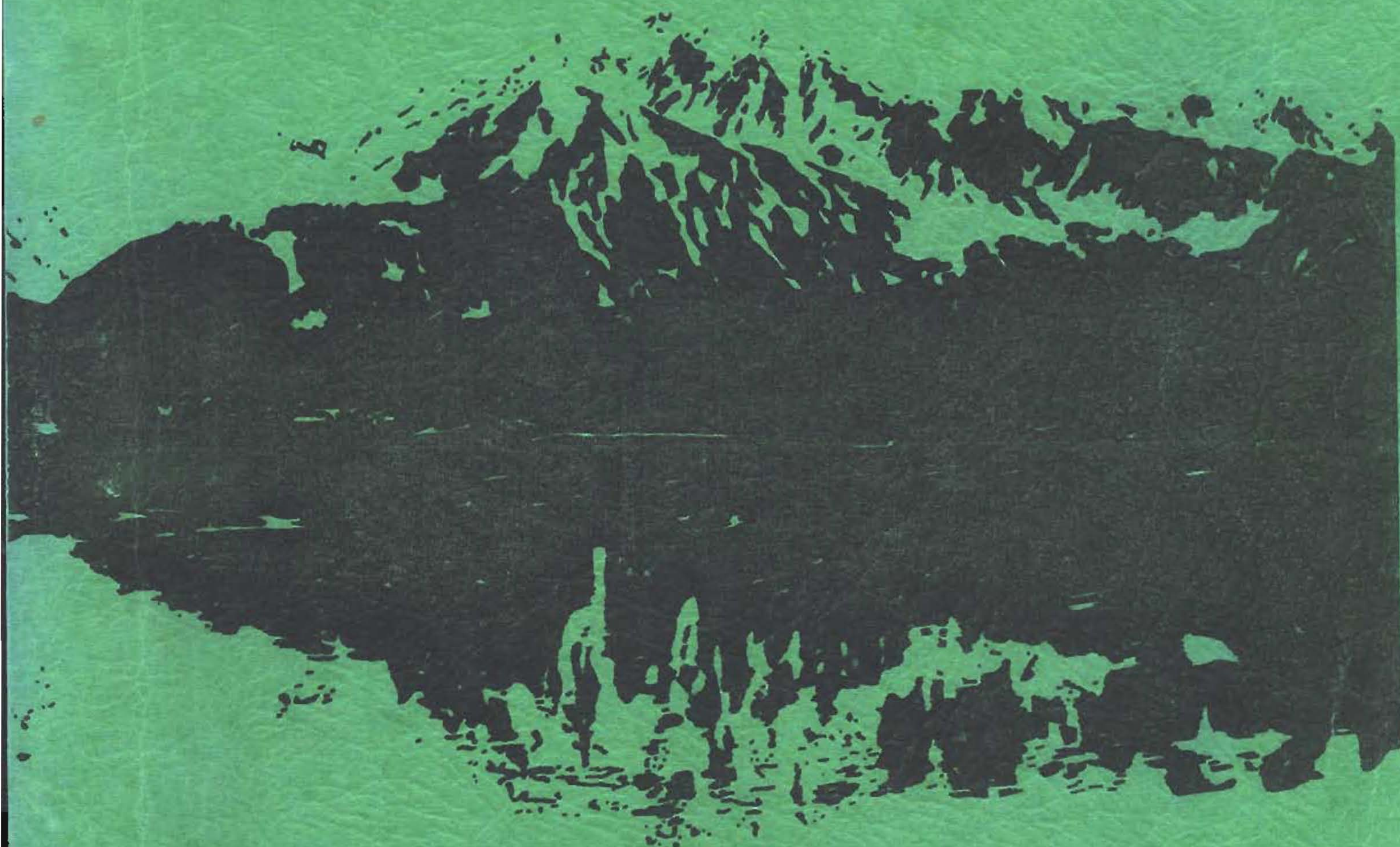
Seward, Alaska

Detailed Project Report and Final Environmental Impact Statement

Proposed Small Boat Harbor Navigational Improvements

APRIL 1982



US Army Corps
of Engineers
Alaska District

DETAILED PROJECT REPORT
AND
FINAL ENVIRONMENTAL IMPACT STATEMENT

SEWARD HARBOR, ALASKA
SMALL BOAT NAVIGATION IMPROVEMENTS

U.S. Army Corps of Engineers
Alaska District
P.O. Box 7002
Anchorage, Alaska 99510

April 1982

SUMMARY

Seward is one of the leading commercial fishing ports on the Kenai Peninsula and depends primarily on its small boat fleet for its economic base. Sufficient harbor space is unavailable for the local fleet and as a result, unprotected vessels, docks, and expensive gear suffer damages and other economic losses. For this reason, full development of the fishery and recreation potential has not been realized.

Various problems and needs relating to the development of an adequate small boat harbor were analyzed. This report concludes that the Nash Road site (Plan B) best meets the needs of the residents of Seward. Development of this site at the head of Resurrection Bay would involve installing a 1,400-foot-long south breakwater, a 2,800-foot-long west breakwater, and a 1,700-foot-long north silt barrier, creating approximately 30 acres of mooring basin dredged to varying depths of -10 to -16 feet MLLW. A 200-foot-wide entrance channel dredged to -18 feet MLLW would provide access to the harbor. This plan would provide moorage for 1,073 recreational and commercial craft, in addition to the 594 spaces provided by the existing harbor, resulting in a total moorage capacity of 1,667. The estimated annual benefits for Plan B are $2,081,700 with average annual costs of $1,387,700; the benefit/cost ratio is estimated as 1.5. This project would have a first cost to the Federal government of $1,927,000 with $38,800 per year for annual maintenance. Nonfederal first cost for the harbor and facilities would be $16,410,900, yielding a total project cost of $18,495,900.

Pertinent Data on Selected Plan

Nash Road Site

Harbor Capacity	1,073 vessels
Design Depth	
Mooring Basin	-10 to -16 MLLW
Entrance Channel	-18 MLLW
Basin Area	30 acres

Project First Costs

Major Navigation (Federal)1/	$ 1,927,000
Major Navigation (Local)	14,656,800
Other (Local)	1,912,100
	$18,495,900
Equivalent Annual Costs 2/	$ 1,387,700

Average Annual Benefits

(1) Damage Reduction	
Recreational Boats	$ 86,300
Commercial Boats	145,000
Harbor Facilities	5,000
(2) Labor Savings	27,000
(3) Charter Boats	98,300
(4) Recreational Boats	1,393,800
(5) NED Employment	145,100
(6) Increase Fish Catch	110,100
(7) Harbor of Refuge	30,000
(8) Land Enhancement	41,100
Total Benefits	$ 2,081,700
Net Benefits	694,000
Benefit/Cost Ratio	1.5

1/ Includes $6,000 for U.S. Coast Guard aids to navigation.

2/ Includes an average $96,500 per year maintenance costs.

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TABLE OF CONTENTS

Item	Page
INTRODUCTION	
Study Area	1
Study Authority	1
Scope of the Study	1
Study Participants and Coordination	2
The Report	2
Studies of Others	4
PROBLEM IDENTIFICATION	
Existing Condition	5
Without Action Profile	5
Problems, Needs, and Opportunities	7
Problems	7
Harbor Needs	8
Opportunities	9
Planning Constraints	9
Planning Objectives	9
Resource Management Problems (Water and Related Land)	10
Navigation	10
Recreation	10
Water Supply and Quality Management	10
Fish and Wildlife	10
Land Management Considerations	10
Local Implementation Items	10
PLAN FORMULATION	
Formulation and Evaluation Criteria	11
Rationale for National and Regional Objectives	12

TABLE OF CONTENTS (cont)

Item	Page
Formulation of Preliminary Plans	13
Townsite Location	13
Alaska Railroad East	13
Existing Harbor Expansion East	13
Existing Harbor Expansion South	16
Nash Road Site	16
Fourth of July Creek	16
Lowell Point	16
Comparison of Alternatives	17
Alternatives Worthy of Further Consideration	17
ASSESSMENT AND EVALUATION OF DETAILED PLANS	18
General	18
Harbor Sizing	18
Plan A (South Expansion)	18
Plan Description	18
Construction	22
Maintenance	22
Impacts	22
Implementation Responsibilities	23
Construction Responsibilities	23
Maintenance Responsibilities	23
Economic Analysis	23
Public Views	23
Cost Estimate	24
Annual Cost	26
Plan B (Nash Road Site)	26
Plan Description	26
Construction	29
Maintenance	29
Impacts	29
Implementation Responsibilities	30
Construction Responsibilities	30
Maintenance Responsibilities	30
Land Enhancement	30
Economic Analysis	30
Cost Estimate	31
Annual Cost	31
Public Views	33

TABLE OF CONTENTS (cont)

Item	Page
U.S. Fish and Wildlife Service	33
Comparison of Detailed Plans	34
Comparison of Detailed Plans	34
Rationale for Designation of the NED Plan	35
Rationale for Designation of the EQ Plan	36
Rationale for Proposed Plan	36
Determination of Consistency with Coastal Zone Management Program	36
CONCLUSIONS	37
RECOMMENDATIONS	38
FINAL ENVIRONMENTAL IMPACT STATEMENT	EIS-1

APPENDIXES

Item		Title
A	Problem Identification	A-1
B	Economics	B-1
C	Engineering	C-1
D	Foundations and Materials	D-1
E	Coordination With Other Agencies	E-1
F	Water Quality Information	F-1
G	Water Circulation Study	G-1
H	Statement Recipients	H-1

LIST OF FIGURES

Number	Title	Page
1	Vicinity Map	3
2	Existing Seward Harbor	5
3	Harbor Sites Not Selected	14
4	High Risk Earthquake Area	15
5	South Expansion Dredged Disposal and Maintenance Dredged Disposal Site	19
6	South Expansion Breakwater Design	20
7	Nash Road Site, Proposed Plan	27

LIST OF TABLES

Number	Title	Page
1	Total Demand	8
2	South Expansion Site	21
3	Benefits	23
4	Cost Estimate	25
5	Nash Road Site	28
6	Benefits	30
7	Cost Estimate	32

DETAILED PROJECT REPORT
AND
FINAL ENVIRONMENTAL IMPACT STATEMENT
SEWARD HARBOR, ALASKA
SMALL BOAT NAVIGATION IMPROVEMENTS

INTRODUCTION

STUDY AREA

Seward is located on Resurrection Bay, an arm of the North Pacific Ocean, 120 miles south of Anchorage. Mountains surround this deeply incised fjord of glacial and epogenic origins. The townsite is sited on an alluvial outwash of Lowell Creek which extends into the bay. Climate is mild, influenced by the warm waters of the North Pacific Ocean. However, glacial ice fields overlook the townsite, and strong winds and heavy precipitation are characteristic of the area.

Approximately 2,500 people live in Seward and its immediate vicinity. The community relies on commercial fishing, tourism. and the Alaska Railroad (federally owned) for its basic industry. In addition, Seward is the site of an Alaska Marine Highway System ferry terminal, a vocational training school, and a field experiment station for the University of Alaska's Institute of Marine Science. Seward is served by the Alaska Marine Highway System, commercial air service, a State highway, and the Alaska Railroad.

STUDY AUTHORITY

In recognition of the importance of harbors to the commercial and recreational needs of Alaska's seacoast towns, and of the overcrowded harbor conditions at Seward, the United States Senate Committee on Public Works adopted a resolution on 9 September 1970 authorizing a study on the feasibility of providing navigation improvements at Seward, Alaska. A draft Feasibility Report and Environmental Impact Statement was submitted for a 45-day public review period on 29 February 1980. At the end of that review period, the city of Seward requested the study be converted to a Detailed Project Report under Section 107 of the 1960 River and Harbor Act, as amended.

SCOPE OF THE STUDY

The area of consideration for this study is shown on Figure 1. Investigations were made of the present and future needs for small craft refuge; methods of satisfying such needs; economic, environmental and social considerations; and associated matters, including coordination with concerned agencies, local government, and the public. A State proposal envisioned as a cooperative Federal-State-City project for harbor extension and inner harbor mooring facilities served as the basis in determining a recommended plan.

Both fixed and floating breakwaters were considered for possible use. The effectiveness of modular floating concrete breakwaters is based on existing structures in use in Alaska by the State Division of Harbor Design and Construction, previously designed by the Corps of Engineers for Ketchikan, Alaska, and a special technical evaluation report on floating breakwaters prepared by the University of Washington, Department of Civil Engineering.

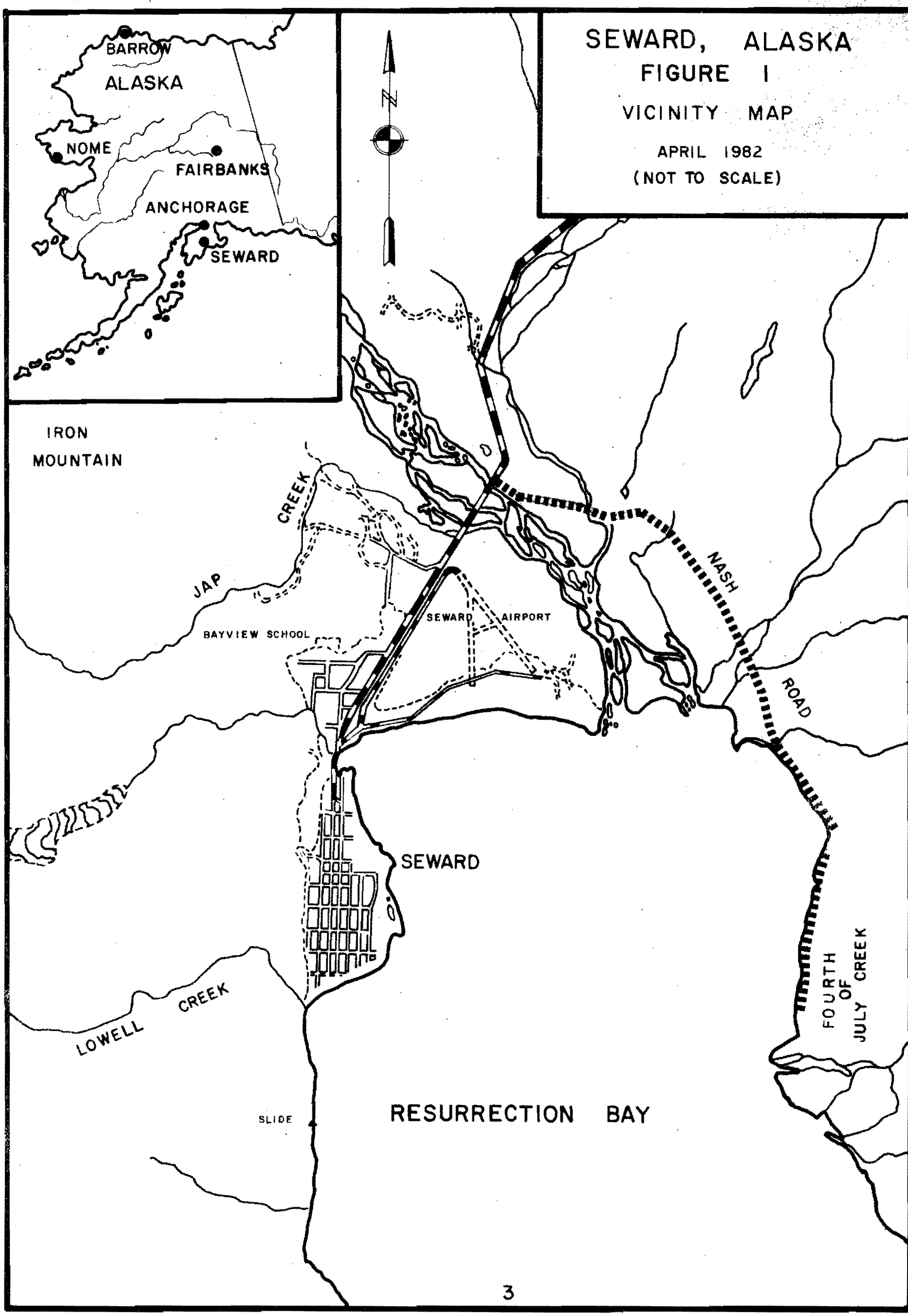
STUDY PARTICIPANTS AND COORDINATION

An initial public meeting was held in Seward on 22 March 1977 to gather information on the needs, problems, and desires of the community. Subsequent public workshops and meetings were held on 25 October 1978 and 16 April 1980 to present the study findings and to obtain public comments on the findings. Close coordination has been maintained with city officials, interested citizens, and concerned agencies including State and Federal fish and wildlife agencies, the Environmental Protection Agency, the federally owned Alaska Railroad, the State Department of Environmental Conservation, the State Division of Harbor Design and Construction, the Kenai Peninsula Borough and the city of Seward. Coordination methods have included written correspondence, telephone conversations, field trips, and meetings. For a more detailed description of the public involvement program, see the Public Involvement Section in the EIS.

THE REPORT

Through public meetings, workshops, and discussions with State and local officials, public needs were defined. A general reconnaissance of the area was made to identify potential harbor sites or alternative ways to meet perceived needs. These sites/alternatives were evaluated based on their ability to meet these needs. Some were eliminated as being too small, extraordinarily expensive, or not technically feasible. Of those remaining, preliminary design and cost estimates were made and the environmental impacts assessed.

The results of this study are included in the main report, the Final Environmental Impact Statement (FEIS), and the accompanying appendixes. The main report summarizes the need for and advisability of providing small boat harbor navigation improvements at Seward, Alaska. The various appendixes contain technical information and back-up data in support of the main report. Each appendix is intended to augment the information found in the main report.


SEWARD, ALASKA
FIGURE I
VICINITY MAP
APRIL 1982
(NOT TO SCALE)
BARROW
ALASKA
NOME
FAIRBANKS
ANCHORAGE
SEWARD
N
IRON
MOUNTAIN
JAP
CREEK
BAYVIEW SCHOOL
SEWARD AIRPORT
NASH
ROAD
SEWARD
LOWELL CREEK
SLIDE
RESURRECTION BAY
FOURTH OF JULY CREEK

STUDIES OF OTHERS

The following studies recently completed by other agencies are as follows:

a) "Kenai Borough Growth Management Data Base Study," University of Alaska, Anchorage Urban Observatory.

b) "Hydrography and Chemistry of Resurrection Bay," David Burnell, University of Alaska, Institute of Marine Science, Fairbanks, Alaska.

c) "Dynamics of Silicon in Marine Productivity," John Goering, University of Alaska, Institute of Marine Science, Fairbanks, Alaska.

d) "Socioeconomic Impacts of Selected Foreign OCS Development," Bureau of Land Management.

e) "City of Seward Land Use Plan," CH2M Hill.

f) "Harbor Needs Study," Woodward/Clyde Consultants.

g) "Fourth of July Creek Industrial Marine Park, City of Seward, Alaska," Century & Quadra Engineers, December 1980.

PROBLEM IDENTIFICATION

The initial step for finding a solution to local needs is the identification of local problems, evaluation of opportunities for solving the problems, and testing solutions against national economic and social objectives.

EXISTING CONDITION

Seward is both a deep-draft and shallow-draft port site. One inclosed harbor and four dockage areas are in use. (See Figure 2.) Two of these existing structures accommodate deep-draft vessels. They are: the Fourth Avenue Municipal Dock, which is a 200-foot, city-owned wharf with depths of -35 to -40 feet (MLLW) alongside, located at the south end of Seward; and the 750-foot Alaska Railroad (Federal) pier located at the head of the bay, with controlling water depth reported to be 30 feet.

The small boat harbor constructed by the Corps of Engineers in 1931 was destroyed by the March 1964 earthquake. Congress provided authorization and funding for construction at a different location in August 1964. The basin was completed in October 1964 and the breakwaters were completed in June 1965 with Office of Emergency Planning funds. Dredging of the basin expansion was completed in November 1965.

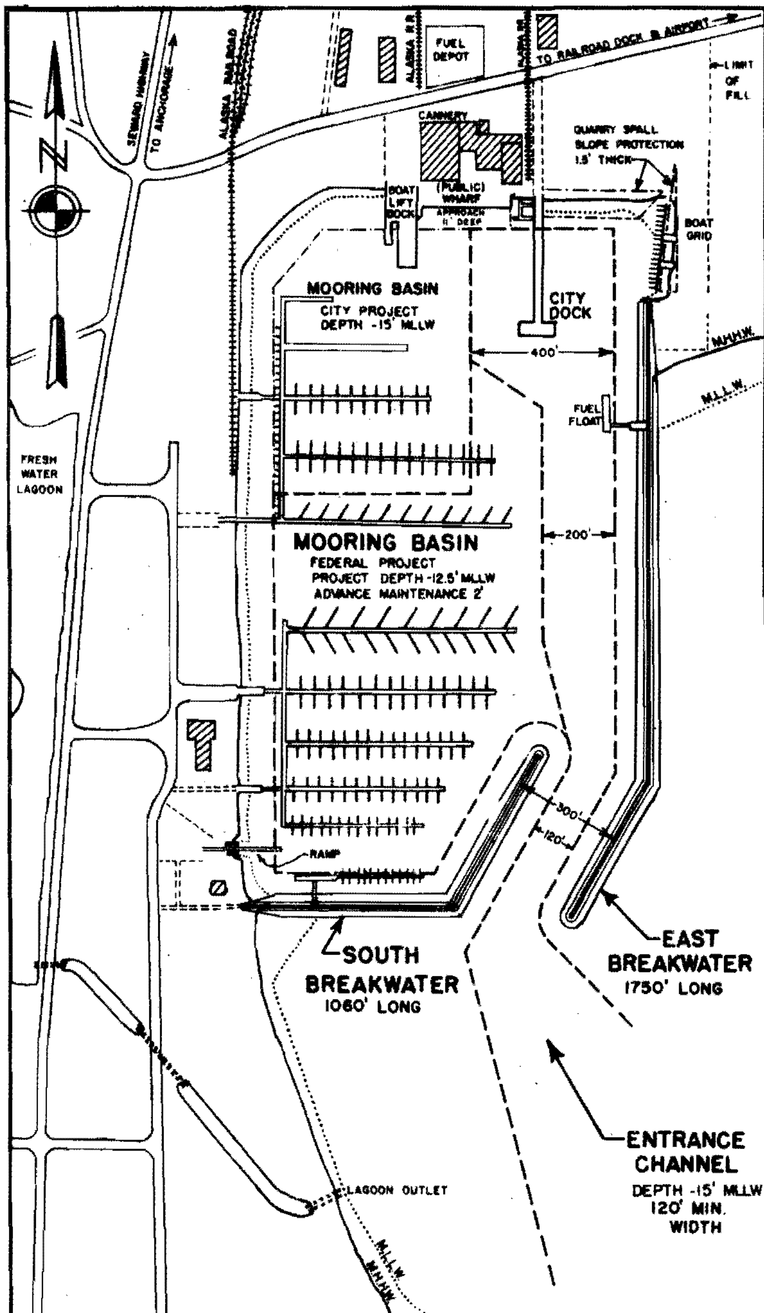
The new harbor consisted of a 4.75-acre replacement basin at -12.5 feet MLLW, a 12.45-acre expansion basin at -15 feet MLLW, an entrance channel at -15 feet MLLW, and two rubblemound breakwaters, 1,060 and 1,750 feet long.

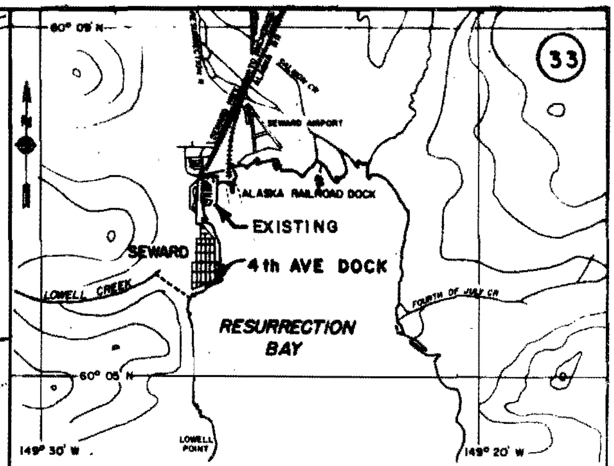
A condition survey made June 1972 resulted in beach slope repair and installation of quarry spall slope protection at the north end of the basin in October 1972. Maintenance dredging has not been required in the harbor since construction was completed by the Corps of Engineers in 1965. The last condition survey was taken in June 1981.

The small boat basin is used as an operating base for commercial fishing and pleasure craft and provides berthing and anchorage for 594 boats. In addition, a small medium-draft dock used for fisheries unloading is located in the northeast corner of the harbor.

WITHOUT ACTION PROFILE

The number and size of boats seeking to use the Seward harbor will increase in the future. The trends toward larger boats to exploit the harvest of bottomfish are well established. This can only result in increased damage due to overcrowding and insufficient maneuvering area in the harbor. In addition, steadily increasing numbers of recreational craft are being seen in the Seward area.

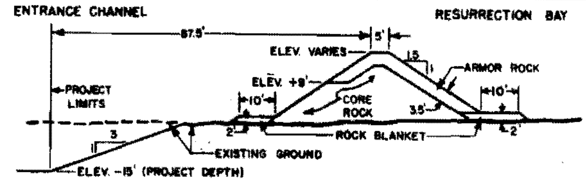




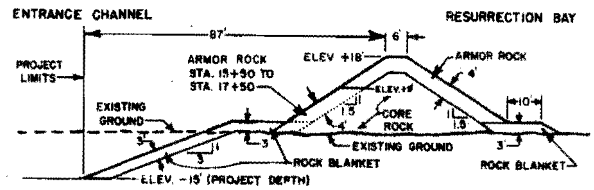
VICINITY MAP

SCALE IN MILES

SCALE IN KILOMETERS



NORTH END



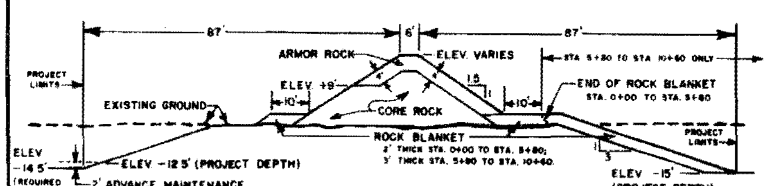
SOUTH END

TYPICAL SECTIONS EAST BREAKWATER

SCALE IN FEET

SCALE IN METERS

METRIC CONVERSIONS									
FEET	METERS	FEET	METERS	FEET	METERS	FEET	METERS	ACRES	HECTARES
1.5	0.46	11	3.35	96	29.26	1325	403.86	4.75	1.92
2	0.61	12.5	3.81	120	36.58	1550	472.44	12.45	5.04
3	0.91	14.5	4.42	200	60.96	1750	533.40	17.2	6.97
3.5	1.07	15	4.57	300	91.44				
4	1.22	16	4.88	400	121.92				
5	1.52	17	5.18	435	132.59				
6	1.83	18	5.49	580	176.78				
8.3	2.53	19	5.79	860	262.13				
9	2.74	87	26.52	950	289.56			SQUARE FEET	HECTARES
10	3.05	87.5	26.67	1060	323.09			207,000	1.92
10.5	3.20	90	27.43	1195	364.24				



TYPICAL SECTION — SOUTH BREAKWATER

SCALE IN FEET

SCALE IN METERS

NOTES

1. SOUNDINGS & ELEVATIONS ARE BASED ON M.L.L.W. 0.0'.
2. THIS LOCALITY IS SHOWN ON C & G S CHARTS 8502, 8552, & 8529.

FIGURE 2

EXISTING SEWARD HARBOR ALASKA

SCALE IN FEET

SCALE IN METERS

PROBLEMS, NEEDS, AND OPPORTUNITIES

Problems

Because of the limited number of deep-draft docks (two) and adverse weather, the 20 or more weekly landings cause the existing deep-draft facilities to be overtaxed. Thus, constant reshuffling is required, resulting in extra costs for wharfage and standby time. This is directly attributable to the lack of adequate dock space. A previously submitted Section 107 Reconnaissance Report, dated 20 December 1976, determined that deep-draft navigation improvements at Seward do not justify Federal participation.

Medium-draft and shallow-draft commercial boats have similar dockage problems due to insufficient dock space. Fish processing plants, fuel, and servicing are concentrated at the inner dock face of the small boat harbor. During rush periods, boats must stack up two to four abreast to service or to await their turn to unload. This is particularly notable with shrimp, crab, and halibut boats which may require 10 hours to offload. Standby time is costly, and detrimental to catch quality.

Small fishing boats and recreational craft share common problems. Such craft are normally stored elsewhere during the winter, then trailer-mounted to be hauled to Seward for seasonal, weekend, or daily use. This results in overcrowded launching ramps, (only one is available) and lost time while waiting for the boats to be launched. Cost and inconvenience are attributed to lack of mooring space and inner harbor facilities. Approximately 400 boats await assigned moorage.

In addition to assigned and wait-listed boats, more than 1,000 transient craft of varying types visit the area each year for commercial fishing or recreation. These boats require short term mooring space for service, supply, fueling, marketing, and repair.

Harbor Needs

The total estimated existing and future demand for moorage space at Seward is shown on Table 1. For a more detailed breakdown of Seward's moorage demands see Appendix B, Economics.

TABLE 1

EXISTING AND FUTURE DEMAND

	Recreational Boats	Commercial Boats
Existing Full-Time Boats	505	89
Existing Transient Boats	156	94
Existing Wait Listed Boats	182	32
Existing Trailered Boats	61	0
Future Commercial Fishing Boats	0	15
Future Charter Boats1/	0	30
Future Recreational Boats	503	0
Total	1,407	260

1/ Over the next 10 years, charter boats are anticipated to increase by 30 boats.

Opportunities

Opportunity for water related development would be encouraged by local interests working in cooperation with State and area agencies to build and maintain the basic slips and floats needed to accommodate the future fleet. They would also provide the standard services, which include water, electrical, and fire protection equipment, and be responsible for managing other on-shore services that will be needed to fuel, maintain, and supply boats using the harbor. Some of these latter services may include seafood processing, cold storage, boat maintenance operation, and other water related facilities.

PLANNING CONSTRAINTS

A Section 107 Reconnaissance Report, submitted 20 December 1976, determined that deep-draft navigation improvements at Seward could be accomplished by local interests and did not require breakwaters or entrance channels because Resurrection Bay provided adequate protection. Shore facilities such as docks and moorage are a local responsibility. Therefore, this study will consider only shallow and medium-draft improvements associated with a new harbor or expansion of the existing small boat basin to meet the needs for additional harbor space.

All studies have been conducted in the depth and detail necessary to allow selection of a plan based on its feasibility under the Principles and Standards of the Water Resources Council.

PLANNING OBJECTIVES

An analysis of public concerns and management problems led to the formation of the following general planning objective categories: economic, engineering, and environmental. Engineering planning objectives include an adequate size harbor to accommodate future needs, development for shorebased facilities, adequate depths for safe navigation clearance and adequate protection from damaging storm waves. The economic planning objectives include reducing damages to the existing fleet, improving cargo handling and maintenance facilities, and encouraging the harvest of commercially viable fish species. Environmental planning objectives include minimizing adverse effects on migrating adult salmon, maintaining an acceptable level of water quality, minimizing intertidal and subtidal impacts, avoiding disturbance of wildlife and marine habitat and maintaining the esthetic quality of the area.

Resource Management Problems (Water and Related Land Resources)

The public concerns, as identified through correspondence and at Corps-sponsored public meetings, were classified into various classes of resource management problems.

Navigation: Most of the public concerns fell into this category.

1. The need for more harbor space was addressed in this study.

2. Provision of marine maintenance facilities, docks, landings, piers, berthing areas, mooring facilities, launching ramps, access roads, storage areas, and parking areas are all a local responsibility. They would have to be constructed and maintained at nonfederal expense.

Recreation: The economic impacts of recreational boats and the implications of their presence were a factor in the study.

Water Supply and Quality Management: Factors associated with water supply were considered, but the impacts of any alternative on water quality were evaluated.

Fish and Wildlife: Fish and wildlife studies were conducted throughout the study.

Land Management Considerations:

Local interests would be responsible for providing all lands, easements, rights-of-way, and dredged material disposal areas as stated in the local cooperation agreement. Recently, the city of Seward has proposed that the city owned waterfront area east of Seventh Avenue be kept as a greenbelt recreation area. Investigations revealed that there are no threatened or endangered species in the study area. However, there is one possible archeological site located in the vicinity of Lowell Point which is discussed in a letter from the State Historic Preservation Office (Appendix E).

Local Implementation Items:

1. Launching ramps, inner harbor mooring, vehicle parking, and marine grid are inner harbor or shore-based facilities and are a local responsibility.

2. Provision of additional dock space for commercial fishing boats is a local responsibility.

PLAN FORMULATION

FORMULATION AND EVALUATION CRITERIA

To permit a fair and objective appraisal of the merits and disadvantages of the various alternatives, a standard set of criteria has been adopted. Such criteria have been defined as: technical, economic, social, and environmental.

Technical criteria: The selected plan should be adequately sized to accommodate present and future user needs, and provide for the development of shore-based facilities. Adequate depths and entry are required for safe navigation clearance. The plan must also be "implementable," that is, capable in all ways of being carried through to construction.

Economic criteria: All plans must be formulated such that satisfied needs can be expressed in quantitative terms. Benefits attributed to a plan must be expressed in terms of time, value of money, and must exceed equivalent economic costs for the project. To be economically feasible, each separable portion or purpose of a plan must provide benefits at least equal to the cost of that unit. The scope of development must be such that benefits exceed project costs to the maximum extent possible (maximum net benefits). Further, a more economical means of accomplishing project purposes must not be precluded if available and comparable on an equivalent evaluation basis. For this study, the economic evaluation of alternative plans is on the common basis of current prices, equal project life (50 years), and an interest rate of 7-5/8 percent. The most economical plan provides a baseline for considering numerous other factors (sociological) not definable in monetary terms, but which warrant consideration.

Environmental criteria: Environmental criteria include the identification of forms of aquatic life and wildlife which might be endangered by a plan's implementation, minimization of disruption of an area's natural resources, avoidance of plans with severe social impacts, and use of measures in the selected plan to protect or enhance existing environmental values.

Social criteria: Each plan must be consistent with State, regional, and local land use and harbor development plans; must minimize adverse social impacts; and must serve to preserve the local culture and way of life. Construction activities related to the selected plan must be acceptable, and the plan must be fully coordinated with all Federal and State agencies, interest groups, and individuals concerned.

RATIONALE FOR NATIONAL AND REGIONAL OBJECTIVES

In general, Principles and Standards (P&S), National Environmental Policy Act (NEPA), and other authorities establish and define the national objectives for water resource planning. Current policy requires that federally assisted water planning be directed to achieve National Economic Development (NED) and Environmental Quality (EQ) as national objectives. NED is to be achieved by increasing the value of the nation's output of goods and services and improving national economic efficiency; EQ is to be achieved by the management, conservation, preservation, creation, restoration, or improvement of the quality of certain natural and cultural resources and ecological systems.

In addition to the NED and EQ objectives, current policy also requires that the impacts of a proposed action be measured against Regional Economic Development (RED), and Other Social Effects (OSE). The RED account includes a proposal's effects pm a region's income, employment, population, economic base, environment, and social development. Contributions to the OSE account are determined by establishing a proposal's effects on real income, security of life, health and safety, education, cultural and recreational opportunities, emergency preparedness, and other factors.

The National Environmental Policy Act of 1969, as amended, and the River and Harbor and Flood Control Act of 1970 further mandate that social and environmental objectives be considered in the planning and evaluation process. Section 122 of the 1970 Act specified those impacts that, as a minimun, must be assessed for any proposed action. Section 102(2) (c), of NEPA requires that the invironmental impacts of any proposed action be fully assessed and that the four functional planning tasks of problem identification, formulation of alternatives, impact assessment, and evaluation, be performed throughout a study.

A recommended plan, when considered individually on the basis of "with" versus "without" the project, must be justified on the basis that combined beneficial NED and EQ effects outweigh combined adverse NED and EQ effects. Therefore, a plan lacking net NED benefits may be recommended when EQ benefits are sufficiently large, even though the latter are not stated in dollar values.

FORMULATION OF PRELIMINARY PLANS

Townsite Location

This site lies in the shore area from Jefferson Street North to C Street, and extends to -30 feet MLLW maximum depth (see Figure 3). Little dredging would be required because the water is deep enough for the entry and maneuvering areas. This site would be convenient to the community, adjacent parking and access area, and near the existing boat harbor. This area is classified as being highly unstable due to submarine landslides (see Figure 4) during the 1964 earthquake. Wave attack in this area is also more severe than in other possible sites. This plan was dropped from further consideration due to the extreme cost of a breakwater.

Alaska Railroad East

This alternative would be located in the mudflats area at the head of the bay, immediately eastward of the Alaska Railroad dock. All dredging would be confined to a rectangular area 1,500 feet east by 900 feet west. The shoreward (northerly) side extends to +5 feet MLLW and the southward boundary extends to -18-foot MLLW. Because the site would be in the mudflats, wave activity is limited. However, to protect the entrance channel from storm waves at high tide, a conventional breakwater section would be employed on two sides (see Figure 3).

Development of a harbor in the mudflats area would be risky because of the high initial cost due to dredging, and the uncertainties of annual maintenance. At this site, access would be a problem requiring a long, filled ramp and parking. Dredged material might be available for this parking purpose. While dredging the waters around the Alaska Railroad dock, hardpan was encountered. This site also would be subject to freshwater icing from nearby Resurrection River, and it conflicts with present developments for private dockage by the Kenai Lumber Company. Therefore, this site was dropped from further consideration.

Existing Harbor Expansion East

This alternative is within the area confined by the present harbor on the west and the Alaska Railroad dredging on the east, extending north-south to take advantage of the existing entrance channel. Construction of this alternative would consist of moving the existing north-south breakwater laterally 550 feet east, as indicated on Figure 3.

Although this area has favorable aspects for harbor expansion, it lies within an area already programmed for development by private industry. Permits and a long term property lease have been granted to Dresser Industries for a dredged basin and dock to serve offshore oil exploration and development. Legal cancellation of a private industrial enterprise such as this may not be in the public interest and the city is reluctant to become involved in such action at this time due to the high costs involved in acquiring the lease.

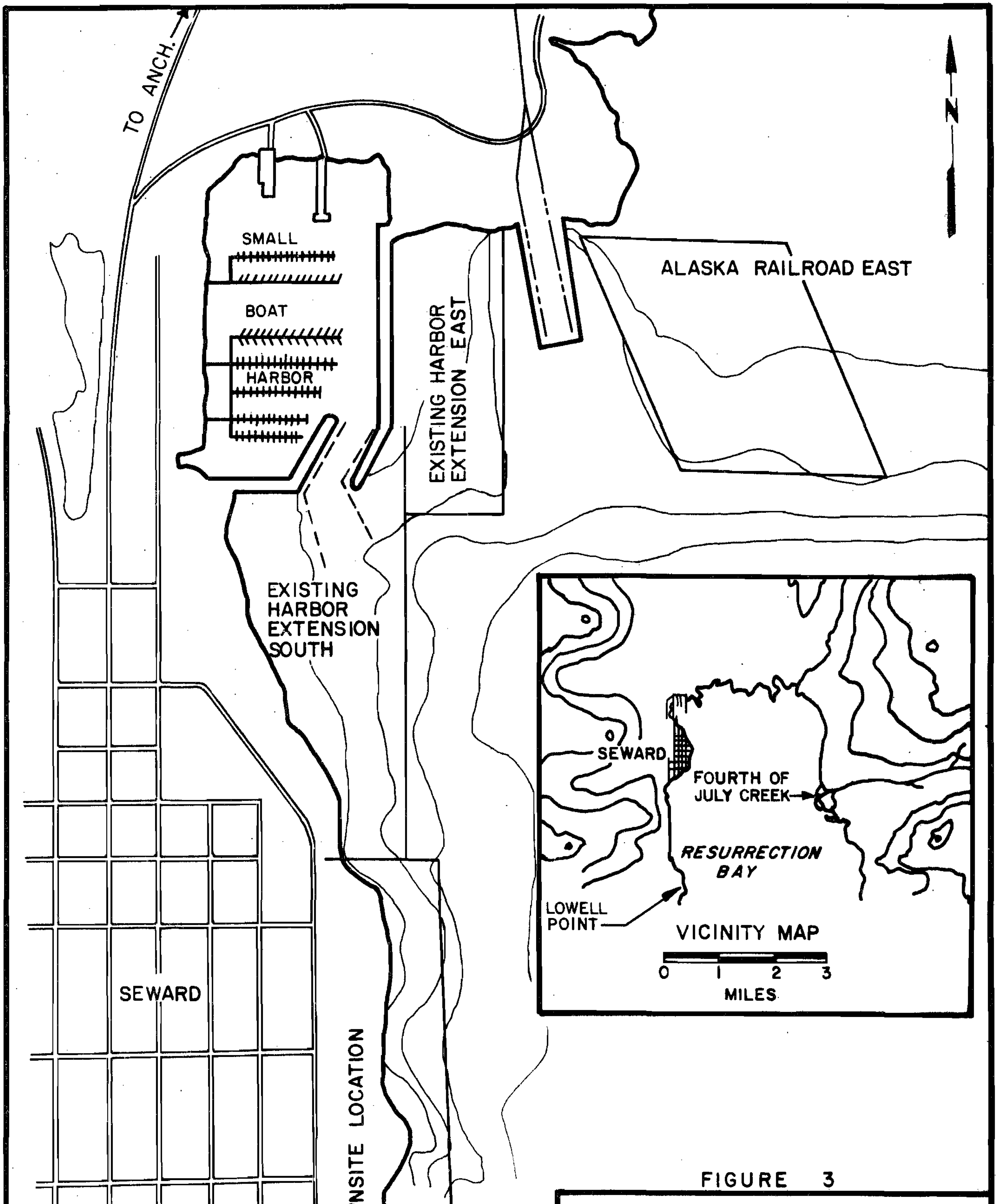


FIGURE 3

SEWARD, ALASKA
SEWARD HARBOR EXPANSION

HARBOR SITES
NOT SELECTED

U.S. ARMY ENGINEER DISTRICT, ALASKA

APRIL 1982

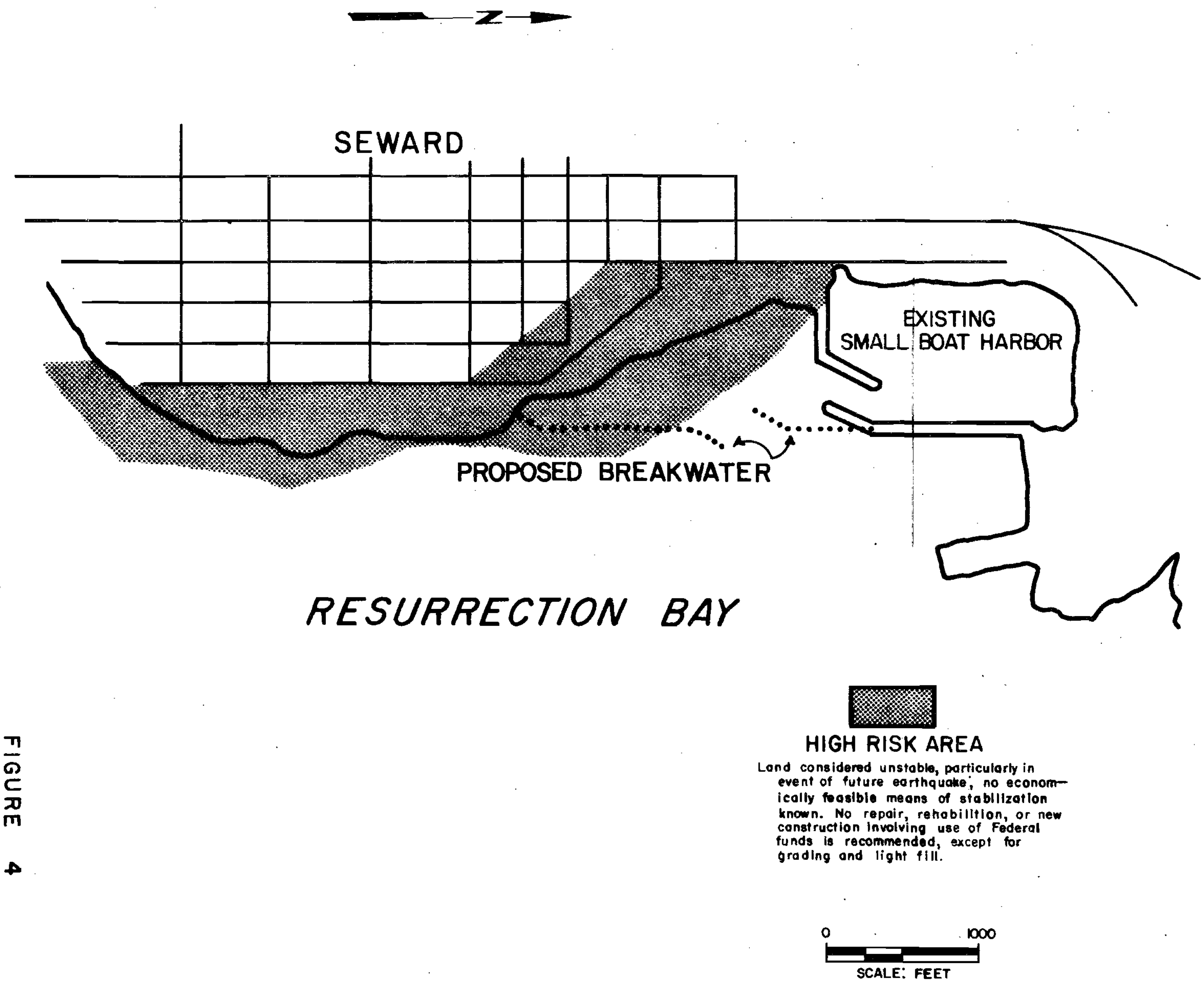


FIGURE 4

SEWARD, ALASKA
SEWARD HARBOR EXPANSION

HIGH RISK
SEISMIC FAULT AREA

U.S. ARMY ENGINEER DISTRICT, ALASKA
APRIL 1982

The Alaska Railroad has been contacted and is strongly opposed to this proposal as a navigational hazard to ships approaching their dock. It is also felt that the shore parking would be an inconsistent use of prime industrial shore land; consequently this site has been dropped from further study.

Existing Harbor Expansion South

This plan involves expanding the existing harbor 1,600 feet to the south, thus adding a 14-acre mooring basin. The harbor would be divided into areas varying in depth and would be protected by a rubblemound breakwater. This site is close to the community and would take advantage of the harbor support facilities already established.

Nash Road Site

This plan calls for construction of a new harbor at Nash Road, 2 miles northeast of Seward at the head of Resurrection Bay (Figure 3). A harbor at Nash Road would consist of a 1,400-foot-long south breakwater, a 2,800-foot-long west breakwater, and a 1,700-foot-long north silt barrier protecting a 30-acre mooring basin. A 200-foot-wide entrance channel at -18 MLLW would provide access to the harbor area. Harbor support facilities would have to be developed.

Fourth of July Creek

During the initial stages of this study, Fourth of July Creek was considered as a possible site for a small boat harbor (Figure 3). Since that time, the city of Seward has received funds from the State of Alaska to develop a marine industrial park, which will include ship repair and vessel fabrication facilities. This facility will be for larger vessels (up to 250 feet) that could not use the proposed harbor. Therefore, this alternative has been dropped from further consideration.

Lowell Point

This site is within shallow areas at the mouth of a stream and would require dredging into the alluvial fan extending into the bay (Figure 3). An artificially dredged mooring basin 1,800 feet long, 700 feet wide, served by a 200-foot-wide, -18 feet MLLW entrance and maneuvering channel, and protected by 2,000 feet of rockfill breakwater, could provide an interim answer to local needs. Property acquisition, parking, utilities, and an access road are requisites for site development.

Although this site has engineering potential, it is 2.5 miles from the townsite, has no utilities, and is accessible only over a narrow cliff roadway. Property at Lowell Point is predominantly privately owned and not available for public development except at high cost, and it is outside the corporate limits of the city of Seward. Land acquisition difficulties and the fact that this site is outside of the local sponsor's jurisdiction, precluded the Lowell Point site from further study.

COMPARISON OF ALTERNATIVES

An initial screening of the alternatives was accomplished to eliminate those alternatives which did not warrant further study. This screening was accomplished by applying four sets of criteria: engineering, environmental, economic, and public acceptance. The result of applying these criteria is the selection of those plans which should be examined in detail.

ALTERNATIVES WORTHY OF FURTHER CONSIDERATION

The preceding discussions of the alternatives indicate that the options that best meet the planning objectives are expanding the existing harbor south or construction of a new harbor at Nash Road.

ASSESSMENT AND EVALUATION OF DETAILED PLANS

GENERAL

The only alternatives remaining after the initial screening were south expansion at the current harbor and construction of a new harbor at the Nash Road site. An examination of these alternatives led to the development of two detailed plans which were carefully studied. The first, designated as Plan A, would involve expanding the existing harbor south utilizing a rubblemound breakwater. The second, Plan B, would involve construction of a new harbor on the opposite side of Resurrection Bay at the Nash Road terminus.

Harbor Sizing

A harbor size of 36 acres, 30-acre mooring basin and 6-acre entrance channel, would accommodate the maximum expansion of the commercial and recreational fleets expected during the foreseeable future.

The present harbor accommodates 594 boats in slips, averaging 35 boats per acre. In sizing the Seward harbor, a figure of 36 boats per acre was used because a high percentage of smaller recreational craft moored in the harbor.

PLAN A (South Expansion)

Plan Description

By extending the current project limits 1,600 feet to the south, an additional 14 acres of mooring area would be provided, resulting in a total mooring basin of 30 acres. Maximum expansion of the existing harbor would be accomplished even though the resulting harbor size would not be able to meet the future boat user demands. The harbor would be characterized by an expanded triangular harbor of 1,600 feet by 900 feet. The harbor would be divided into three areas of varying depths (-12 to -15 feet MLLW within the mooring basin and -18 feet MLLW in the entrance channel), to accommodate the various classes of craft in the design fleet. The harbor would be protected by a rubblemound breakwater. Armor required by the breakwater would come from an existing quarry site located at Fourth of July Creek. Core material consisting of spalls and gravel would also come from this location. In addition, the 1,060-foot-long south breakwater and 400 feet of the east breakwater would be removed and utilized as core and secondary armor to construct 1,250 feet of the new south breakwater. The south breakwater would have a nonnavigable channel at the shore end. This would allow for better circulation and allow the salmon fry to escape. Some 222,100 cubic yards of dredged materials would be used to construct the Ballaine Boulevard greenbelt with camping and picnicking areas on the uplands east of Seventh Avenue (see Figure 5). The area developed by this scheme is covered in a separate report listed on page 4.

Plan A is illustrated in Figure 6, and important dimensions of the plan are presented in Table 2.

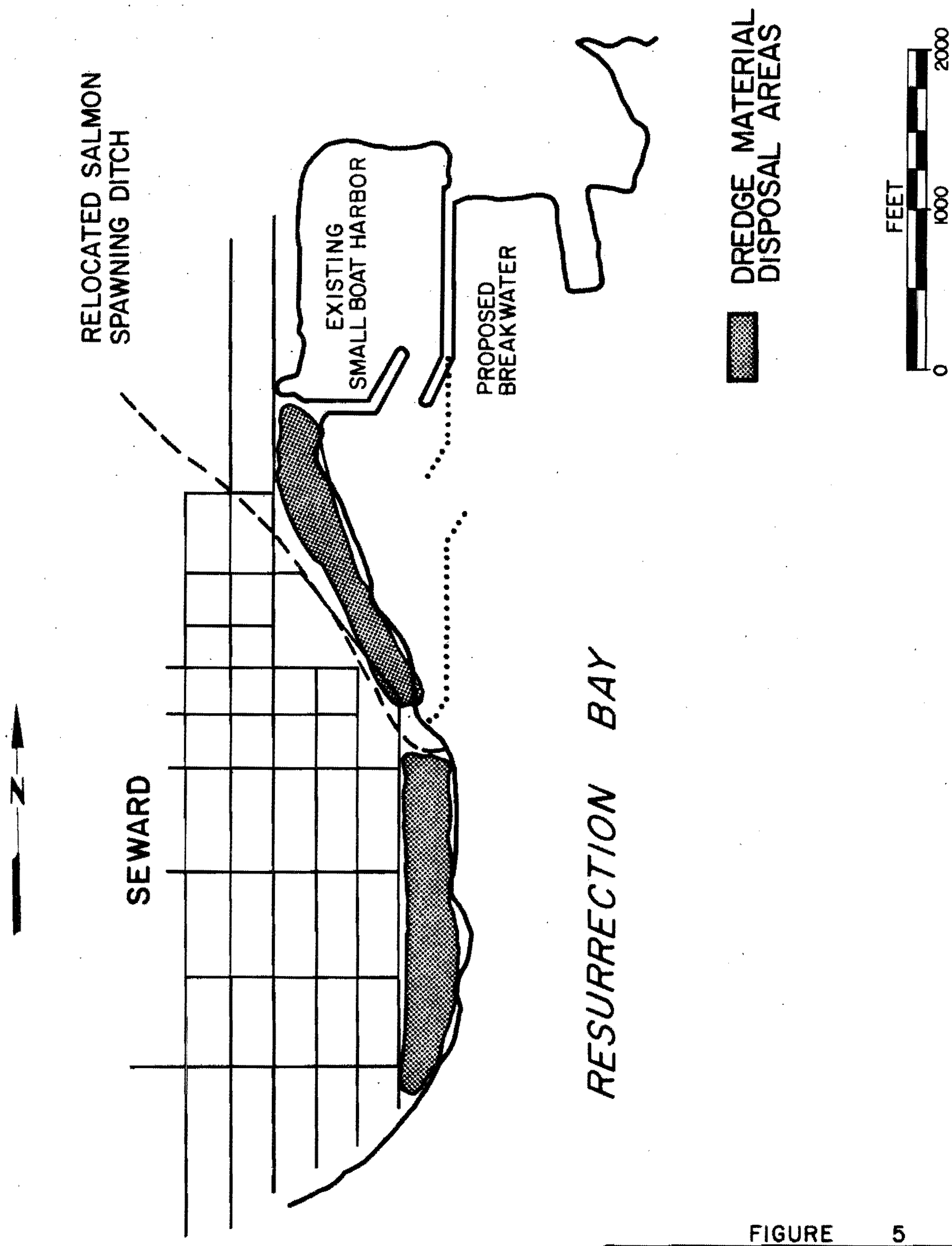


FIGURE 5

SEWARD, ALASKA
SEWARD HARBOR EXPANSION

DREDGED MATERIAL
AND MAINTENANCE
DISPOSAL SITE

U.S. ARMY ENGINEER DISTRICT, ALASKA

APRIL 1982

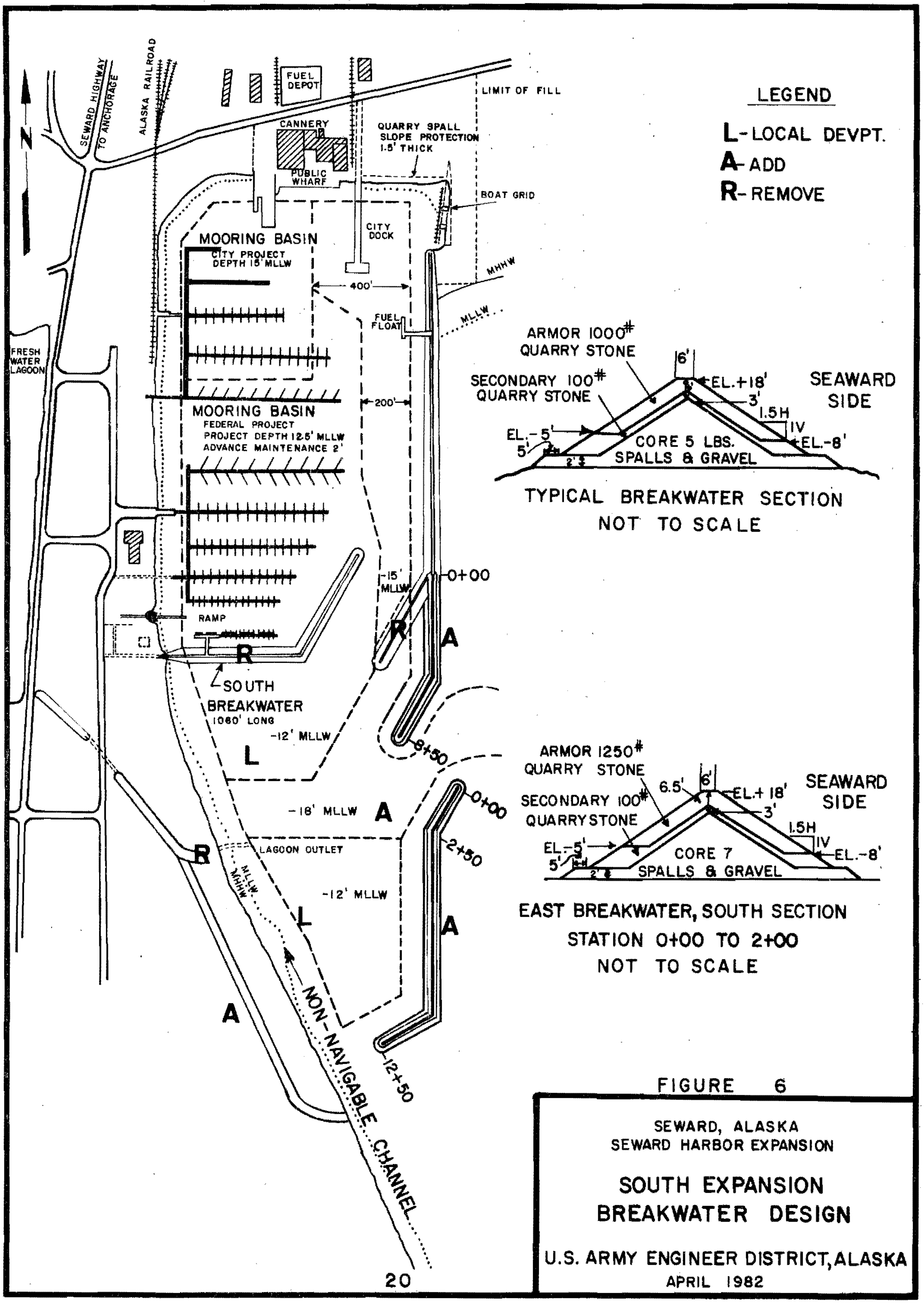


FIGURE 6

SEWARD, ALASKA
SEWARD HARBOR EXPANSION

SOUTH EXPANSION BREAKWATER DESIGN

U.S. ARMY ENGINEER DISTRICT, ALASKA
APRIL 1982

TABLE 2

SEWARD SMALL BOAT HARBOR
SOUTH EXPANSION SITE

Boats Accommodated (equivalents)

Commercial		
Existing (in present harbor)	89	
Future	23	
Subtotal		112
Recreational		
Existing (in present harbor)	505	
Future	456	
Subtotal		961
Total (both harbors)		1,073

Mooring Basin Area in Present Harbor	16.0 ac
New Mooring Basin Area at project depth	14.0 ac
Total available with expansion	30.0 ac

Areas Committed	Dredging: Entry Channel	Dredging: Mooring Basin	Area Under Breakwater	For Creation of Greenbelt (acres)	Total Areas Involved In Expansion (acres)
Uplands	0	0.5 ac	0	24.3	24.8
Intertidal	0	0.8 ac	0		0.8
Subtidal	6.7 ac @ -18' MLLW	12.7 ac @ -12' MLLW	1.7 ac North Portion East Breakwater 4.0 ac South Portion East Breakwater		25.1
Total	6.7	14.0	5.7	24.3	50.7

Construction

A hydraulic dredge would probably be used in the expansion of the harbor. Once on site, a 20-inch dredge could accomplish all required excavation within a 90-day period. Allowing time for staged construction, weather delays, mobilization and demobilization, equipment downtime, and resource agency recommendations, up to 12 months may be required for construction. With the breakwater construction first, dredging could continue without interference from storm-generated waves.

All new material would come from the existing quarry site at Fourth of July Creek. A suitable road exists for transporting the material to the proposed harbor site. Allowing time for final slope dressing and site cleanup leaves a quarry schedule fitting within the one season constraint of harbor construction.

Construction activities at both sites (harbor and quarry) would be timed to avoid unacceptable adverse impacts on seasonal phenomona such as salmon migration. Scheduling construction around these periods will still allow project completion within one season. Construction may also be curtailed during brief periods of exceptionally high usage of the harbor (for example, Fourth of July weekend). As construction approaches the implementation phase, exact times for these periods would be coordinated with resource agencies and local officials.

Maintenance

A condition survey of the existing harbor is currently carried out on a 4-year cycle. Although operators of some deep-draft fishing boats have expressed complaints of shoaling in the channel entrance, it is believed that this problem will be circumvented by increasing the channel project depth to allow additional clearance for the larger boats.

Impacts

Construction of the Plan A alternative will result in several environmental impacts of varying significance. Water quality will be degraded during construction and during maintenance activities. If this alternative were selected, the salmon spawning channel, which crosses the site, must be relocated to avoid adverse impacts on the salmon resources. The high risk earthquake area must also be considered as a potential impact. It is unknown whether approval for Federal participation in a project constructed in an earthquake hazard area could be obtained. A detailed discussion of environmental impacts that could result from construction of this alternative is found in Chapter V of the FEIS.

Implementation Responsibilities

Construction Responsibilities: Federal participation is possible in the construction and maintenance of all general navigation features of the project. These include breakwaters, entrance and maneuvering channels, and removal of those portions of the old breakwater surrounding the original Federal harbor. Local responsibilities include dredging berthing areas, removing breakwater portions surrounding the local extension to the original Federal project, and providing inner harbor facilities.

Maintenance Responsibilities: Once the project is constructed, the Federal Government would maintain breakwaters and entrance and maneuvering channels. The local sponsor would be responsible for maintaining the berthing areas to project depths.

Economic Analysis

National Economic Development (NED) benefits for a harbor expansion accrue in the categories indicated in Table 3. Fifty percent of recreational benefits are classified as local.

TABLE 3

ANNUAL NED BENEFITS - SOUTH EXPANSION SITE

Types of Benefits	Local	Federal	Total
Damage Reduction			
Recreational Boats	$ 20,000	$ 20,000	$ 40,000
Commercial Boats		68,000	68,000
Harbor Facilities		2,300	2,300
Labor Savings		13,000	13,000
Charter Boats		48,500	48,500
Recreational Boats	311,200	311,200	622,400
NED Employment	28,900	80,300	109,200
Increased Fish Catch		173,000	173,000
Harbor of Refuge		14,000	14,000
Total (Dollars)	$360,100	$730,300	$1,090,400
Total (Percent)	33.0	67.0	100.0

Public Views

Throughout the course of this study, public opinion has favored expansion of the existing harbor to the south. The consensus has been that development at the existing harbor site is the proper course of action.

As expressed on numerous occasions by citizens, businessmen, and city officials, development of Plan A is most desirable. However, at a public workshop in October 1978 another site at Nash Road, located 2 miles northeast of Seward on the opposite side of Resurrection Bay, was proposed for consideration.

Cost Estimate

Estimated costs for construction of the south expansion are shown in Table 4.

Corps of Engineers participation cannot exceed $2,000,000, including planning costs, because of the Federal cost limitation placed upon Section 107 projects. Therefore, the adjusted Federal cost is $2,000,000 and the nonfederal share is $15,468,100. Under current Administration policy, associated costs are the costs of those measures needed over and above project measures to achieve the benefits derived during the period of analysis. In other words, associated costs are those local costs for which project benefits have been claimed. These local associated costs are included in the benefit/cost ratio. Local self-liquidating costs are those costs for project features that would be constructed by local interests, but that would not contribute to project benefits.

Apportionment of Costs

Based on the distribution of benefits, general navigation features of this project are assigned as 67.0 percent Federal and 33.0 percent nonfederal. However, because of the Federal cost limitation imposed upon Section 107 projects, Corps of Engineers participation cannot exceed $2,000,000. Thus, a nonfederal sponsor must assume project costs exceeding $2,000,000. In addition, nonfederal responsibilities include lands, easements, and rights-of-way and all self-liquidating costs. The apportionment of costs is as follows:

Federal	
Corps of Engineers (67.0%) ($9,361,200) or ($2,000,000), whichever is less.	$2,000,000
Coast Guard (aids to navigation)	6,000
	$2,006,000
Nonfederal	
Cash Contribution (33.0%) ($9,361,200) or ($9,361,200-2,000,000), whichever is greater.	$7,361,200
Associated Local Costs	6,425,500
Local Self-Liquidating Costs	1,681,400
Total Cost	$17,474,100

TABLE 4

COST ESTIMATE, SOUTH EXPANSION

Item	Quantity	Unit ($)	Federal ($)	Associated Local Costs ($)	Local Self Liqui-dating Costs ($)	Total ($)
Mob. & Demob.	1 Lump Sum	Job	600,000			600,000
Dredging						
Entry Channel	71,700 cy	6	430,200			430,200
Mooring Basin	150,400 cy	4		601,600		601,600
Remove Existing Armor Rock	1,000 cy	10	11,000			11,000
Remove Existing Core Rock	28,600 cy	8	228,800			228,800
New Breakwater, Armor Reuse	9,600 cy	18	172,800			172,800
Quarried Material						
Armor Rock, A	38,400	36	1,382,400			1,382,400
Secondary Rock, B	43,700	32	1,398,400			1,398,400
Core	137,800	23	3,169,400			3,169,400
Misc. Removal & Relocation	1 Lump Sum	Job			704,600	704,600
Float System, Concrete	479 boats	4,291		2,055,400		2,055,400
Utilities and other Related Structures					616,600	616,600
Subtotal			7,393,000	2,657,000	1,321,200	11,371,200
Contingencies (20%)			1,478,600	531,400	264,200	2,274,200
Engineering & Design (6%)			443,600	159,400	79,300	682,300
Supervision & Admin. (5%)			369,600	132,900	66,000	568,500
Lands, Easements, Rights of Way				3,000,000		3,000,000
USCG Navaids (Relocation)	2	3,000	6,000			6,000
Planning Costs			79,000			
Total Project Cost			9,446,200	6,425,500	1,681,400	17,553,100

Annual Cost

The annual cost may be computed by assuming a 50-year project life at 7-5/8 percent interest. All costs and benefits are based on October 1981 prices.

Interest and Amortization

Major Navigation Features	$9,367,200 x .07823 =	$ 732,800
Associated Local Costs	$6,425,500 x .07823 =	502,700
Annual Maintenance (Federal)		50,500
Annual Maintenance (Local)		27,200
TOTAL AVERAGE ANNUAL COST		$1,313,200

Comparison of the cost and benefits on an annual basis yields no net benefits and a benefit/cost ratio of 0.8.

PLAN B (NASH ROAD SITE)

Plan Description

A new harbor site could be developed 2 miles northeast of Seward at the head of Resurrection Bay. The harbor configuration, as proposed in Figure 7, is based upon the result of a circulation study, Appendix G. Construction of a harbor at Nash Road would consist of a 1,400-foot-long south breakwater, a 2,800-foot-long west breakwater, and a 1,700-foot-long north silt-barrier breakwater. A 200-foot-wide entrance channel at -18 feet MLLW would provide access to a maneuvering channel and mooring area. The mooring basin would be divided into three areas of varying depths (-10, -12, and -16 feet MLLW) to accommodate the various classes of craft in the design fleet. Dredged material would be placed on nearby uplands (10,300 cubic yards), intertidal zone (509,550 cubic yards), and subtidal zone (509,550 cubic yards) as fill to provide access to and a staging area for the harbor. The breakwater inclosure serves several purposes: to protect the basin from waves, prevent freshwater flows, prevent silt deposit from the north, and to divert fish migrations around the harbor. Rock for the breakwaters is available from an existing quarry at Fourth of July Creek. Power is available in the immediate area and water and sewer service can be developed. New U.S. Coast Guard aids to navigation would be required.

Plan B is illustrated in Figure 7, and important dimensions of the plan are presented in Table 5. Breakwater sections are shown in Plate 1 and 2 (Appendix C).

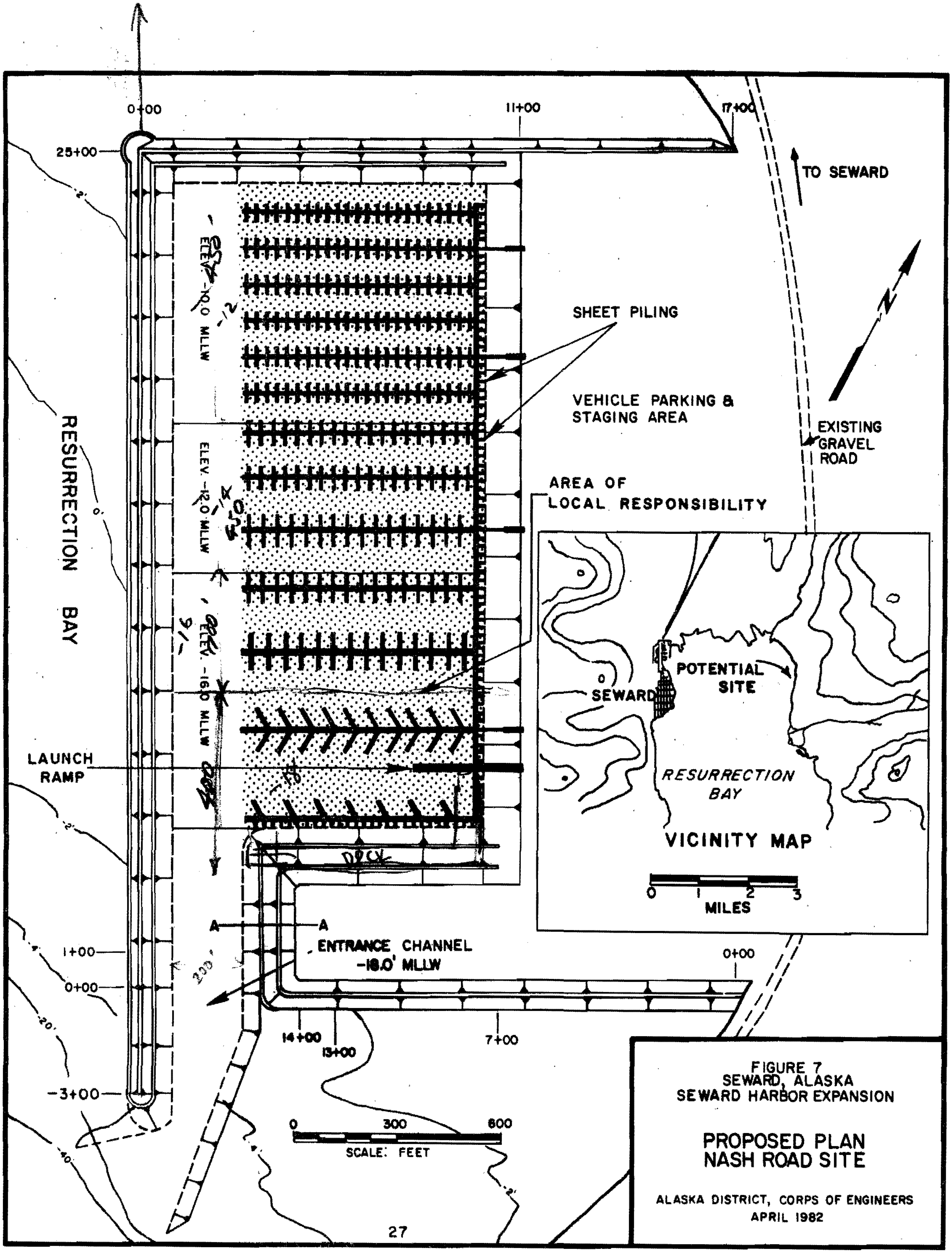


FIGURE 7
SEWARD, ALASKA
SEWARD HARBOR EXPANSION

PROPOSED PLAN
NASH ROAD SITE

ALASKA DISTRICT, CORPS OF ENGINEERS
APRIL 1982

TABLE 5

SEWARD SMALL BOAT HARBOR
NASH ROAD

Boats Accommodated (equivalents)

Commercial		
Existing (in the present harbor)	89	
Future	171	
Subtotal		260
Recreational		
Existing (in the present harbor)	505	
Future	902	
Subtotal		1,407
Total (both harbors)		1,667

Areas at project depth

-10 feet MLLW	12.6 acres
-12 feet	7.2 acres
-16 feet	10.2 acres
Total	30.0 acres

Areas Committed	Dredging: Entry Channel	Dredging: Mooring Basin	Area under Breakwater	Staging Area (acres)	Total Areas Involved In Project (acres)
Uplands	0	0	0	0.3	0.3
Intertidal	5.4 acres	16.7 acres	3 acres (Silt Barrier) 4 acres (West Breakwater)	24	53.1
Subtidal	9.1 ac @ -18MLLW	13.3 ac @ -12'MLLW	1.8 acres (South Breakwater) 4 acres (West Breakwater) 0.1 acres (Entry Channel)	24	52.3
Total	14.5	30.0	12.9	48.3	105.7

Construction

A 20-inch or large hydraulic dredge would be an optimum choice for excavation at the Nash Road site. This unit could accomplish all required excavation within a 1-year period, allowing time for contract award, mobilization and demobilization, and salmon spawning runs. Staged construction at this site would be required because the silt barrier is composed of armor rock placed over the core. The total project construction time may run less than 1 year since the existing quarry at Fourth of July Creek would be used. With the perimeter breakwater construction first, dredging could continue without interference from storm-generated waves.

Development time for the quarry at Fourth of July Creek would be minimal. Conventional blasting and screening operations would produce the rock quantities needed. Allowing time for final slope dressing and site cleanup leaves a quarry schedule fitting within the one season constraint for harbor construction.

Construction activities at both sites (harbor and quarry) would be timed to avoid unacceptable adverse impacts on seasonal phenomena such as salmon migration. Scheduling construction around these periods would still allow project completion within one season. Exact times for these activities would be coordinated with resource agencies and local officials immediately prior to construction.

Maintenance

Since this site is located closer to the mouth of the Resurrection River, silting and shoaling may be more prevalent than at the existing harbor. Consequently, maintenance dredging would be required at approximately 10-year intervals. Silting would be abated somewhat by the general configuration of the entrance channel. Maintenance dredged material (50,000 cubic yards) would be placed in the area designated on Figure 5. A condition survey would be done every three years.

Impacts

The construction of Plan B may result in minor disturbance of migrating salmon enroute to Salmon Creek upstream of the mouth of Resurrection River. Personnel from the U.S. Fish and Wildlife Service have indicated that no freshwater channels entering the bay from the Resurrection River are located within 1,500 feet of the harbor entrance channel.

The U.S. Fish and Wildlife Service found benthic organisms at this site to have limited productivity. Consequently, little permanent impact is expected when the area is covered by dredged material during the construction of the staging area. A complete discussion of impacts can be found in the EIS.

Implementation Responsibilities

Construction Responsibilities: Federal participation is possible in the construction and maintenance of all general navigation features of the project, which include breakwaters entrance and maneuvering channels. Local responsibilities include providing the lands, easements and rights-of-way, dredging of berthing areas and providing inner harbor facilities.

Maintenance Responsibilities: Once the project is constructed, the Federal Government would maintain breakwaters and entrance and maneuvering channels. The local sponsor would be responsible for maintaining the berthing areas.

Land Enhancement: Besides a staging area, the newly created land at Nash Road would be utilized for various marine related facilities. The estimated annual equivalent value of this enhancement is classified as a project benefit and is allocated as shown below.

Economic Analysis

National Economic Development (NED) benefits for a harbor expansion accrue in the categories as indicated in Table 6. Fifty percent of recreational benefits are classified as local.

TABLE 6

ANNUAL NED BENEFITS - NASH ROAD SITE

Types of Benefits	Local	Federal	Total
Damage Reduction			
Recreational Boats	$ 43,150	$ 43,150	$ 86,300
Commercial Boats		145,000	145,000
Harbor Facilities		5,000	5,000
Labor Savings		27,000	27,000
Charter Boats		98,300	98,300
Recreational Boats	696,900	696,900	1,393,800
NED Employment	79,800	65,300	145,100
Increased Fish Catch		110,100	110,100
Land Enhancement	41,100	0	41,100
Harbor of Refuge		30,000	30,000
Total (Dollars)	$860,950	$1,220,750	$2,081,700
Total (Percent)	41.3	58.7	100.0

Cost Estimate

Estimated costs for construction of the Nash Road site are shown in Table 7.

Corps of Engineers participation cannot exceed $2,000,000 including planning costs because of the Federal cost limitation placed upon Section 107 projects. Therefore, the Federal cost equals $2,000,000 and the nonfederal share of $16,410,900. Under current Administration policy, associated costs are the costs of those measures needed over and above project measures to achieve the benefits derived during the period of analysis. In other words, associated costs are those local costs for which project benefits have been claimed. These associated costs are included in the benefit/cost ratio.

Apportionment of Costs

Based on the distribution of benefits, general navigation features of the project are assigned as 58.7 percent Federal and 41.3 percent nonfederal. However, because of the Federal cost limitation imposed upon Section 107 projects, Federal participation cannot exceed $2,000,000. Thus, a nonfederal sponsor must asume project costs exceeding $2,000,000. In addition, nonfederal responsibilities include lands, easements, and rights-of way-and all self-liquidating costs. Apportionment of costs is as follows:

Federal	
Corps of Engineers (58.7%) ($7,526,800) or (2,000,000), whichever is less.	$2,000,000
Coast Guard (aids to navigation)	6,000
	$2,006,000
Nonfederal	
Cash Contribution (41.3%) ($7,526,800) or ($7,526,800-2,000,000), whichever is greater.	$5,526,800
Associated Local Costs	9,051,000
Local Self-Liquidating Costs	1,912,100
Total Cost	$18,495,900

Annual Cost

The annual cost may be computed by assuming a 50-year project life at 7-5/8 percent interest. All costs and benefits are based on October 1981 prices.

Interest and Amortization		
Major Navigation Feature	7,453,800 x .07823 =	$583,100
Associated Local Costs	9,051,000 x .07823 =	708,100
Annual Maintenance (Federal)		38,800
Annual Maintenance (Local)		57,700
TOTAL AVERAGE ANNUAL COST		$1,387,700

Comparison of the cost and benefits, on an annual basis yields a benefit/cost ratio of 1.5 within net benefits of $694,000.

TABLE 7

COST ESTIMATE, NASH ROAD SITE

Item	Quantity	Unit ($)	Federal ($)	Associated Local Costs ($)	Local Self Liquidating Costs ($)	Total ($)
Mob. & Demob.	1 Lump Sum	Job	600,000			600,000
Dredging						
Entry Channel	360,300 cy	2.50	900,800			900,800
Mooring Basin	669,100 cy	2.50		1,672,800		1,672,800
Quarried Material						
Armor Rock, A	23,000 cy	28	644,000			644,000
Secondary Rock, B	41,200 cy	24	988,800			988,800
Core	134,400 cy	16	2,150,400			2,150,400
Gravel	6,000 cy	10	60,000			60,000
Filter Fabric	217,200 sf	.60	130,300			130,300
Fill (Staging Area)	1,115,000	1.0	360,300	669,100	85,600	1,115,000
Floating System (concrete)	1,073 boats	4,291		4,604,200		4,604,200
Utilities and other Related Structures					1,408,200	1,408,300
Subtotal			5,834,600	6,946,100	1,493,800	14,274,500
Contingencies			1,166,900	1,389,200	298,800	2,854,900
Engineering & Design			154,600	208,400	44,800	407,800
Supervision & Administration			291,700	347,300	74,700	713,700
Lands, Easements, Rights of Way				160,000		
U.S. Coast Guard (aids to navigation)			6,000			
Planning Costs			79,000			
Total Project Cost			7,532,800	9,051,000	1,912,100	18,495,900

Public Views

The Nash Road site became a prime alternative as a result of a public workshop held 25 October 1978 in Seward. The concerns expressed by the workshop participants have been clearly met by consideration of Plan B in that the alternative best meets the city's master plan for regional development of the Nash Road area. Even though this site would be developed as a 30-acre harbor, provisions could be included for future expansion.

U.S. Fish and Wildlife Service: The following are the Corps of Engineers' responses to the recommendations given in the 19 July 1979 Coordination Act Report from the U.S. Fish and Wildlife Service (USFWS).

1. Recommendation: "...Model studies be utilized to project flushing rates in the selected harbor and that the harbor be constructed only when conformation to Alaska water quality standards can be assured..."

Response: A model circulation study was completed for the proposed Nash Road site. The final harbor configuration is based on the results of that study.

2. Recommendation: "...The southward expansion be chosen as the selected plan because it will have fewer impacts on fish and wildlife resources than the Nash Road alternative..."

Response: We agree, this alternative has the least impact on fish and wildlife resources. However, this plan is not recommended as the selected plan because of its proximity to a high risk earthquake zone (reference Task Force 9 Recommendation).

3. Recommendation: "...All dredged spoil be disposed on uplands in such a manner as to avoid impact to wetlands, and only clean return flows from the dredged disposal site be allowed to enter the streams and waters of Resurrection Bay..."

Response: All dredged material disposal for Plan A would be upland and would include the construction of a containment bulkhead that would limit leachate runoff. For Plan B, dredged material disposal will be used to develop the staging areas on tideland sites. Suitable upland sites are not available and the impacts associated with upland disposal are far greater than those associated with tideland disposal at the Nash Road site.

4. Recommendation: "...A semipervious bulkhead be constructed to contain spoil material and prevent excessive leaching if the southward alternative is selected..."

Response: (See response Number 3.)

5. Recommendation: "...If the southward expansion alternative is selected, the Seward Lagoon outlet be located adjacent to a nonnavigable entrance at the south shoreline of the expanded harbor. This outlet shall have an invert elevation of -1.4 feet at the harbor then rise to +7.0 feet approximately 80 feet downstream of Fourth Avenue..."

Response: If this plan were selected, the outlet to the Seward Lagoon would be relocated in a manner that would best meet the needs of protecting the resource.

6. Recommendation: "...Spill prevention control and counter measure plans in compliance with Coast Guard requirements be described in future planning documents for the harbor..."

Response: Each fuel station operator is required by the Coast Guard to have a spill prevention control and counter measure plan before they can operate. These plans will not be developed by the operator until completion of the small boat harbor and therefore cannot be described in the Corps detailed project report.

7. Recommendation: "...All construction activities be conducted between November 1 and April 1 to avoid disturbance of migrating and spawning herring and/or salmon..."

Response: The above recommendation was a result of a recommendation made by the Alaska Department of Fish and Game (ADF&G) in their 16 January 1979 review letter of the Draft Coordination Act Report. State and Federal resource agencies were contacted to provide a more suitable time frame for the project construction. ADF&G has reevaluated their position and now, with the concurance of USFWS, recommends (in a 11 October 1979 letter) the following: "...holding in water work to the periods of 15 June to 10 August and 1 November to 15 April..." With careful construction scheduling, either site could be constructed within this time frame. Please refer to Appendix E, Item 2 for a copy of the 16 January 1979 and 4 October 1979 coordination letters from ADF&G.

COMPARISON OF DETAILED PLANS

Comparison of Detailed Plans

A comparison of both plans reveals that Plan A will result in a 30 acre mooring basin and Plan B will result in a 46 acre mooring basin (existing plus new). Plan A may be described as having the greatest public acceptance because it is located adjacent to the existing harbor and remains close to existing community activities and services.

At the Plan A site, dredging to project depths would be less and breakwater design would require larger rock than with Plan B. This is due to the rapidly increasing slope gradient and the sizable design wave for the site. Plan B, because of its location, is subject to less wave activity than the Plan A site. Consequently, overall breakwater quantities are less because the water is shallower. While Plan B offers a flatter contour, and hence, less breakwater cross-section, initial dredging would be considerable.

From the standpoint of potential future expansion, Plan B offers the best alternative because this site could be expanded to cover all of Seward's future needs. Plan A does not have reasonable capability for future expansion.

From an environmental standpoint, Plan A is slightly better than Plan B because Plan A would be expanding an existing harbor with established support facilities and associated development. Plan A is located in an area already developed and does not involve disposal of dredged material on an intertidal area but does involve relocating a culvert and ditch to avoid an important salmon spawning area. However, Plan A is located in a high-risk earthquake zone and it is unknown whether this area has stabilized since the 1964 earthquake. Also, no economical means of stabilizing the area is currently available. Plan B is located in an undeveloped area and does involve disposal of dredged material in an intertidal area but is located away from important salmon spawning areas.

Plan B also might be described as being more oriented toward regional development in that it conforms to the city's master plan for development at Nash Road. A proposed harbor plan in consonance with the city's master plan must provide for adequate future expansion. Plan B more efficiently meets this criterion than Plan A.

Rationale for Designation of the NED Plan

The National Economic Development (NED) plan addresses the planning objectives that maximize net economic benefits. An economic optimization was done before the development of the separate plans and it was determined that a 30-acre harbor was the size of expansion which most efficiently utilized Federal involvement. The economic optimization procedure includes comparing amortized costs and benefits for various harbor sizes from 10 to 50 acres. Of the two plans, plan B has the lesser Federal cost with the greatest net benefits. Consequently, Plan B is designated as the NED Plan.

Rationale for Designation of the LED Plan

For each project, one alternative is chosen as the Environmental Quality (EQ) or Least Environmentally Damaging (LED) plan. The minimum requirement for designating an alternative as the EQ Plan is that it must make a net positive contribution to Environmental Quality when compared to the without condition. If an EQ Plan cannot be designated, the plan which most nearly meets the minimum requirements for the EQ Plan (i.e., the Least Environmentally Damaging Plan) should be identified.

For this study, none of the alternatives, including the "no-action" alternative, makes significant positive contributions to preserving, maintaining, or enhancing the environmental quality in the Seward area. All the construction alternatives involve some degradation of environmental quality, and even the "no-improvements" alternative does not address environmental preservation, maintenance, and enhancement. For example, if the harbor were not expanded, increasing numbers of boats would still seek to use it, fostering increased pollution in the existing harbor.

Of the alternatives discussed, Plan A is the least environmentally damaging because it involves a lesser quantity of dredging and tidelands committed to construction. This plan is also desirable because it confines impacts to an area already developed.

Plan A does have some beneficial side effects on the environment. For example, expansion of the harbor under Plan A would result in improving water quality in the existing harbor, mainly because a second outlet from the harbor would be added by not running the breakwater to shore at the south end. This would enhance circulation and keep salmon from being trapped during the spawning season.

Thus, Plan A is designated as the LED Plan for the reasons discussed above.

Rationale for Proposed Plan

Plan A is the plan which the community supports as it uses existing facilities and remains centrally located. This plan also complements the proposed Ballaine Boulevard Greenbelt Master Plan. However, Plan A must be eliminated as the selected plan because of its location in a high risk earthquake zone and because of Plan A's inability to accommodate the expected mooring demands at Seward. Therefore, Plan B is the recommended plan. This plan provides the best overall response to the study objectives and is also the National Economic Development Plan.

Determination of Consistency with Coastal Zone Management Program

We have determined that the proposed plan for development at Nash Road is consistent with the Alaska Coastal Management Program. All details, comprehensive data, and information commensurate with the expected effects of the activity on the coastal zone can be found in the Final Report and accompanying Final Environmental Impact Statement.

A consistency determination for coastal zone management will be completed after review of the final report.

CONCLUSIONS

The studies documented in this report indicate that Federal construction of a breakwater, an entrance channel and maneuvering area at Seward, Alaska, generally in accordance with the RECOMMENDED PLAN is technically possible, economically justified and environmentally acceptable. The city of Seward has indicated its willingness to act as local sponsor for the project and fulfill all the necessary local cooperation requirements. The City of Seward, a home-rule city in the State of Alaska, has fulfilled the legal requirements for local sponsorship. The State of Alaska has indicated its willingness to pursue funding for the nonfederal costs of harbor development at Seward. These facts lead to the conclusion that the Recommended Plan should be pursued by the United States in cooperation with the city of Seward and the State of Alaska.

RECOMMENDATIONS

I recommend that the small boat harbor at Seward, Alaska be constructed generally in accordance with Plan B as described in this report, the estimated total first cost exclusive of aids to navigation is $18,489,900 including local cost share of $16,562,900 for construction and $96,500 annually for maintenance, provided that prior to construction local interests agree to:

a. Provide without cost to the United States all lands, easements, and rights-of-way necessary for the construction and subsequent maintenance of the project and for aids to navigation, upon the request of the Chief of Engineers, including suitable areas determined by the Chief of Engineers to be required in the general public interest for initial and subsequent disposal of dredged material, and including necessary retaining dikes, bulkheads, and embankments therefore, or the costs of such retaining work;

b. Accomplish without cost to the United States all alterations and relocations as required in streets, utilities, and other structures, and improvements made necessary by the construction;

c. Hold and save the United States free from damages due to construction, operation, and maintenance of the project, but not including damages due to the fault or negligence of the United States or its contractors.

d. Assume responsibility for all project costs, excluding aids to navigation provided by the U.S. Coast Guard, in excess of $2,000,000;

e. Assume responsibility for construction and installation of the nonfederal dredged mooring basin, the appurtenant mooring facilities and services, and assume all costs for operation and maintenance of the mooring area.

f. Provide, maintain, and operate, without cost to the United States, an adequate public landing or wharf with provisions for: the sale of motor fuel and lubricants, potable water, suitable sanitary facilities and the necessary access roads, parking areas, and other needed public use shore facilities.

g. Provide a cash contribution to be applied to the cost of Federal major navigation facilities equal to 50 percent of the final construction cost allocated to recreation.

h. Provide a cash contribution to be applied to the cost of Federal major navigation facilities equal to 100 percent of the final construction cost allocated to land enhancement.

i. Establish regulations prohibiting discharge of untreated sewage, garbage, industrial waste, an other pollutants into the water of the harbor by users thereof, which regulation shall be in accordance with applicable laws or regulations of Federal, State, and local authorities responsible for pollution prevention and control.

In addition to the above local interests will:

a. Comply with all applicable provisions of Section 210 and 305 of the Uniform Relocation Assistance and Land Acquisition Policy Act of 1970, (Public Law 91-646), and be bound by the terms of an agreement of assurance pursuant to Section 221 of Public Law 91-611 and agree that it is obligated to pay any damages arising from its failure to perform;

b. Agree to comply with Section 601 of Title VI of the Civil Rights Act of 1964 (PL 88-352).

LEE R. NUNN
Colonel, Corps of Engineers
District Engineer

FINAL ENVIRONMENTAL IMPACT STATEMENT

PROPOSED PLAN FOR SEWARD
SMALL BOAT HARBOR
SEWARD, ALASKA

The responsible lead agency is the U.S. Army Corps of Engineers, Alaska District.

ABSTRACT

Seward is a community in Alaska located on the east side of the Kenai Peninsula at the head of Resurrection Bay. The Alaska District has investigated public concerns on overcrowded and inadequate harbor facilities for recreational boaters and commercial fishing vessels. Seven alternatives were investigated for expanding boat harbor facilities. Five were eliminated and two were selected for detailed study.

Plan A, Existing Harbor Extension South, consists of extending the existing north-south breakwater, creating a new entrance channel, removing a section of the existing breakwater, and dredging a mooring basin. Plan B, Nash Road, consists of a breakwater enclosure, a dredged entrance channel, and a dredged mooring basin. Both alternatives would meet Seward's needs for small boat refuge and navigation. Plan A confines development to an area already developed but may have an impact on salmon spawning in the Seward Lagoon and the Dairy Creek system. Plan B is located in a previously undeveloped area and places dredged material on an intertidal area. Plan B is the selected plan. This plan provides the best overall response to the study objectives and is the National Economic Development plan. Plan A was not chosen because it is located in a known high risk earthquake zone and has a Benefit-Cost ratio less than one.

SEND YOUR COMMENTS TO
THE DISTRICT ENGINEER BY:

If you would like further information of this statement, please contact:

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FINAL ENVIRONMENTAL IMPACT STATEMENT
PROPOSED PLAN FOR SEWARD
SMALL BOAT HARBOR
SEWARD, ALASKA

COVER SHEET	EIS-1
LIST OF PREPARERS	EIS-2

TABLE OF CONTENTS

Item	Page
I. SUMMARY	EIS-5
A. Major Conclusions and Findings	EIS-5
B. Areas of Controversy	EIS-5
C. Unresolved Issues	EIS-6
D. Relationship to Environmental Requirements	EIS-6
II. NEED FOR AND OBJECTIVES OF ACTION	EIS-8
A. Study Authority	EIS-8
B. Public Concerns	EIS-8
C. Planning Objectives	EIS-8
III. ALTERNATIVES	EIS-9
A. Plans Eliminated from Further Study	EIS-9
B. Without Condition (No Action)	EIS-9
C. Plans Considered in Detail	EIS-10
D. Comparative Impacts of Alternatives	EIS-12
IV. AFFECTED ENVIRONMENT	EIS-14
A. Environmental Conditions	EIS-14
B. Significant Resources	EIS-15
1. Resurrection River Wetlands	EIS-15
2. Quarry Sites	EIS-15
3. Upland Dredged Material Disposal Site (Plan A)	EIS-16
4. Affected Intertidal Area	EIS-16
5. Fisheries and Marine Resources	EIS-17
6. Water Quality	EIS-18
7. Nash Road Undeveloped Area	EIS-18
8. Tourism and Recreation	EIS-19
9. Scenic and Esthetic Characteristics	EIS-19

TABLE OF CONTENTS (cont)

Item	Page
V. ENVIRONMENTAL EFFECTS	EIS-20
A. Effects on Significant Resources	EIS-20
1. Resurrection River Wetlands	EIS-20
a. Plan A	EIS-20
b. Plan B	EIS-20
2. Quarry Site	EIS-21
3. Upland Dredged Disposal Site (Plan A)	EIS-21
4. Intertidal Areas	EIS-21
a. Plan A	EIS-21
b. Plan B	EIS-22
5. Fisheries and Marine Resources	EIS-22
a. Plan A	EIS-22
b. Plan B	EIS-24
6. Water Quality	EIS-25
7. Nash Road Undeveloped Area	EIS-27
a. Plan A	EIS-27
b. Plan B	EIS-27
8. Tourism and Recreation	EIS-28
a. Plan A	EIS-28
b. Plan B	EIS-28
9. Scenic and Esthetic Characteristics	EIS-28
a. Plan A	EIS-28
b. Plan B	EIS-29
VI. PUBLIC INVOLVEMENT	EIS-29
A. Public Involvement Program	EIS-29
B. Required Coordination	EIS-30
C. Statement Recipients	EIS-30
D. Public Views and Responses	EIS-30
VII. INDEX, REFERENCES, APPENDIXES	EIS-32
BIBLIOGRAPHY	EIS-35

I. SUMMARY

A. Major Conclusions and Findings

The Nash Road alternative, Plan B, was chosen as the NED Plan because it has the maximum net benefits (difference between cost and benefits). The South Harbor Expansion alternative, Plan A, was chosen as the least environmentally damaging (LED) plan because it involves a lesser quantity of dredging and tidelands committed to construction. The plan also confines impacts to an area already developed and improves circulation in the existing harbor. For greater detail on the rationale for choosing an NED and LED plan please refer to "Comparison of Detailed Plans" page 34 of the main report.

Plan B is recommended as the selected plan because it provides the best overall response to the planning objectives given on page EIS-8. Plan A was not chosen because it is located in a known high risk earthquake zone and there is no economically feasible means of stabilizing this area or designing an earthquake proof harbor. In 1965, Federal Task Force 9 recommended no Federal participation or cost sharing in this high risk earthquake zone. Plan B has been revised in the final report to improve circulation and improve the mooring basin configuration. Figure 7 shows the revised Plan B. The revisions to improve circulation were a result of recommendations made in a circulation study prepared for Plan B. The circulation study is included in Appendix G. The rectangular shape would result in more efficient use of floats and piers within the mooring basin. A supplement to the draft EIS was not prepared because the changes in the harbor configuration would not result in significant changes in the impacts described in the draft EIS. However, the changes warrant extending the final review period to 45 days as recommended by EPA. The 404(b)(1) evaluation for the selected plan involved investigation of impacts from fill and dredging activity. The areas affected by project development include 53.1 acres of intertidal and 52.3 acres of subtidal. The Resurrection River wetland could be indirectly affected by development in the area of the proposed small boat harbor. The discharge site for fill and dredged material for the proposed Nash Road alternative can be specified through the Section 404(b)(1) evaluation (see Appendix F).

No endangered species, archeological sites or marine mammals would be affected by the project. The major concerns are minimizing impacts to spawning salmon and water quality. Coordination with the U.S. Fish and Wildlife Service to provide information on fish and wildlife impacts occurred throughout the planning stages. The results of the coordination is given in the 19 July 1979 Coordination Act Report and 18 September 1981 supplement report included in Appendix E.

B. Areas of Controversy

Major concerns among public interests during the course of the study included project site location, water quality and dredged material disposal.

C. Unresolved Issues

There are no unresolved conflicts or major disagreements among study area interests.

D. Relationship to Environmental Requirements

<table>
<tr><th>Federal Policies</th><th>Plan B
Nash Road</th><th>Plan A
South Expansion</th></tr>
<tr><td>Archeological and Historical Preservation Act</td><td colspan="2">Full Compliance</td></tr>
<tr><td>Clean Air Act, as amended</td><td colspan="2">Full Compliance</td></tr>
<tr><td>Coastal Zone Management Act of 1972</td><td colspan="2">Partial Compliance; requirements will be met when final EIS is reviewed</td></tr>
<tr><td>Endangered Species Act of 1973</td><td colspan="2">Full Compliance</td></tr>
<tr><td>Estuary Protection Act</td><td colspan="2">Full Compliance</td></tr>
<tr><td>Clean Water Act</td><td colspan="2">Full Compliance</td></tr>
<tr><td>Federal Water Project Recreation Act</td><td colspan="2">Full Compliance</td></tr>
<tr><td>Fish and Wildlife Coordination Act</td><td colspan="2">Full Compliance</td></tr>
<tr><td>Land and Water Conservation Fund Act</td><td colspan="2">Not Applicable</td></tr>
<tr><td>Marine Protection, Research and Sanctuary Act</td><td colspan="2">Not Applicable</td></tr>
<tr><td>National Environmental Policy Act</td><td colspan="2">Partial compliance; requirements will be met with the filing of the final EIS with EPA</td></tr>
<tr><td>Rivers and Harbors Act of 1899</td><td colspan="2">Not Applicable</td></tr>
<tr><td>Watershed Protection and Flood Prevention Act</td><td colspan="2">Not Applicable</td></tr>
<tr><td>Water Resource Planning Act of 1966</td><td colspan="2">Full Compliance</td></tr>
<tr><td>Wild and Scenic Rivers Act</td><td colspan="2">Not Applicable</td></tr>
<tr><td>Flood Plain Management E.O. 11988</td><td colspan="2">Full Compliance</td></tr>
<tr><td>Protection of Wetlands E.O. 11990</td><td colspan="2">Full Compliance</td></tr>
</table>

State and Local Policies	Plan B Nash Road	Plan A South Expansion
Alaska Coastal Management Program	Partial Compliance; requirement will be met when Final EIS is reviewed.	Noncompliance
Land Use Plans		
Seward Comprehensive Land Use Plan	Full Compliance	
Required Federal Entitlements	None Required	

Notes: The compliance categories used in this table were assigned based on the following definitions:

a. Full compliance - all requirements of the policy and related regulations have been met.

b. Partial compliance - some requirements of the policy and related regulations remain to be met.

c. Noncompliance - none of the requirements of the policy and related regulations have been met.

d. NA - Not applicable to this project.

II. NEED FOR AND OBJECTIVES OF ACTION

A. Study Authority

On 9 September 1970, the Committee on Public Works of the United States Senate requested a review of existing reports to determine whether any modifications to the existing Seward Small Boat Harbor were advisable.

B. Public Concerns

Resource management needs and public concerns were identified in the study. Additional facilities to relieve the overcrowded conditions within the existing harbor, on-land areas to expand harbor support facilities, and location of marine servicing areas were identified as needs. The need to include future development of a bottomfishing industry in planning for the expansion of the small boat harbor was also identified.

The major concerns identified were: possible social impacts of larger boats connected with bottomfishing, negative social economic effects on the community if the boat harbor is not built, economic concerns for local development of harbor accommodations, harbor pollution, water quality, and hazards to the Salmon Creek spawning area.

C. Planning Objectives

An analysis of the public concerns and the management problems led to the formulation of two general planning objective categories; economic and environmental. The economic planning objectives developed include reducing damages to the existing fleet, improving cargo handling and maintenance facilities, and encouraging the harvest of commercially viable fish species. Environmental planning objectives considered include minimizing the effect on migrating adult salmon, maintaining an acceptable level of water quality, minimizing intertidal and subtidal impacts by constructing the smallest practical project, avoiding confrontation with wildlife and marine habitat where possible, maintaining esthetic quality and reducing project related social and economic impacts.

III. ALTERNATIVES

A. Plans Eliminated from Further Study

Seven alternative project sites were considered for the expansion of the Seward small boat harbor. Five of these alternatives have been eliminated from further study for engineering and economic reasons. A description of these alternatives and why they were eliminated is given in the section on Formulation of Preliminary Plans, page 13 of the report. A summary of the reasons for eliminating them is given below:

The townsite location was eliminated because it is located in a highly unstable submarine landslide area, wave attack is more severe than other possible locations, and breakwater construction in deep water would be extremely expensive. The Alaska Railroad east site was eliminated because of high risk, expense of dredging in a mud flat area, poor access, the site would be subject to freshwater icing, and it conflicts with present development for private dockage by the Kenai Lumber Company. Expansion of the existing harbor east was eliminated because the land is under a long term property lease to private industry and because of possible navigation hazards to ships approaching the Alaska Railroad dock. The Fourth of July site was eliminated because it would interfere with the city's proposal to build a marine industrial park. The Lowell Point site was eliminated because of the large percentage of privately owned land, poor access, the cliff shore area would preclude necessary shore development, and it is outside the cooperate limits of the city and would not be covered by the local corporative resolution between the Corps of Engineers and the city of Seward.

B. Without Condition (No Action)

The without condition is a description of what would be expected to occur if no Federal action is taken. At this time, there are no State, local, or private plans that address the planning objectives (see page 9).

If a small boat harbor is not built, crowded harbor conditions would continue to increase until harbor use reaches a saturation point, at which time no increase in use would occur. The without condition would have a detrimental effect on recreation, tourism, and the sports fishing industry. It would lessen the recreational experience of those who do use the harbor. The commercial fishing industry would not be able to expand to include bottomfishing.

Additional crowding in the harbor would further degrade the water quality within the existing harbor by increasing and concentrating pollutants. In addition, the potential for accidental fuel spills would increase as overcrowding increases the possibility of collisions.

C. Plans Considered in Detail

Two alternatives, Nash Road site and existing harbor expansion south, are being considered in detail.

Plan A, the South Harbor Expansion, would be accomplished by expanding the existing 16-acre harbor, which involves removing 1,460 feet of existing south and east breakwaters, and by adding 2,100 feet of new east breakwater. This would create approximately 14 acres of new basin dredged to a depth of -12 MLLW. The new harbor, in combination with the present harbor would have a capacity to moor 1,073 recreational and commercial craft. The mooring basin would total 30 acres. Dredged material including maintenance dredged material would be disposed of in the upland dredged disposal area shown in Figure 5.

Plan B, the Nash Road Site, has been revised to improve circulation and the configuration of the mooring area, Figure 7. The revised Plan B would involve building a new harbor in an undeveloped area by installing 1,400 feet of south breakwater, 2,800 feet of west breakwater, and 1,700 feet of north silt-barrier. This would create approximately 30 acres of mooring basin dredged at varying depths of -10 to -16 feet MLLW. This alternative would offer mooring capability for approximately 1,073 recreational and commercial craft. Dredged material would be placed in upland, intertidal, and subtidal habitat for construction of a staging area, Figure 7. Without creating fast land by placing dredged material in the tideland, adequate land would not be available for necessary harbor facilities or for a staging area for construction of the harbor. Vertical rock cliffs are found along at least a third of the shore adjacent to the proposed harbor site.

The dredged material not used in the staging area and the maintenance dredged material would be disposed of on the upland dredged disposal area identified in Plan A and Figure 5. The material would be drained before being placed on the upland site so a containment dike would not be necessary. The material is composed primarily of sand and gravel and therefore would create a well drained stable surface for use as a greenbelt area. This information also applies to Alternative A.

Plan B has been designated as the NED plan and the recommended plan, and Plan A has been designated as the LED Plan. A description of the evaluation process for this selection is given in Comparison of Detailed Plans, page 34 of the main report.

The Federal Government's responsibilities for implementing both alternatives include: constructing all new breakwaters, providing entrance and maneuvering channels and maintaining breakwaters, entrance and maneuvering channels. Plan A also includes removal of portions of the existing south and east breakwaters in the original Federal harbor. Local implementation responsibilities include: dredging berthing areas, removing breakwater portions surrounding the local extension to the original Federal project, providing inner harbor facilities, and maintaining the berthing areas to project depths.

The following are mitigation measures that would be included in the project:

1. The South Harbor Expansion would enclose the Seward lagoon outlet. The lagoon is a salmon rearing area and provides access to Dairy Creek, which is an important salmon spawning area. For a more detailed description of Seward Lagoon, see Fisheries and Marine Resources on page EIS-17. Mitigation measures involve relocating the Seward lagoon outlet outside the expanded harbor, adjacent to a nonnavigable entrance at the south shoreline. Location of the outlet outside the harbor would reduce entrapment of salmon within the harbor and disorientation of salmon returning to the lagoon. At present, the outlet is located at an elevation of +6 feet which limits the time the salmon can return to the lagoon.

2. The South Harbor Expansion was designed with a nonnavigable entrance channel between the shore and the south breakwater to minimize impacts on spawning salmon by avoiding the possibility of salmon being entrapped in the harbor. The opening would also improve circulation in both the existing and the new expansion, thereby minimizing water quality impacts.

3. The Nash Road alternative was relocated 1,200 feet southward from its initial location adjacent to Nash Road to eliminate the problem of enclosing the outlet of a stream at the end of Nash Road. Freshwater flows into the harbor would cause an ice problem. The relocation also minimizes disrupting the anadromous salmon returning to the stream.

4. Two provisions were included in the local cooperative agreement to minimize impacts on water quality from discharge of untreated sewage, industrial waste, and garbage. Item C requires that the local sponsor provide for suitable sanitary facilities. Item F requires that the local sponsor establish regulations prohibiting discharge of untreated sewage, garbage, industrial waste, and other pollutants into the water of the harbor by users thereof, which regulations shall be in accordance with applicable laws or regulations of Federal, State, and local authorities responsible for pollution prevention and control.

5. The proposed project was planned to avoid construction during the following critical salmon spawning and migrating times identified by the Alaska Department of Fish and Game: 15 April to 15 June and 10 August to 1 November.

6. To improve circulation and minimize water quality impacts, the breakwater configuration for the Nash Road Site was revised in the final report. The circulation study, which resulted in the revision, is given in Appendix G.

D. Comparative Impacts of Alternatives

	No Action	Plan A South Expansion	Plan B Nash Road
Resurrection River Wetlands	No Impact	No Impact	Possible secondary impacts from increased development in the area. Urbanization.
Quarry Sites	No Impact	Uses existing quarry.	Uses existing quarry site.
Dredged Material Disposal Site	No Impact	222,100 cubic yards of dredged material will be disposed of on a 46-acre upland area.	[1] Maintenance material will be disposed of on a 46-acre upland area.
Intertidal Habitat	No Impact	Eliminate approximately 0.8 acres of intertidal habitat.	Eliminate approximately 53.1 acres of intertidal habitat. (habitat has low productivity).
Marine Resources	No Impact	Eliminate approximately 25.1 acres of subtidal marine habitat (habitat has low productivity). Cause some reduction in salmon spawning in Seward Lagoon.	Eliminate approximately 52.3 acres subtidal marine habitat (habitat has low productivity).
Scenic Esthetic Quality	Crowded harbor, additional land cleared for upland storage of boats, could reduce the esthetic and scenic quality of Seward and small boat harbor.	Change will be compatible with existing esthetic quality of SBH. Increase esthetic quality of area by the use of dredged material for possible greenbelt.	Change scenery from undeveloped natural area to manmade quality of SBH.

[1] Initial dredged material would be used in the construction of the staging area. Areas effected are as follows: uplands-10,300 cy; intertidal-509,550 cy; subtidal-508,550 cy.

Comparative Impacts of Alternatives (cont.)

	No Action	Plan A South Expansion	Plan B Nash Road
Tourism	Adverse effect due to crowded harbor conditions.	Increased tourist industry.	Increased tourist industry.
Water Quality	Water quality maybe degraded due to increased over-crowded harbor conditions.	Water quality would be degraded in proposed harbor site. Water quality would improve in existing harbor.	Water quality would be degraded.
Nash Road - Undeveloped	Area available for other industrial or residential development as consistent with local land use plan.	Area available for other industrial or residential development as consistent local land use plan.	Increase the rate at which this area develops. Development will be towards industrial, business use.
Seismic	No Impact	Located in a high risk earthquake area.	No known impact.
Sports Fishing	Crowded harbor conditions will stifle sports fishing by making it less attractive.	Sports fishing will increase in popularity due to increased harbor facilities.	Sports fishing will increase in popularity due to increased harbor facilities.

IV. AFFECTED ENVIRONMENT

A. Environmental Conditions

Seward is located in the northwest corner of Resurrection Bay. The bay is a glacial fjord with steep slopes that drop to depths of 300 to 700 feet. It is surrounded by the Kenai Mountains which rise abruptly to elevations of 2,000 to 5,000 feet. The town is sited on an alluvial fan of Lowell Creek. Clay, silt, and sand underlie much of the city.

The city was established in 1903 by a group of individuals who proposed to construct a railroad from Seward to the coal and gold fields of the interior. Seward experienced slow but steady growth until the late 1950's when a rapid decline in employment was experienced. In 1964 the Alaska earthquake destroyed approximately 90 percent of Sewards's industry, including the fish processing plants, railroad yards, fishing fleet, dock, warehouse, and oil tank farms. Employment plunged after the earthquake and did not regain preearthquake levels until 1974 (Arctic Environmental Engineers, Anchorage, Alaska 1979).

At present, Seward is a homerule city with a population of approximately 1,800. No one industry is dominant; Seward relies on commercial fishing, tourism, and is a terminus of the Alaska Railroad. Seward also has a marine ferry system terminal, and is the site of a vocational training school, and a field experimental station for the University of Alaska Marine Institute.

The climate is mild, influenced by warm waters of the north Pacific Ocean. However, glacial ice fields overlook the townsite, and strong winds and heavy precipitation, 66 inches annually, are characteristic of the area.

Winds are influenced by the north-south orientation of Resurrection Bay. During April through September, winds are predominantly from the south, whereas northerly winds occur during the rest of the year. The bay around the airport and city proper receives less wind compared to surrounding areas.

Resurrection River and Salmon Creek empty into the northeast side of Resurrection Bay to form a large delta wetland area.

Seward is located in the coastal forest zone where the predominant tree species are Sitka spruce, western hemlock, Alaska cedar, balsam poplar, and black cottonwood. Common understory species include Sitka alder, devils club, pacific red elderberry, and blueberry. Alpine and barren ground tundrae are found in the mountainous areas around Seward.

Mammals typical to southcentral Alaska are found in the undeveloped areas around Seward. Black bear and moose are found in the lowland and mountain goats range in the mountains surrounding Seward. Other mammals include fox, coyote, weasel, land otter, and in the mountain areas, arctic ground squirrel, pika, and hoary marmot. Fishery and marine resources are described on page EIS-17.

B. Significant Resources

Significant resources include all resources which, if affected by an alternative, would create a significant impact that needs to be addressed, and all resources that have been identified by local, State, and Federal laws as being significant, such as wetlands (Clean Water Act). No endangered marine or terrestrial species, historical or archeological sites, or designated wild and scenic rivers are present in the project area. Coordination letters on endangered species are included in Appendix E. The current Federal Register of Historical and Archeological sites (March 18, 1980) was consulted to determine that no known historical or archeological sites are located in the project area. The Corps of Engineers coordinated with the State Historical Preservation Officer and the Heritage Conservation and Recreation Service (now the Park Service) to determine that the project would have no probable impact on historical and archeological resources. Coordination letters are included in Appendix E.

1. Resurrection River Wetland

Resurrection River, Salmon Creek, and several other small streams empty into the northeast side of Resurrection Bay to form a large delta wetland area. The braided streams in the upland area form tidal guts as they near Resurrection Bay. Salt marshes are found in the upper tidal area and mudflats in the lower intertidal zone.

The wetland is used as a resting and molting area for waterfowl, however, they do not nest there. A list of the birds identified is given in Appendix E.

Wetlands are considered to be significant resources under the Clean Water Act; therefore, the Resurrection River wetland has been included in this section. However, biologically and hydrologically, this wetland is not considered to be a critical resource to the Seward area.

2. Quarry Sites

Plan A and Plan B would use an existing quarry site at Fourth of July Creek. This site is currently being used as a quarry site for the shipyard at Fourth of July Creek.

3. Upland Dredged Material Disposal Site

The upland site is located just south of the proposed Plan A harbor site and parallels the shoreline within the designated high risk earthquake zone (see Figure 4). It is an area covered with gravel and alder with depressions, metal debris, and pieces of concrete remaining from the 1964 earthquake. The leftover debris represents original harbor facilities destroyed by the tidal wave that followed the quake. The use of the area both by birds and for human activities is minimal with the exception of camping on the upper part of the site during the salmon season. This site would be used for dredged material disposal for Plan A and for maintenance dredged material disposal for both plans.

4. Affected Intertidal Area

The Nash Road intertidal area is located on the northeast side of Resurrection Bay within the area of the proposed small boat harbor. The affected intertidal area has increased from what was described in the Draft EIS. The staging area is larger, requiring more fill, and the breakwater configuration was revised to a more rectangular shape. The revised Plan B would affect approximately 53.1 acres of the intertidal area as compared to 5.8 acres presented in the draft EIS. A field survey was conducted in June 1981 during a -3.7 tide to determine if the habitat and substrate type affected by the revised Plan B is the same type of sparesly populated habitat found during the intertidal investigation conducted by Fish and Wildlife Service and the Corps in July 1979. The survey demonstrated that the habitat and substrate type do not change in any area that would be directly or indirectly affected by increased intertidal dredging and disposal. The upper intertidal area is composed primarily of loose slate that varies in size from less than an inch to 1 to 2 feet. The lower intertidal area of is composed of approximately 66 percent sand and 34 percent silt. The intertidal surveys conducted by biologists from the Corps of Engineers and Fish and Wildlife Service in the Nash Road intertidal area showed only marginal productivity. The most common species found in the narrow band forming the upper intertidal area are rockweed, blue mussels, acorn barnacles, limpets, isopods, and green algae. The lower intertidal area is sparsely populated with annelids, molluscs, and arthropods species. The active sediment deposit from Resurrection River contributes to the low productivity in the area.

The South Harbor Expansion would affect approximately 0.8 acres of intertidal area just south of the existing harbor. The substrate is composed primarily of sand (75 percent) and gravel (25 percent). Within the intertidal areas of the South Harbor Expansion, an intertidal survey revealed that the infauna was dominated by several families of marine worms and clams. Other groups occurring in the area included Copepod, Amphipod, and Cumacean (Gardner, 1978). In the upper intertidal area, the brown algae rockweed dominated. Epifauna on the surface, and infauna among the rocks and in the seaweed include: blue mussel, barnacle, limpet, crescent gunnel, isopod, and polychaetes. (U.S. Fish and Wildlife Service, 1979). The species composition of the intertidal area is basically the same as found at the Nash Road Site.

The intertidal surveys were limited surveys that involved taking core samples at random locations along transect lines at low tide and by using scuba. The term productivity is used in the EIS to describe the abundance of species in the affected intertidal or subtidal areas in Alaskan waters. The results of the survey (species list) are given in Appendix E page and the Fish and Wildlife Coordination Act Report.

5. Fisheries and Marine Resources

Resurrection Bay supports a large marine sport fishery for coho salmon. Incidental catches of pink and chinook salmon also occur in this fishery. Sockeye and chum salmon occur in the study area, but do not contribute significantly to the fishery. Other sports fish include various species of bottomfish.

The small boat harbor and adjacent intertidal and subtidal waters are utilized as spawning substrate for Pacific herring in the spring. Other inhabitants include: Pacific staghorn sculpin, starry flounder, Pacific cod, Pacific tomcod, and greenling.

Since 1960, funds appropriated under the Federal Aid in Fish Restoration Act have been utilized to enhance coho rearing habitat at Bear Lake and Seward Lagoon. Management at Bear Lake involves supplemental plants of coho fingerling, monitoring of smolt and adult migrations, and periodic rehabilitation for threespine stickleback control.

Seward Lagoon occupies approximately a 10-acre area directly west of the small boat harbor. It has a freshwater lens of about 1 foot, but salinity levels of 30 parts per thousand occur through much of the lagoon. These waters are utilized by Dolly Varden and about 100 coho and 50 sockeye salmon prior to ascending to spawning grounds in the Dairy Creek system (Ted McHenry, 1978). The resultant fry rear in the lagoon or creek until smoltification. In May the lagoon is planted with approximately 100,000 coho smolts, which mill around the small boat harbor and adjacent areas before moving into Resurrection Bay. Each plant contributes approximately 2,000 to 8,000 adult coho and 1,000 to 4,000 jacks to the sport catch (McHenry, 1978). The lagoon waters are discharged through an open ditch that is interrupted by culverts at Seward Highway, Fourth Avenue, and at its outlet. The outlet has been placed at an elevation of +6.0 feet. Since mean high water is +9.7 feet and mean low is +1.4 feet, access to the lagoon is not continuous. Returning adults consequently concentrate in very shallow waters and become susceptible to snagging. Smolts must also negotiate intertidal waters and are susceptible to predation by gulls and other fish-eating birds. (U.S. Fish and Wildlife Service 1979).

Subtidal investigations of the Nash Road Site revealed that the area has low productivity. Species observed included: starry flounder, sea pen, cockles, and moon snails. (McGillivary, 1979). The project area was found to be relatively flat and shallow (-4 feet), sloping to the southwest, then dropping off abruptly to -40 feet. During subtidal investigations, harbor seals were observed outside the subtidal area of the Nash Road Site. Cetaceans such as harbor porpoise and dall porpoise may occasionally visit Resurrection Bay. (Gusey 1978).

All species found at both the south harbor expansion site and the Nash Road site are given in the Fish and Wildlife Service Coordination Act Report in Appendix E.

6. Water Quality

The State of Alaska has not classified the water quality of the Seward area. Based on water samples taken 31 May 1979, the water quality at both proposed project areas meets the State of Alaska Water Quality Standards (given in Appendix F) for Class II (C) water use: marine water uses for growth and propagation of fish, shellfish, aquatic life, and wildlife including sea birds, waterfowl, and furbearers. It was not possible to determine if the water quality met the standards for other water uses such as aquaculture, seafood processing, industrial use, water recreation, and harvesting of raw aquatic life. More extensive water quality test for fecal coliform (indicates presences of fecal waste) would be necessary to make this determination.

Water quality tests were taken on 31 May and 1 June 1979. The results of these tests are given in Appendix F. The results of the tests taken at both sites were within the normal ranges expected for uncontaminated, nonpolluted marine water.

7. Nash Road Undeveloped Area

The Nash Road undeveloped area is one of the few remaining areas in Seward available for development and expansion. Other land around Seward is either too steep or is within the Chugach National Forest. The area includes the land along Nash Road on the northeast side of Resurrection Bay to the end of Nash Road and south to Fourth of July Creek.

The northeast section of Nash Road is primarly a low density residential area. With the exception of a small sawmill, there is little commercial development in the area. Along the north and northeast part of the road, the land is relatively flat and wetland areas occur adjacent to creeks that enter Resurrection Bay. The area just south of the end of Nash Road to Fourth of July Creek is very steep except near the mouth of the creek where an area of low relief is found by the creek. The area from the end of Nash Road to Fourth of July Creek is undeveloped private land and land owned by the city of Seward.

There are no residences immediately surrounding the harbor site area. The property immediately adjacent to the harbor is undeveloped, private land. Sheer rock cliffs are found along at least one third of the shore adjacent to the proposed harbor site.

The city of Seward has prepared a comprehensive land use plan that encourages land use at the end of Nash Road that is compatible with industrial development at Fourth of July Creek. The possible land uses suggested are commercial, residential, and support industries.

8. Tourism and Recreation

Sports fishing and the scenic and esthetic qualities of Seward make it a popular tourist and recreational area. Approximately 85 percent of the boats occupying spaces in the existing small boat harbor are recreational boats. Eighty-five percent of the boats on the waiting list for harbor space are also recreational boats (Economics, Appendix B). Existing data on the local economy indicate that approximately 20 to 25 percent of the workers in Seward are engaged in occupations directly or indirectly related to tourism and recreation. Seward ranks high in importance as a recreational resource for the people of this region.

9. Scenic and Esthetic Characteristics

One of the assets of Seward is its scenic and esthetic qualities. These qualities, as well as fishing, attract visitors to the area which in turn supports the local economy.

Seward is located in a very scenic area with contrasting visual characteristics created by Resurrection Bay and the steep surrounding mountains. The existing small boat harbor blends with the visual characteristics of the town and in fact is part of the scenic qualities of Seward that are enjoyed by many visitors.

V. ENVIRONMENTAL EFFECTS

Effects on Significant Resources

1. Resurrection River Wetlands

a. Plan A. This alternative would not have any effects on the Resurrection River wetlands.

b. Plan B. Although there are no direct impacts on the wetlands, there are some secondary impacts associated with building a small boat harbor in this location. Increased traffic along Nash Road would increase activity and noise, primarily during construction, and may impair the area for use as bird habitat. After construction, disturbance from noise and activity would be significantly reduced. Increased development in the area may degrade the water quality of the wetland.

Locating a small boat harbor in this area would increase human activity in proximity to a wetland. The actual impact the small boat harbor would have on the wetland depends on the types of activities that occur in the area and whether or not those activities are stimulated by the construction of a small boat harbor or would have occurred as a normal process of development. Some development may occur near the wetland as a result of the proposed project. However, most of the development, such as bait shops, boat repair supplies, and cold storage facilities would occur near the small boat harbor. It is quite likely that nonharbor dependent development would occur in the area before a small boat harbor is built.

Wetlands are protected under the authority of Section 404 of the Clean Water Act. A permit is required from the Corps of Engineers for fill activities in a wetland, which in this case would include the tidelands, since they are part of the contiguous wetland. An evaluation of impacts is required for each permit activity. An EIS would be required for activities that would have significant impacts. A permit can be denied for an activity that does not comply with the protection measures outlined in the Clean Water Act and or is found not to be in the best interest of the public. Impacts to the Resurrection River Wetlands that could occur as a result of development stimulated by the small boat harbor, such as degradation of water quality, would be minimized by the requirements described above.

2. Quarry Sites

a. Plan A. Quarry activities would not have a significant impact on the Fourth of July Creek quarry. Because deep water exists right off the quarry site, quarry material could be barged or trucked to the harbor site. If it is barged, it would eliminate significant noise and dust from trucking quarry material through town.

2. Quarry Site

Impacts from the quarry activities are expected to be minimal. During construction, increased noise would occur along the road between Fourth of July quarry and Nash Road.

One of the advantages of this site is road acess to the quarry, which is more economical than having to barge the material from the Lowell Point quarry.

3. Upland Dredged Disposal Site

Approximately 222,100 cubic yards of dredged material from construction of Plan A would be disposed of on the 46-acre upland site. This site would be used to dispose of the maintenance dredged material for both Plan A and B. Some leaching may occur but it is not expected to be significant. Filling this area would conceal the metal and concrete debris remaining from the 1964 earthquake, thus making it possible for the city to develop the area as a greenbelt. Placing fill on this area has the potential of enhancing both the esthetics of the area and its potential for recreational use.

4. Intertidal Areas

a. Plan A. Approximately 1,060 feet of the existing south breakwater would be removed. Only a small portion of the breakwater extends into the intertidal area thus eliminating less than an acre of sessile marine invertebrate habitat that now exists on the breakwater in the intertidal area. The majority of marine habitat eliminated by breakwater removal is in the subtidal area where sessile marine invertebrates also occur. Increased sedimentation from removal of the existing breakwater and construction of a new breakwater would temporarily degrade the water quality in the intertidal area. The material, once removed, would be used to construct the new breakwater.

Breakwater construction would not eliminate any portion of the intertidal area. The breakwater would not be connected to the shore because of the nonnavigable channel for water circulation on the south side of the proposed harbor (see Figure 6).

Inner harbor dredging by local interests would eliminate 0.8 acres of intertidal marine habitat. Recolonization of marine invertebrates in this area would occur soon after dredging. A mature marine community should occur within a few years. Maintenance dredging every 30 years would again disrupt the marine organisms that have established in the harbor area. Dredged materials would be placed on an upland site. Due to the low productivity of the intertidal area, the loss of this habitat is not considered significant to the overall productivity of the marine ecosystem in the general area.

Onshore services, such as bait shops, sea food processing plants, and restaurants already exist to accommodate the present harbor.

b. Plan B. Construction of the breakwaters, north silt barrier dredging the mooring basin and entrance channel and placing dredged material for a staging area would impact 53.1 acres of intertidal habitat. Approximately 7 acres would be covered by breakwaters, 5.4 acres dredged for the entrance channel by the Corps and 16.7 acres would be dredged for the inner harbor mooring basin by the local sponsor. Dredged material would be placed on the intertidal area to create adequate land for necessary harbor facilities and staging area for the harbor (the fill continues into the subtidal area). Placing dredged material on the intertidal area would eliminate 24 acres of intertidal habitat and preclude eventual recolonization by benthic organisms. Staging area construction would totally preclude the limited use of the area as feeding habitat for some avifauna (shorebirds, waterfowl U.S. Fish and Wildlife Service, 1979). Only water oriented facilities would be allowed on the staging area. Colonization of sessile marine inverterbrates on the breakwater would occur soon after construction.

Due to the low productivity of the intertidal area, the loss of this habitat is not considered to be significant to the overall productivity of the marine ecosystem in the general area.

Water pollution from waste disposal and fuel stations within the harbor could have an effect on intertidal areas outside of the harbor, although it is not expected to be significant because the strong tides that occur in the area would rapidly disperse the pollutants rather than concentrating them. Building a harbor in this location would encourage support facilities both on the fill and on the shore adjacent to the harbor. The development in this area that is directly associated with the small boat harbor could have a detrimental impact on the adjacent tidelands and intertidal areas due to a decrease in the water quality. Permits from the Corps of Engineers would be required for any construction or development in the intertidal area. Generally, only water oriented or water dependent development would be permited, although other types of development may be allowed if there is no other practicable alternative.

5. Fisheries and Marine Resources

a. Plan A. Dredging, removing the existing southeast breakwater, and building breakwaters to create the southward expansion alternative would destroy approximately 25.1 acres of subtidal marine habitat. In addition, 5.7 acres would be covered by breakwater, 6.7 acres would be dredged by the Corps for the entry channel and the 13.7 acres of the inner harbor mooring basin would be dredged by the local sponsor.

Colonization of sessile marine inverterbrates on the breakwater would occur soon after construction. A mature marine community should develop within a few years; however, maintenance dredging every 30 years would disrupt the marine organisms that have established themselves in the harbor area and would temporarily increase turbidity. Maintenance dredging would be timed to avoid critical spawning periods, thus reducing the impact on fish species. Benthic sampling has indicated that the productivity of this area is low and that no important shellfish habitat would be affected (U.S. Fish and Wildlife, 1979). Loss of this habitat is not considered to be significant to the long term productivity of the marine ecosystem in the general area.

In-water construction from April through October would disturb several species of fish that either spawn in or migrate through the intertidal area. Dolly Varden, coho and sockeye salmon migrate through the affected intertidal area into a culvert that leads to Seward Lagoon and then into the Dairy Creek system which is an important spawning area. Mitigation measures involve relocating the culvert outside the expanded harbor to avoid entrapment of salmon and to minimize impacts to this important fishery. The project would not have a direct impact on Seward Lagoon or Dairy Creek; however, the fish runs that utilize Dairy Creek could be impacted by in-water construction as they pass through the affected intertidal area. The impacts include gill abrasion in salmon smolt from increases in suspended sediment, disorientation, and avoidance of the construction area. In-water construction could smother herring spawn and disturb other species of fish that are found in the area. By avoiding construction during critical migrating spawning periods, these impacts would be minimized. The Alaska Department of Fish and Game has identified the critical times to be; 15 April to 15 June and 10 August to 1 November. The proposed project was planned to avoid in-water construction during these times.

Decreased water quality from increased human activity in the expanded harbor could have a detrimental effect on salmon within the harbor area. Adequate circulation is expected in the proposed harbor (see Water Quality page EIS-26), thus, the impact from degraded water quality on salmon would be greatly reduced. Reduction of dissolved oxygen levels, which can have a serious impact on salmon, is not expected to be a problem.

Federal, State and local laws prohibit dumping of all forms of refuse in navigable waters. Achieving a desired water quality condition would depend on the enforcement of applicable laws by Seward and a recognition by harbor users of the consequences of dumping refuse in the harbor. Construction of boat slips and floats by the local sponsor would not have a significant impact on the fisheries or marine resources. Other inner harbor facilities such as a fuel station and waste disposal stations could have an effect on the fisheries and marine resources from degradation of the water quality, although it is not expected to be significant because strong tides in the area will rapidly disperse the pollutants. Onshore services, such as bait shops, sea food processing plants, and restaurants already exist to accommodate the present harbor and are not expected to significantly increase.

b. Plan B. Construction of the breakwaters, north silt barrier and dredging the mooring basin and entrance channel would impact 52.3 acres of subtidal marine habitat. Approximately 5.9 acres would be covered by breakwaters, 9.1 acres dredged for the entrance channel by the Corps and 13.3 acres would be dredged for the inner harbor mooring basin by the local sponsor.

Dredged materials would be placed on the subtidal area to create a staging area for the harbor (the fill also covers 24 acres of intertidal area). Placing dredged material on the subtidal area would eliminate 24 acres of subtidal marine habitat and preclude eventual recolonization by benthic organisms.

The dredged materials would come from Corps' dredging activities during construction of the breakwater and entrance channel and from local inner harbor dredging. The staging area would totally preclude the limited use of the area as feeding habitat for some avifauna. (U.S. Fish and Wildlife, 1979).

Colonization of sessile marine invertebrates on the breakwaters would occur soon after construction. A mature marine community should develop within a few years; however, maintenance dredging every 10 years would disrupt the marine organisms that have established themselves in the harbor area and would temporarily increase turbidity. Activities would be timed to avoid critical spawning periods thus minimizing the impact on fish species.

No major shellfish beds would be affected. The productivity of this area is low. Loss of this habitat is not considered to be significant to the long term productivity of the marine ecosystem in the general area.

The primary impact on fish from in-water construction would be similar to those described for the South Harbor Expansion. Salmon migrating through the intertidal area to the unnamed anadromous fish stream could be impacted by increased suspended sediment, gill abrasion in salmon smolt, disorientation, and avoidance of the construction area. In-water construction could smother herring spawn and disturb other species of fish that are found in the area. As in the South Harbor Expansion alternative, the impacts to migrating salmon would be minimized by avoiding construction during critical spawning and migration times identified by Alaska Department of Fish and Game. These times are 15 April to 15 June and 10 August to 1 November. The unnamed anadromous fish stream is not a major spawning area like Dairy Creek; therefore, the degree of impact would be much less. To mitigate impacts, the project site was moved 1,200 feet southward to eliminate the problem of enclosing the outlet of the unnamed anadromous fish stream (coho and pink salmon) at the end of Nash Road, thus greatly reducing the impact on migrating salmon.

Water quality degradation from local constructon of boat slips, floats, fuel stations, and waste disposal stations in the inner harbor could adversely impact the fisheries and marine resources. The impacts from the above activities are not expected to be significant due to adequate circulation in the harbor (see Water Quality Section).

Building a harbor in this location would encourage support facilities, both on the fill and on the shore, adjacent to the harbor. The impacts associated with development as a result of the small boat harbor are difficult to assess. Increased development adjacent to the tidelands could degrade the water quality from runoff and increase sedimentation, thus having a detrimental effect on the marine ecosystem. With careful planning, impacts from degradation of water quality could be avoided. Because of the low productivity of the marine ecosystem, development could occur with a minimal impact on the marine resources and fisheries. The small boat harbor could induce development near the anadromous fish stream. The Alaska Department of Fish and Game would require an anadromous fish permit for any construction activity that would affect an anadromous fish stream. Through the use of the Anadromous Fish Act, impacts such as degradation of water quality and siltation could be greatly minimized.

6. Water Quality

Potential water quality impacts for both proposals are evaluated in one discussion because they are not substantially different. Possible impacts associated with the small boat harbors are: degradation of water quality from poor circulation within a harbor, gas and oil spills, and disposal of sanitary waste from boats. Poor circulation can cause these wastes to be concentrated and can reduce the amount of dissolved oxygen available for living organisms.

Impacts associated with gas and oil spills and disposal of sanitary waste would be reduced by local cooperation requirements (see page 38), which would require the local sponsor to operate and maintain sanitation facilities, and to establish regulations prohibiting discharge of untreated sewage, garbage, industrial waste, and other pollutants into the harbor. The regulations would be in accordance with applicable laws or regulations of Federal, State, and local authorities responsible for pollution control.

Dredging and construction of the small boat harbor would affect the water quality by increasing the turbidity and amounts of suspended solids and sediment load of the water. This would reduce the light penetration and may have an effect on marine vegetation. The effect is expected to be minimal due to the low productivity of the area. The consequent effects on fish and marine organisms from the above effects on water quality were described in Fisheries and Marine Resources, page EIS-17.

The dredged material disposal area for Plan B would be surrounded by dikes designed to contain the dredged material and allow it to settle as usable fill. The dredged material would consist of silty medium to fine uniform sands and lean dark clay with scattered shell fragments and organic matter. Some of the finest material would escape the containment area during the dredging operation thus causing a short term increase in turbidity. Leaching of fine silt may occur until the dredged material stabilizes, which should occur after 1 year.

Water quality tests were taken in the existing harbor and compared with samples taken outside the harbor to get an indication of what water quality problems could be expected from the expansion of the small boat harbor. Temperature and dissolved oxygen tests were taken at three levels, surface, midlevel, and benthic, at four locations within the harbor. The average temperature and dissolved oxygen readings were the same inside the existing harbor as they were at the two proposed sites outside the harbor. This indicates good circulation and flushing within the harbor. The coliform count at three sites was not substantially higher than those outside the harbor but was substantially higher for the fourth site. The high count at that site probably indicates an isolated disposal of human waste from a boat. More extensive coliform counts taken over a longer period of time would be necessary to determine an average coliform level for the harbor. Other water quality tests for heavy metals, oil, and grease, pH, etc., were not significantly different inside the harbor than they were outside the harbor. The results of the water quality tests are given in Appendix F.

Several positive factors would minimize water quality impacts for both alternatives. Seward has a mean tidal range of 8.3 feet, and an extreme range of 19.7 resulting in a large exchange of water which would disperse and dilute pollutants. The water temperature is low, 10° C, which will not allow for the rapid growth of coliform bacteria and, cold water holds more dissolved oxygen. Because Seward is isolated, the problem of accumulated impacts from other harbors is nonexistant. One other significant factor influencing water quality is the harbor design.

For the purpose of improving circulation, the south harbor expansion plan was designed with two openings, the main entrance and a nonnavigable channel on the south side (see Figure 6). This entrance channel would minimize the impact to water quality by improving the circulation. The shore opening would also improve circulation within the existing harbor. Although a circulation study was not done for this alternative, there are no foreseeable problems with this harbor design.

A circulation study was done in July 1980 for the Nash Road Site, which was identified as the tentatively selected plan in the draft. The recommendations of that study were to make a minor change in the harbor configuration to improve circulation. With the revision, the harbor is expected to have good circulation. The results of the circulation study are given in Appendix G.

In conclusion, water quality tests for the existing harbor indicate that the water quality inside the harbor is not significantly degraded when compared to the control sites, Nash Road, and Harbor Expansion South. As long as Alternative A has good circulation, as expected, regions of poor flushing, concentration of pollutants or reduction in available dissolved oxygen would not be expected.

The conclusion derived from the water quality test and the circulation study for Alternative B is: Circulation and mixing characteristics for the Nash Road site is expected to be sufficient to prevent any regions of poor flushing, concentration of pollutants or reduction in available dissolved oxygen. For both alternatives, isolated incidents of disposal of human waste from boats may occur and may temporarily cause regions with abnormally high coliform counts. This type of disposal is strictly prohibited by Alaska State Statutes on water quality and would not be a normal occurrence. The project, when completed, is expected to meet applicable State of Alaska water quality standards.

7. Nash Road Undeveloped Area

a. Plan A. Not applicable

b. Plan B. The small boat harbor is consistent with the present trend towards development in the Nash Road area and does not conflict with the proposed Seward comprehensive land use plan which identifies potential land uses as commercial, residential, and industrial.

The majority of the Nash Road area is now undeveloped but is expected to develop in the future. The decision to locate a small boat harbor here could influence the rate at which Nash Road develops and the type of development that would occur in the area. The harbor could act as a catalyst for development and could set a trend for certain types of development. For instance, the harbor would tend to encourage more recreational oriented development as opposed to residential or industrial development. Development of harbor support facilities such as bait shops, restaurants, boat supply, and maintenance shops could occur. These are also identified as potential uses for the end of Nash Road.

The small boat harbor, however, is not a single influencing factor. Other potential industries in the area, such as the proposed shipyard at Fourth of July Creek, will influence development at the end of Nash Road. It is likely that development at the Nash Road area would occur before a small boat harbor is constructed.

8. Tourism and Recreation

a. Plan A. This alternative would benefit the local economy by increasing recreation and tourism and would provide additional recreational opportunities in the southcentral region of Alaska. Expanding the small boat harbor would relieve the overcrowded conditions that now exist by creating more recreational facilities for boats. Increased recreational use would benefit the existing hotels, grocery stores, sports fishing stores, and restaurants. Increases in additional facilities could also be expected.

b. Plan B. A small boat harbor at Nash Road would also relieve overcrowding in the existing small boat harbor and benefit recreational boaters in the region. It would not benefit the existing recreational services and support services in Seward as much because new facilities would probably be developed at Nash Road. Many recreational users may tend to bypass Seward and go straight to Nash Road. It could benefit the local economy however, by increasing investment potential at Nash Road. A harbor in this location may increase recreational use of Forest Service lands.

9. Scenic and Esthetic Characteristics

a. Plan A. Expanding the existing small boat harbor to the south would not significantly change the esthetics of the area. If the city creates a greenbelt as planned on the proposed upland dredged disposal site, the esthetics of that area could be significantly improved. The upland disposal site is now covered with twisted metal and concrete debris from the 1964 earthquake.

b. Plan B. Building a small boat harbor at the Nash Road Site would change the esthetic qualitites of the area. The characteristics of the undeveloped natural area would be lost and replaced with the esthetic qualities associated with small boat harbors. Whether this is a positive or negative effect would depend on the type of development that occurs in the area. The dredged materials that would be placed on the beach area would probably have low esthetic value unless efforts to improve their appearance were made, such as landscaping. In any case, the esthetic characteristics of the area would be completely changed from what they currently are.

VI. PUBLIC INVOLVEMENT

A. Public Involvement Program

The public was initially involved in the study through a public meeting held in Seward, Alaska on 22 March 1977. The purpose of the meeting was to gather information concerning navigational needs and possible solutions to these needs.

The public meeting was followed by a public workshop in Seward on 25 October 1978. Prior to the workshop, factsheets were mailed to local residents and copies given to the city manager to distribute. A print of the factsheet was included in the local paper and public service announcements about the workshop were broadcast on the radio. About 60 people attended the workshop. The nominal group process, which involves forming into small groups, was used at the workshop to gather the local opinions on the alternatives that were being proposed. The major results of the workshop were to add Nash Road as a new alternative and to narrow down the other alternatives to expanding the existing habor to the south or to the east.

Comments were requested from the public, organizations, and agencies for consideration in the preparation of the draft EIS. These requests were made by news releases, newspaper display advertisements, and individual letters. A public meeting to discuss the DEIS was held on 16 April 1980 prior to the expiration of the public comment period.

B. Required Coordination

Distribution of the Final EIS will be made to all Federal, State, and local agencies, and interested individuals and organizations for review and comment.

C. Statement Recipients

This list is included as Appendix H.

D. Public Views and Responses

The Nash Road alternative was originally overlooked in the initial planning stages of the study. However, the majority of the individuals participating in the October 1978 workshop expressed the opinion that Nash Road should be considered as an alternative. As a result of the public views stated at the workshop, this alternative was added to the study. The Nash Road alternative was found to be both economically and environmentally feasible and is the selected plan.

Approximately 250 copies of the draft report and EIS were sent out for review. Five letters of comment were received on the draft. Comments were received from: U.S. Fish and Wildlife Service through the U.S. Department of the Interior, Regional Environmental Officer Alaska; National Marine Fisheries Services, Alaska Region; Advisory Council on Historic Preservation; U.S. Environmental Protection Agency, Alaska Operations Office; and U.S. Environmental Protection Agency, Region X.

The majority of the comments received on the draft report and EIS resulted in minor corrections or clarifications of information. A discussion of maintenance dredging was included as a result of the comments received and the discussion on mitigation measures was improved. The comments received did not result in a major change in the study's conclusion.

The U.S. Fish and Wildlife Service commented that both alternatives are biologically acceptable but they preferred Plan A because it would be placed in a previously developed area with support facilities present and it would not involve intertidal fill for a staging area. They had no other comments on the report.

The National Marine Fisheries Service commented that both plans appear to meet the needs of the Seward community in providing additional harbor space while considering environmental, economic, and engineering matters. While they agreed that neither site would have unacceptable impacts to the marine environment, they recommended Plan A because it is located in a previously developed area and impacts the least amount of intertidal and subtidal habitat. They provided the Corps with comments that resulted in corrections and clarifications to the report. Their main concerns were for further clarification on seismic hazards for both alternatives, for additional information on circulation and flushing characteristics, and dredged material disposal.

The Advisory Council on Historical Preservation was concerned that the DEIS did not contain information that demonstrated compliance with Section 106 of the National Historic Preservation Act of 1966. Information was contained in the DEIS but was not correctly referenced.

The Alaska Operations Office of the of U.S Environmental Protection Agency provided comments on improving the 404(b)(1) evaluation.

Comments were received from U.S. Environmental Protection Agency (EPA), Region X which suggested major revisions and reevaluations of the alternatives. EPA feels the DEIS underestimates the potential impacts of the alternatives and contains omissions which are significant. They feel the alternatives are not focused on the problems they are theoretically supposed to resolve and readers cannot determine which of the alternatives is most acceptable from a public health standpoint or from an environmental perspective. By responding to their comments, they hope the Corps will provide a more acceptable alternative.

As a result of the draft plan revisions, further coordination with EPA and the other resource agencies was initiated by the Corps of Engineers. It was determined that the CEQ regulations will be satisfied with the Final Envionmental Impact Statement. A letter of concurrence from EPA is included in the comment-response section.

INDEX

Subjects	STUDY DOCUMENTATION: Environmental Impact Statement	Main Report (References Incorporated)	Report Appendixes (References Incorporated)
Affected Environment	EIS-14-19		App. E
Alternatives	EIS-9-13		
Areas of Controversy	EIS-5		
Comparative Impacts of Alternatives	EIS-12		App. F
Endangered Species	EIS-15		
Environmental Conditions	EIS-14		
Environmental Effects	EIS-21-29		App. F, App. E
Fish and Wildlife Coordination Act Report			App. E
Historical Archeological	EIS-14, 15		App. E, pp. 29
List of Preparers	EIS-2		
Major Conclusions and Findings	EIS-5		
Need for and Objectives of Action	EIS-8		
Planning Objectives	EIS-8		
Plans Considered in Detail	EIS-9-11		App. C, App. D
Plans Eliminated from Further Study	EIS-9		
Public Concerns	EIS-8		

Subjects	STUDY DOCUMENTATION Environmental Impact Statement	Main Report (References Incorporated)	Report Appendices (References Incorporated)
Public Involvement	EIS-30		
Public Involvement Program	EIS-30		
Public Views and Responses	EIS-30		
Relationship to Environmental Requirements	EIS-6		App. F, App. E
Section 404(b)(1) Evaluation			App. E, App. F
Significant Resources	EIS-21-29		
Fisheries & Marine Resources	EIS-17 EIS-24		App. E
Intertidal Areas	EIS-16 EIS-22		App. E, App. F
Nash Road Undeveloped Area	EIS-18, 28		
Resurrection River Wetlands	EIS-15, 21		App. F
Scenic and Esthetic Characteristics	EIS-19, 29		
Tourism and Recreation	EIS-19, 29		
Water Quality	EIS-18, 26		App. F
Statement Recipients			App. H
Study Authority	EIS-8		
Summary	EIS-5		
Table of Contents	EIS-3		

Subjects	STUDY DOCUMENTATION Environmental Impact Statement	Main Report (References Incorporated)	Report Appendices (References Incorporated)
Unresolved Issues	EIS-6		
Water Quality Data			App. F
Without Conditions (No Action)	EIS-9		

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APPENDIX A

PROBLEM IDENTIFICATION

APPENDIX A

PROBLEM IDENTIFICATION

TABLE OF CONTENTS

Item	Page
General Background	A-1
Prior Reports	A-1
Existing Conditions	A-3
Without Condition	A-5

GENERAL BACKGROUND

Seward is a small community located on Resurrection Bay on the Kenai Peninsula, in Southcentral Alaska. Resurrection Bay, noted for its fisheries potential, connects to the Pacific Ocean. The gravel outwash of Lowell Creek forms a fan jetting into the ocean on which the town is sited. The climate is mild because of warm bay waters; however, storms sweep down from inclosing mountains bringing wind and precipitation.

The community of 2,500 people relies on commercial fishing and fish processing, transportation, and tourism for its basic industry. Recent enactment of the 200-mile offshore limit has placed Seward in an envious position for the development of bottomfishing and processing. Seward is a log exporting center, has a marine ferry terminal, is the terminus of a State highway, the site of a State vocational training school, and home port for research vessels of the University of Alaska Marine Institute. The government owned Alaska Railroad connects northward 114 miles to Anchorage and 356 miles further to Fairbanks. During the construction of the trans-Alaska pipeline, heavy cargo was shipped inbound, but that has ceased with completion of construction.

PRIOR REPORTS

The following reports have been submitted covering navigation improvements at or in the vicinity of Seward, Alaska.

1. House Document No. 109, 70th Congress, First Session, recommended dredging a 4.75-acre basin and construction of a 580-foot rock breakwater to a height of 16 feet, MLLW, on the southeast side of the basin. The project was authorized 3 July 1930 and construction was completed in 1932 at a cost of $112,401.

2. House Document No. 3, 74th Congress, First Session, was submitted in review of House Document No. 109, with a view to determining whether it was advisable to modify the existing project in any way at that time. The District Engineer recommended that no modification be made to the existing project at that time.

3. House Document No. 182, 83d Congress, First Session, recommended raising the project elevation of the south breakwater 3 feet, constructing two opposing woodpile breakwaters on the east (entrance) side of the basin and filling the gap between the existing breakwater and the piling with rock. The modification was authorized 3 September 1954 and constructed in 1956.

4. The harbor constructed in 1956 (para. 3 above) was found undersized and a new review report authorized 16 June 1959 by the Committee on Public Works of the United States Senate was nearing completion. The report recommended expansion of the existing basin. However, before the report was submitted, the disastrous Alaska earthquake of 27 March 1964, obliterated the waterfront. The harbor was considered a total loss.

5. Following the earthquake and prior to reconstruction several pertinent reports were prepared.

a. Subsurface investigations were conducted and reported upon jointly by the U.S. Geological Survey and Corps of Engineers and by special individual papers, May 1964.

b. Potential quarry sites along Lowell Point Road were investigated, sampled, and reported upon in June 1964 by the Alaska District, Corps of Engineers and North Pacific Division Laboratory, Troutdale, Oregon, June 1964.

c. Congress, following the 1964 earthquake, established a special multidisciplinary panel, the Federal Reconstruction and Development Planning Commission for Alaska. The objective of this commission was to evaluate field team data and special task force recommendations, compile results and submit a report to Congress. Following completion of the report, all units were dissolved.

The Task Force made two sets of recommendations on Seward to the Commission. These recommendations were based on visits to the town by field team members, on detailed geologic reports by the U.S. Geological Survey, and on a soils report to the Corps of Engineers by Shannon and Wilson, Inc.

The first report, released on July 17, 1964 dealt with the suburban subdivisions of Clearview and Forest Acres and the Eads site at Lowell Point. Recommendations on Seward proper were made in a joint Corps of Engineers and Task Force report, released on July 24, 1964.

The greatest part of Seward was classified as "nominal risk," with consequent eligibility for Federal aid, providing that the current Uniform Building Code for Seismic Zone 3 was followed in all design and construction work. The waterfront area, carefully defined in detail on the map was classed as "high risk," and the firm recommendation was made that it be reserved for parks or other uses that do not involve large concentrations of people. The waterfront land within the high-risk line is fractured and weakened as a result of the submarine landslides that destroyed the Seward dock facilities, and the field team and Corps of

Engineers believed that another large earthquake might cause further submarine sliding within the area designated as high risk. The line between high and nominal risk areas was based in part on the distribution of visible earth fractures, but in greater part on differences in the underlying geologic materials.

This classification of the townsite resulted in a line being drawn between high risk and nominal risk areas approximately 500 feet north of the destroyed harbor site. Everything south of the line being high risk (see Figure 3 in the main body of this report).

6. A U.S. Army Engineer District, Alaska report, 12 July 1964, prepared as Letter Report, Seward Small Boat Harbor, Alaska, recommended that replacement of the quake destroyed habor was vital, that relocating to a nominal risk area to the north of the old harbor was preferable, and that in view of prequake needs, expansion of the new harbor was justified. Consequently a new harbor was completed in June 1965 at a location to the north. Cost was distributed between the Office of Emergency Preparedness ($1,403,000) and the Corps of Engineers ($1,150,000). It is this existing project which is currently under review.

7. In response to local requests, a Section 107 Reconnaissance Report submitted in April 1976, found improvements for deep draft navigation at Seward were possible without breakwaters or entrance channels. Thus, no Federal participation was warranted at that time.

8. In response to local requests, a Section 107 Reconnaissance Report submitted in April 1976 found Federal participation in small boat harbor improvements at Seward, although justified, were beyond the scope of the Section 107 authority and a Congressionally authorized study was recommended.

EXISITNG CONDITIONS

Under Russian colonialism during the early 19th century, Resurrection Bay was recognized as a favorable harbor site. Subsequently, under U.S. ownership a town was founded, and in the early 1900's the community was selected as the site of a railroad center with tracks northward into interior Alaska. The railroad went bankrupt and was subsequently absorbed by the government. The federally-owned Alaska Railroad was completed to Fairbanks in 1922.

Inbound freight is offloaded at the Alaska Railroad dock; marine ferries dock at the city ramp at the foot of Fourth Avenue, and some foreign-owned ships dock at Fourth Avenue to load milled timber for overseas shipment. Japanese ships dock at the Alaska Railroad Dock to load milled timber and to fill cargo holds with wood chips for shipment to Japan. These timbers and chips are produced at the adjacent mill and yard of the Kenai Lumber Company. This mill also has its own landing, boom yard, and log handling dockage where log rafts are broken down, logs sorted, and removed from the water for milling. Commercial fishing boats dock at the city wharf inside the small boat basin and at a private dock at the base of Lowell Point Road for off loading, fueling, servicing, and fish processing. Marine research boats dock at the Fourth Avenue wharf, and commercial mineral exploration boats dock at Fourth Avenue and at the railroad dock. Many recreational boats as well as commercial fishing boats use the small boat basin. Because of the limited number of deep-draft docks (two), the 20 or more weekly landings, and interference by adverse weather, existing deep-draft facilities are overtaxed by port activities. Constant reshuffling is required, and extra costs for wharfage and standby time may be incurred. This is directly attributable to lack of dock space. A previously submitted Section 107 Reconnaissance Report determined that deep-draft navigation improvements at Seward would not require breakwaters or entrance channels.

Medium-draft and shallow draft commercial boats have similar dockage problems due to the lack of dock space. Fish processing plants, fuel, and servicing are concentrated at the inner dock face of the small boat harbor. During rush periods, boats must stack up two to four abreast to service or to await their turn to unload. This is particularly notable with shrimp, crab, and halibut boats which may require 10 hours to unload a multiton catch at dockside. Standby is costly and detrimental to catch quality.

Small fishing boats and recreational craft share common problems. Such craft are normally stored elsewhere for off season, then trailer mounted to be hauled to Seward for seasonal, weekend, or daily use. Two problems evolve: crowded launching ramps, (only one is available) and lack of sheltered mooring space in the harbor. Much time is lost at the ramp and a long waiting list of 300 to 400 boats await assigned moorage. Increased cost and inconvenience result from this lack of mooring space and inner harbor facilities.

In addition to assigned and wait-listed boats, more than 1,000 transient craft of varying types visit the area for commercial fishing or recreation. These boats require space for short term mooring for service, supply, fueling, marketing and repair, for safety in time of storm, and for tie up during closed periods in commercial fishing. Further, hospital, medical, and air service are available at Seward for emergencies.

WITHOUT PROJECT CONDITION

A number of complex management resource problems at Seward, were identified in the course of this study. They are listed and explained below.

Fleet

The present harbor at Seward is severely overcrowded, resulting in costs to the commercial fishing and recreational boat fleets. Recent trends indicate a sizeable increase in number of small recreational craft can be expected in the near future. Therefore, presently crowded conditions will continue and be intensified by fleet increases and fleet activity. Losses to the fleet will be accentuated, inconvenience will be increased, and potentials for expansion in the fisheries industry cannot be achieved, with resultant losses to the environment and national economy.

Present and future fleet needs are shown below.

1. Recreational Boats. The present recreational boat fleet numbers 911 for which there are 594 slips available. By year 2025 the recreation fleet is expected to average 1,414 boats. For a detailed analysis, see the Economics Section Appendix B.

2. Commercial Boats. Currently, there are 215 commercial boats using the Seward harbor facilities. By the year 2025, the future expected commercial fleet is expected to be 260 craft. For a detailed analysis, see Appendix B.

3. Dry Land Storage. For commercial boats needing off-season repairs or without storage berthing, more adequate facilities for removal from the water and dry land storage are needed. Although area is available, it is unimproved and has poor access. The existing area needs improvement,

4. Launching Ramp and Mooring. Recreational boats are launched and retrailered, resulting in long waits at the launching ramp and difficult overnight storage. Another launching ramp and more boat slips are needed.

5. Vehicle Parking. As a result of concentrated commercial fishing and recreational boating, auto and trailer congestion has become acute in the vicinity of the small boat harbor. Additional paved parking is needed.

6. Marine Grid. The State of Alaska marine repair grid at Seward is too small, too light in capacity, and overtaxed. New grid space is needed to assist local boat owners, thereby preventing the costly trip to Puget Sound for major repairs.

7. Onshore Winds. During winds from the south, vessels are pinned to the Fourth Avenue dock by waves. This forces State of Alaska ferries to dock at the Alaska Railroad dock which is not equipped to handle automobiles, and for which the railroad charges a fee. A new dock, protected from onshore waves is needed, or a site along Lowell Point Road could be developed tangential to onshore waves.

8. Commercial Fishing Boat Stacking. Adequate offloading facilities are unavailable and long periods of time are required to unload shrimp, crab, and halibut. Boats awaiting their turn to unload must moor two to three abreast at the dock. Such mooring causes constant shuffling, boat damage, overloading of electric circuits, is detrimental to catch, and causes extra crew work. The problem can be relieved by additional dock space and offloading facilities.

9. Flood Control. Maintenance at the existing Federal flood control project has been a problem. Rock debris is brought down by swift currents and constantly destroys the tunnel invert. Cobbles and gravel build up to such an extent that during heavy flows the Lowell Point Road and bridge are threatened. Crews must remove debris and the townsite has been threatened with flooding. A larger bridge opening, and more frequent maintenance of debris removal at the outfall and at the upper intake might lessen the problem. Operation and maintenance has been turned over the the city of Seward.

10. Harbor Mouth Shoaling. Local crab and halibut boats have been scraping bottom in the harbor entrance. Owners complain this is caused by harbor mouth shoaling, and that their boats must await high tide to enter the harbor when loaded. They say dredging may be required to relieve the problem. A condition survey was completed June 1977 and found the harbor and entrance at project depth, with no dredging required.

11. Beach Erosion. As a result of the 1964 earthquake subsidence, areas fronting the townsite came under wave attack. Fill restored most frontage areas. However, ocean waves are again attacking the unconsolidated fill and erosion is apparent. Riprap and heavy fill are needed to resist waves in the area from the small boat harbor to the foot of

Fourth Avenue. A pilot erosion control project with Federal funding was planned, however, local interests were reluctant to meet these requirements for local cost sharing. Furthermore, erosion control is beyond scope of this study.

12. Summary. As relates to navigation needs:

a. The primary problem for deep and medium-draft vessels at Seward is the lack of dock and moorage space.

b. Shallow draft boats, for commercial and recreational usage at Seward, suffer from lack of protected mooring area and insufficient moorage facilities. This study will concentrate on provision of harbor protection wherein local interests can develop inner harbor facilities.

APPENDIX B

ECONOMICS

APPENDIX B

ECONOMICS

TABLE OF CONTENTS

Item	Page
METHODOLOGY	B-1
MOORAGE DEMANDS	B-2
Existing Fleet	B-2
Transient Boats	B-2
Wait Listed Boats	B-3
Trailored Boats	B-4
Future Boats	B-5
Charter Boats	B-5
Commercial Boats	B-5
Recreational Boats	B-5
Summary	B-6
BENEFITS	B-7
Method of Analysis	B-7
Benefit Analysis	B-7
Savings from Reduction of Overcrowding	B-7
Charter Boats Benefits	B-9
Recreational Boats	B-10
Existing Boats	B-10
Future Boats	B-12
NED Employment Benefits	B-13
Increased Fish Catch	B-14
Harbor of Refuge Benefits	B-15
Land Enhancement Benefits	B-15
Summary of Allocated Benefits	B-16
Benefit/Cost Ratio	B-16

LIST OF TABLES

Number	Title	Page
B-1	Existing Stalls Available	B-2
B-2	Existing Transient Fleet	B-3
B-3	Wait Listed Boats	B-3
B-4	Equivalent Number of Trailored Boats	B-4
B-5	Equivalent Permanent Moorage Spaces Required	B-6
B-6	Preventable Boat Damage	B-8
B-7	Benefits to Recreational Boats	B-11
B-8	NED Employment Benefits	B-14
B-9	Summary of NED Benefits Nash Road	B 16

ECONOMICS

The purpose of this section is to delineate the economic aspects of the selected plan, regarding benefit derivation and annual costs. Data presented in the following narrative concern only such aspects of the proposed improvements as can be assigned tangible monetary values.

METHODOLOGY

Any tangible economic justification for the proposed improvements is best determined by comparison of equivalent average annual charges (including both capital and maintenance costs) with an estimate of average annual benefits to be derived from construction of the project. Benefits should equal or exceed costs to justify Federal participation in the project. Derivation of benefits and costs adhere to standard Corps of Engineers policy and practice. All costs and benefits in this analysis are estimated in monetary terms at October 1981 price levels.

Benefits and costs are made comparable by conversion to an equivalent time value of money by application of an appropriate interest rate. The current approved interest rate for evaluation of Federal water resource develop- ment projects is 7-5/8 percent. A number of economic and physical factors influence the economic life of the project, such as physical deterioration of structures, changing needs, or depletion of fishing resources. An economic life of 50 years is selected for analysis of the Seward project.

MOORAGE DEMAND

EXISTING FLEET

The existing 21-acre small boat harbor at Seward, Alaska provides for 594 permanent moorage slips ranging in size from 18 to 75 feet. Each of these slips have been leased and vessels wanting permanent moorage within the harbor are on a 3-year waiting list.

In addition to the 594 leases for permanent moorage space, the port sells permits to boat owners on a daily, weekly, monthly, or yearly basis to dock their boats as space will allow. During the active season from 1 May to 30 September, the port can provide for approximately an additional 250 transient boats. Many of the spaces for these 250 transient boats are made available by severely overcrowding the transient dock. Transient boats are moored to the ends of floats and between the main float and the bank.

As an interim effort to accommodate as many vessels as possible the port has also implemented a management technique policy called "hot berthing" which means that a slip can be reassigned while the regular user is away for an extended period of time.

Table B-1 shows the number of slips by size presently available in the harbor and the types of vessel which have permanent leases on those slips.

TABLE B-1

EXISTING SLIPS AVAILABLE

Slip Size	Recreational Vessels	Commercial Vessels	Total Slips
18	146	2	148
24	88	10	98
32	135	27	162
40	66	24	90
50	62	18	80
75	8	8	16
Total	505	89	594

TRANSIENT BOATS

Seward Harbor accommodates a large fleet of transient boats, especially during the peak summer months. Many of the transient boats require moorage space for less than a day, while others stay as long as 5 or 6 weeks. Approximately 1,000 transient craft visit the harbor annually. The harbormaster estimates that the transient fleet accounts for 250 equivalent full-time moorage spaces.

Table B-2 shows the existing transient fleet as equivalent boats requiring permanent moorage spaces.

TABLE B-2

EXISTING SLIPS AVAILABLE

Boat Length	Equivalent Recreation Boats	Equivalent Commercial Boats
18-23	55	2
23-26	64	2
27-36	25	28
37-44	9	16
45-54	3	9
55-84	0	25
85+	0	12
Total	156	94

WAIT LISTED BOATS

In addition to the 594 permanent boats and the 250 equivalent transient boats, the port of Seward currently has a waiting list for moorage spaces for 358 boats, of which 85 percent are recreational and 15 percent are commercial. These boats are expected to be full-time users once moorage spaces become available. A review of harbor records showed that 40 percent of the wait-listed boats were also included in the transient category of 1,000 vessels. A value of 214 equivalent permanent boats will be used (358 x 60 percent).

Table B-3 shows the 214 equivalent wait listed boats classed as recreational or commercial by boat length.

TABLE B-3

WAIT LISTED BOATS

Boat Length	Recreational Boats	Commercial Boats
18-23	75	2
23-26	64	10
27-36	38	10
37-44	4	4
45-54	1	2
55-85	0	2
85+	0	2
Total	182	32

TRAILORED BOATS

Under existing conditions, it is estimated that on a weekend during the peak season an average of 150 recreational boats will be trailored to Seward. The great majority of these users haul their boats back on Sunday due to the lack of available slips and adequate dry storage. Most of the trailored boats originate in Anchorage, which is about a 3-hour drive from Seward. Upon arrival in Seward, these boat owners invariably confront severe congestion at the boat harbors only launching ramp and limited make-shift arrangements for dry storage. Not considering the special difficulties of creating additional dry storage, this alternative is unattractive to boat operators in that it does not relieve the inconvenience of waiting to launch the boat. That dry storage which is available is disorganized, unsecured, and less favored (than wet storage) because of the adverse effects of repeated weekend handling and the need for specially equipped, and often uneconomical vehicles. These factors, coupled with limited prospects for additional ramps has led to a strong preference for wet storage over dry storage. That preference is expected to be accented by ever larger recreational boats, which do not lend themselves well to launching operations. Interviewed boat operators showed that about 90 percent would use harbor moorage if available to avoid the long drive pulling a boat and the waiting in line to launch the boats. Acting on the widespread consensus that the waiting list is futile and that wet moorage is unattainable, about 10 percent of the trailored category is estimated to be wait-listed. These would in all likelihood include the larger trailored craft. On an average the boat operators indicated that they would expect to use the harbor for only about 2-1/2 months out of the total 5 month recreation season. Therefore, an equivalency factor of 0.5 was applied to the trailored boats which indicated a need for moorage facilities.

Table B-4 shows the equivalent number of trailored boats which need moorage space.

TABLE B-4

EQUIVALENT NUMBER OF TRAILORED BOATS

Boat Length	Recreational Boats
18-23	36
23-26	16
27-36	09
Total	61

FUTURE BOATS

Charter Boats

Charter fishing out of Seward has been primarily for halibut (other bottomfish and salmon are also taken). In 1980, Seward's charter boat fleet totaled approximtely 20 vessels of a slightly smaller average size than the current fleet. The current fleet consists of 40 boats with a 6 to 20 person capacity and lengths of 35 to 50 feet. The population of the Anchorage-Kenai Peninsula was approximately 209,000 and 240,000 1/ over these representative periods. Corresponding figures for visitors to Alaska were 250,000 and 430,000, respectively 2/. Tourism, and to some extent the population, has been subject to considerable fluctuation, depending on the economy of Alaska and the nation as a whole. Nevertheless the trend has been clearly upward. Accordingly, demand for charter fishing in Seward has increased sharply and is expected to increase at a rapid rate. Some charter operations are making two fishing runs per day to keep up with demand. Recent growth patterns in the Seward charter boat fleet and future demands as seen by local planners and indicated by related statistical trends, show that 30 new charter boats will join the fleet over the next 10 years.

Commercial Boats

The commercial fishing fleet would increase by 15 boats due to harbor expansion. This increase will be discussed later under the economic benefits from increased fish catch.

Recreational Boats

According to the latest available figure (1977) compiled by the U.S. Coast Guard, about 5,500 recreational boats were registered in the Anchorage-Kenai Peninsula area in 1977. This area had a population of about 225,000 1/ people or about 40 people for every recreational boat. Recreational opportunities for boat owners in this area are fairly limited. Most activity involves ocean fishing with some freshwater fishing in the lakes just north of Anchorage and in the rivers of the Kenai Peninsula. About 90 percent of the area's recreational boats currently use salt water harbors on the Kenai Peninsula while the remaining 10 percent use interior lakes and streams.

Under existing conditions, nearly 30 percent of the people owning recreational boats use the Seward Harbor. Seward is one of only three small boat harbors within the area with facilities for recreational boats and it is used regularly because of its proximity to the fishing grounds.

1/ Southcentral Level B Study February 1979. Estimate taken from intermediate case.

2/ The Alaska Economy; Year End Performance 1975, 1979. Division of Economic Enterprise, Department of Commerce and Economic Development, State of Alaska.

In computing future recreational boats, it is assumed that the number of recreational boats will increase at the same rate as the population. Population projections for half of the project life, assuming 40 people per recreational boat, show that total recreational boats will increase to 9,225 by 2010. Subtracting the existing 5,500 from that total projected number leaves a total increase of 3,725 recreational boats in the Anchorage-Kenai Peninsula area. Therefore, 1,117 of the total projected boats would use the Seward Harbor. In computing total required moorage space needed to accommodate the 1,117 boats, the same assumptions that were used with existing trailored boats were applied, i.e. 10 percent would trailor these boats and would not need moorage space, the remaining 90 percent would, on the average, require moorage space 2-1/2 months out of the 5 month recreational season. Spaces required would equal: 1,117 X .9 X .5 = 503.

SUMMARY

Table B-5 shows total existing and future demand for moorage space at Seward.

TABLE B-5

EQUIVALENT PERMANENT MOORAGE SPACES REQUIRED

	Recreational Boats	Commercial Boats
Existing Full-Time Boats	505	89
Existing Transient Boats	156	94
Existing Wait-Listed Boats	182	32
Existing Trailored Boats	61	0
Future Commercial Fishing Boats	0	15
Future Charter Boats 1/	0	30
Future Recreational Boats	503	0
Total	1,407	260

1/ Over the next 10 years, charter boats are anticipated to increase by 30 boats.

BENEFITS

METHOD OF ANALYSIS

Current commercial fishing and related activities, as well as recreational needs and activities, have been investigated as they relate to present and future trends and to the need for navigation improvements at Seward. Extensive coordination has been conducted with State and local government agencies, private citizens, and local and State business interests. Data supplied by agencies have been supplemented and verified by local testimony and field interviews with fishermen, cannery operators, fish processors, and recreational users. These data, as analyzed herein, are the basis for benefit determinations.

BENEFIT ANALYSIS

As analyzed in detail in the following sections, benefit categories for Seward are savings from reduction of overcrowding, charter boats, harbor of refuge, recreation, area redevelopment, and increased fish catch. Where benefits are expressed in terms of number of boats, these raw boat numbers have been reduced to an appropriate number of fulltime vessel equivalents. Where a benefit is attributable to recreational interests, as opposed to commercial, Corps policy stipulates that such benefits be divided equally between Federal and local interests. This division becomes the basis for the sharing of the cost of general navigation facilities.

Savings from Reduction of Overcrowding

These benefits include reduced damages to boats, reduced damages to harbor facilities, and labor saved in moving boats within the existing overcrowded harbor.

Heavy congestion in the harbor causes damages to transient craft far in excess of normal wear and tear. These craft must be moored abreast of each other, thus causing scratched/damaged paint, line chaffing, broken windows (due to line breaking and fixtures going through windows), and minor collision/bumping damage. Harbormaster records show that an average of 389 transient vessels per year receive damage which would be prevented if the congestion were alleviated. Preventable damage is shown in Table B-6 for both recreational and commercial boats.

TABLE B-6

PREVENTABLE BOAT DAMAGE

Boat Length	Recreational Boats	Commercial Boats	Damage Amount	Recreational Damage	Commercial Damage
18-20	62	7	$ 100	$ 6,200	$ 700
21-40	118	135	300	35,400	40,500
41-60	5	24	650	3,250	15,600
61-80	1	20	1,250	1,250	25,000
81+	0	17	1,500	0	25,500
Total	186	203		$ 46,100	$107,300

Maneuvering under crowded conditions causes collison damage to all boats. Broken ribs, sprung planking, and damages to rigging, stays, and steerage are examples of this type of damage. The harbormaster states that an average of seven collisions are reported yearly. The following shows preventable collsion damages to both recreational and commercial boats.

	Recreational Damages	Commercial Damages
2 Major Collisions	$3,200	$3,200
5 Minor Collisions	1,000	1,500
Total	$4,200	$4,700

In the past 5 years approximately $400,000 in fire loss has occured to vessels, $200,000 to recreational boats, and $200,000 to commercial boats. The harbormaster estimates that the losses would have been reduced 75 percent had overcrowding been eliminated.

Type of Boat	Fire Damage	Prevented	Annual Damage Preventable
Recreational	$200,000	.75	$30,000
Commercial	$200,000	.75	$30,000

Finally, smaller skiffs and smaller boats (outboards) are crushed and damaged. An average of six per year are reported to the harbormaster at an estimated cost of $1,500 per boat.

Number Boats	Damage Per Boat	Recreational Damages	Commercial Damages
4	$1,500	$6,000	-0-
2	$1,500	0	$3,000

Inner Harbor Damage

Damage to harbor facilities is caused by the overcrowded conditions in the current harbor. Annually, an average of five pilings are damaged due to excessive pressures and must be replaced at a cost of $1,000 each. Elimination of this damage equates to an annual benefit of $5,000.

Labor Savings

Elimination of overcrowding would produce labor savings for harbor personnel. At least one-half man-hour per shift is required to check on large commercial transients to insure that lines are properly secured, resulting in an annual cost of $10,950. Further, it is estimated that 800 man-hours per year are expended by harbor personnel in moving vessels within the harbor. Vessels must be moved when their owners are not present to allow boats "boxed-in" by overcrowding to leave the harbor, this amounts to $16,000 per year, for total labor savings of $26,950 annually.

Charter Boat Benefit

It is anticipated that 30 additional charter boats would be added to the Seward charter fleet over the next 10 years if additional harbor space were available. To compute charter benefits, the depreciated value (50 percent) of the expanded fleet value is assumed to return 15 percent annually. This benefit assumes a growth period of 10 years, with a level period for the remaining 40 years of project life.

Fleet Value:	10 boats @ 50' @ $2,200/ft	=	$1,100,000
	20 boats @ 35' @ $1,000/ft	=	700,000
			$1,800,000

At the end of a 10-year growth period the annual earning from the charter fleet would be $1,800,000 X .50 X .15 or $135,000. The present worth of this future earning for a 10-year growth period and a 40-year constant period is derived as follows:

			Prevent Worth
a.	$135,000-: 10 X 33.4	=	451,440
b.	$135,000 X 5.96	=	805,000
	Total P.W.	=	$1,256,440

The equivalent annual benefit for the charter additional fleet is:

$1,256,440 X .07823 = $98,300

Recreational Boats

Existing Boats: Existing recreational boats include those with permanent moorage, transient, wait-listed, and trailored. In addition to the damages those boats now incur, they receive only 70 percent of the ideal rate of return which is assumed to be 10 percent. The lesser rate of return received is due not only to delays caused by the existing harbor condition but also to the fact that many people do not use the harbor as much as they would under improved conditions. Existing recreational boats are earning 30 percent less (70 percent of the total amount, leaving 30 percent earned due to congestion) than they would earn with adequate protection. Benefits to existing recreational boats are shown in Table B-7 Average depreciated values for the various boat length classes were assumed to be equal to the actual boat appraised values. Conversations with various boat appraisers resulted in the appraised following boat values indicated in Table B-7.

TABLE B-7

BENEFITS TO RECREATIONAL BOATS

Recreational Boats	Number of Boats	Average Depre- ciated Value	Total Depre- ciated Value	Ideal Return with Improve- ments	Total Amount	Increase in % Return Due to Improve- ments	Annual Benefits
Existing Boats							
Outboards							
Length of Boat							
18-23	123	15,000	1,845,000	12%	221,400	30%	66,400
Inboards							
Length of Boat							
18-23	123	15,000	1,845,000	10%	184,500	30%	55,400
23-26	192	22,000	4,224,000	10%	424,400	30%	126,700
27-36	179	45,000	8,055,000	10%	805,500	30%	241,700
37-44	68	69,000	4,692,000	8%	375,400	30%	112,600
45-54	61	82,000	5,002,000	8%	400,200	30%	120,000
55-85	7	94,000	658,000	8%	52,600	30%	15,800
Sail							
Length of Boat							
18-23	65	15,000	975,000	8%	78,000	30%	23,400
23-26	40	22,000	880,000	8%	70,400	30%	21,100
27-36	28	45,000	1,260,000	8%	100,800	30%	30,200
37-44	11	69,000	759,000	8%	60,700	30%	18,200
45-54	5	82,000	410,000	8%	32,800	30%	9,800
55-85	1	94,000	94,000	8%	7,500	30%	2,300
TOTAL	903						$843,600

TABLE B-7 (cont'd)

Future Boats: These boats would receive 100 percent of the ideal rate of return as shown below.

Recreational Boats	Number of Boats	Average Depre-ciated Value	Total Depre-ciated Value	% Return With Improve-ments	Annual Benefits
Future Boats					
Outboards					
Length of Boat					
18-23	90	15,000	1,350,000	12%	162,000
Inboards					
Length of Boat					
18-23	91	15,000	1,365,000	10%	136,500
24-26	146	22,000	3,212,000	10%	321,200
27-36	66	45,000	2,970,000	10%	297,000
37-44	13	69,000	897,000	8%	71,800
45-54	3	82,000	246,000	8%	19,700
55-85	2	94,000	188,000	8%	15,000
Sailboats					
Length of Boat					
18-23	48	15,000	720,000	8%	57,600
24-26	30	22,000	660,000	8%	52,800
27-36	10	45,000	450,000	8%	36,000
37-44	3	69,000	207,000	8%	16,600
45-54	1	82,000	82,000	8%	6,600
55-85	0	94,000	--	--	
TOTAL	503				$1,192,800

The annual net return for future recreational boats is calculated to be $1,192,800 for the 25th year of project life. The annual benefits are figured as a 25-year increasing gradient series followed by a 25-year constant period. The present worth value is amortized over 50 years at 7-5/8 percent and combined with benefits to existing recreational boats as shown.

The benefit to be earned at the end of the 25-year growth period is estimated to be $1,192,800. The present worth of the growth period and the constant period is calculated as follows:

a. $1,192,800 ÷ 25	X	103.40	=	$4,933,400
b. $1,192,800	X	1.76	=	2,099,300
	Present Worth		=	$7,032,700

The equivalent annual benefit for recreation growth is:

$7,032,700 X .07823 =	$ 550,200
Present recreational benefits	843,600
Recreational benefits (Present and future)	$1,393,800

NED Employment Benefits

Area redevelopment, or employment benefits are based on the determination of project construction effects in an area where unemployment and/or underemployment are persistent.

These benefits are claimed as the impact that project construction will have on the local employment picture. Only the costs of major navigation features and mooring basin floats will be considered and these are estimated to be 50 percent machine and equipment and 50 percent labor. Where local hire laws exist, as is the case in Seward, labor costs are expected to fall in a 30-40-30 ratio between the skilled, unskilled, and other categories, respectively. The labor force of the Seward area is estimated at 980 with 140 workers listed as unemployed at any point in time. About 100 laborers are required for project construction with local shares anticipated are shown in Table B-8.

TABLE B-8

NED EMPLOYMENT BENEFITS

		PLAN B ($)	PLAN A ($)
Total Costs - Navigation Features		15,159,700	12,060,000
Portion Assigned to Labor (50%)		7,579,900	6,030,000
	Skilled	2,274,000	1,809,000
	Unskilled	3,031,900	2,412,000
	Other	2,274,000	1,809,000
Local Shares			
	Skilled (20%)	481,100	361,800
	Unskilled (75%)	2,405,300	1,809,000
	Other (30%)	121,600	542,700
Applied Benefit Ratios			
	Skilled (0.43)	206,900	155,400
	Unskilled (0.58)	1,395,100	1,049,200
	Other (0.35)	252,600	189,900
Total		1,854,600	1,394,500
Annual Benefits	(Total X 0.07823)	145,100	109,200

Increased Fish Catch

Harbor expansion would allow further diversification of the fishing industry of the area. Longer boats (80 plus feet) now fishing for shellfish could expand this resource and participate in development of the future bottomfish industry. Detailed research into future fisheries potential is very limited at this point, but National Marine Fisheries Service (NMFS) planners are agreed that considerable bottomfishing activity can be attributed to harbor expansion. An estimated increase in the bottomfish harvest of 8,000,000 pounds per year by U.S. fishermen would occur as a result of the recommended harbor improvements at Seward. This would be accomplished by approximately 15 additional commercial fishing vessels based at Seward. A steady growth from present levels to the fully increased harvest would occur over an estimated 10-year period. Statistics maintained by NMFS for 1981 indicate an average price of $0.11 to $0.12 per pound for all Alaskan bottomfish species. The fleet at Seward is expected to concentrate on the "convenience species," which are marketed as sticks or fillets at an average 1981 ex-vessel price of $0.15 to $0.17 per pound. A value of $0.15 per pound was applied in this analysis. Previous analyses of the net-to-gross ratios realized by vessel owners engaged in bottomfishing in Alaska have revealed an average net-to-gross ratio of 12.6 percent. The net profit of vessel owners from the increased harvest equates to the NED benefit of the recommended project in this category. The total present worth of this NED benefit is calculated as follows, over a 50-year project life at a current interest rate of 7 5/8 percent.

(8,000,000lbs. X $0.15/lb X 0.126)	10 yrs. X 33.44/yr.	= $505,600
(8,000,000lbs. X $0.15/lb X 0.126) X 5.96		= 901,200
Total Present Worth		=$1,406,800

Expressed as an equivalent annual amount, the NED benefit for increased fish harvest is:

$1,406,800 X 0.07823 = <u>$110,100</u>

Harbor of Refuge Benefits

Under existing conditions, Seward harbor is able to offer adequate protection to transient vessels during sudden storms. However, as the number of transient boats using the harbor increases such protection will not be available to all boats. It is estimated that an expanded harbor would prevent $10,000 damage per year to three vessels. Harbor of refuge benefits are estimated at $30,000.

Land Enhancement Benefits

This category of benefits occurs as newly created or improved land is put to a higher and better use as a result of project construction. The annual benefit increases the extent of local participation in the cost of general navigation features of the project. In the case of the south expansion, all federally assigned dredged material would be placed in a designated disposal site. Hence, no land enhancement may be claimed. However, federally and locally owned dredged material from the Nash Road site that can be utilized for land enhancement is 1,029,400 cubic yards (35% Federal, 65% local). Under such an arrangement a total of 35 acres could be enhanced and employed as a staging area. This acreage is otherwise subject to tidal influence and of no economic value. However, with enhancement, local realtors indicate a per acre value of $15,000 based on comparative waterside parcels. Of the total acreage to be affected, 35 percent would be the result of Federal effort and 65 percent a local effort, but 100 percent is allocated as a local benefit as it results from local "associated" costs and accrues to the local sponsor of the project.

35 X $15,000 X .07823 X 1.0 = $41,100

SUMMARY OF ALLOCATED BENEFITS

A summary of the benefits earned by construction of the Nash Road Site and the percent of the total assigned and local interests are shown in Table B-9.

TABLE B-9
SUMMARY OF NED BENEFITS-NASH ROAD

Type of Benefits	Allocated Benefits Total	Federal	Local
Damage Reduction			
Recreation Boats	$ 86,300	$ 43,150	$ 43,150
Commercial Boats	145,000	145,000	
Harbor Facilities	5,000	5,000	
Labor Savings	27,000	27,000	
Charter Boats	98,300	98,300	
Recreational Boats	1,393,800	696,900	696,900
Increase Fish Catch	110,100	110,100	
Harbor of Refuge	30,000	30,000	
Land enhancement	41,100	0	41,100
Annual Benefit	= $1,936,600	$1,155,450	$781,150
Employment Benefit	= 145,100	65,300	79,800
	$2,081,700	$1,220,750	$860,950

B/C Analysis (Plan B, Nash Road)

$$\frac{\text{Annual Benefit}}{\text{Annual Costs}} = \frac{\$2,081,700}{\$1,387,700} = 1.5$$

APPENDIX C

ENGINEERING

APPENDIX C

ENGINEERING

TABLE OF CONTENTS

Item	Page
ENGINEERING CRITERIA	C- 1
General	C- 1
Sedimentation	C- 1
Tides and Currents	C- 1
Climatology	C- 3
Design Analysis	C- 3
Wind Analysis	C- 3
Significant Wave	C- 4
Refraction and Shoaling	C- 4
Breaking Wave Condition	C- 8
Design Wave	C- 9
Diffraction Analysis	C- 9
Breakwater Design	C- 9
Slope	C- 9
Armor Stone Dimensions and Thickness	C- 9
Wave Runup, Crest Elevation, and Crest Width	C-14
Minimum Entry Width	C-14
Harbor Depth	C-14

LIST OF FIGURES

Title	Page
Frequency Curves	C- 5
Wind Velocity - Duration Curves	C- 6
Effective Fetch	C- 7
Nash Road, Refraction Diagram @ 210°	C-10
Nash Road, Refraction Diagram @ 183°	C-11
Nash Road, Diffraction Diagram @ 210°	C-12
South Expansion, Diffraction Diagram @ 130°	C-13

LIST OF PLATES

Number	
C-1	Nash Road Breakwater Sections
C-2	Nash Road Breakwater Sections

ENGINEERING CRITERIA

GENERAL

The following general criteria have been adopted to guide in formulating small boat harbor navigation improvement plans for the Seward vicinity:

1. The selected plan should be consistent with local and State goals for harbor development;

2. The selected plan must conform to local land use planning;

3. Dimensions of the selected plan should be adequate to accommodate expected user fleet size for the present and foreseeable future; and

4. Adequate access should be available in the area of the selected plan.

In addition to the general criteria, specific technical considerations have influenced formulation plans. Because all alternative sites and the existing harbor are subjected to equal wave forces, only one set of determinants is derived. Major technical considerations are as follows.

Sedimentation

Marine waters in the Seward area are relatively clear with few suspended sediments except during tidal movement and storm wave activity when a slight increase in turbidity occurs. As a result of incoming streams during the previous geological eras, extensive sediment deposits occurred in the coves and in upper Resurrection Bay. Glacial streams continue to contribute silt to Resurrection Bay.

Tides and Currents

Alaska coastlines fronting the north Pacific Ocean are subject to two diurnal tides of relatively great range resulting in extreme currents among the islands and inlets. Tidal currents at Seward are derived from 1979 Tidal Current Tables, Pacific Coast North American and Asia (NOAA-U.S. Department of Commerce).

The following currents are noted at Seward:

Maximum Currents (knots)

Vel. Ratio Flood	Vel. Ratio Ebb	Flood Direction	Flood Ave. Vel.	Ebb Direction	Ebb Ave. Vel.
0.3	0.5	180°	1.0	355°	1.7

Currents in Resurection Bay indicate a relationship that ebb velocity exceeds flood velocity except when influenced by strong onshore winds, and then only at the surface.

The tidal prism is inadequate to flush freshwater dilution from the existing harbor, thereby resulting in shell ice formation in winter months. Local boat owners voice complaints about this condition for which there appears no solution.

Local tides in Resurrection Bay are as follows:

Datum Plane	Elevation Referred to MLLW Tide
Highest tide observed	14.9
Mean higher high water	10.5
Mean high water	9.6
Mean tide level	5.4
Mean low water	1.3
Mean lower low water (MLLW)	0.0
Lowest tide observed	-4.8

In summary, the extreme range of tide in the harbor is about 19.7 feet; the mean range is 8.3 feet; and the diurnal range is 10.5 feet. Because of the harbor's location at the head of the bay, tidal currents are negligible and pose no difficulty to navigation. Conversly, however, the harbor is openly exposed to southerly winds converging on the entire length of the bay, resulting in generation of waves of sufficient magnitude to prohibit small boat navigation. Southeasterly winds cause considerable difficulty to vessels approaching or leaving the deep-draft docks. Offshore winds from the north move down from the valley at the head of the bay and generate choppy seas that hinder the navigation of the smaller craft. Direct easterly winds of any appreciable intensity create a wave disturbance through the entrance to the small boat basin. In the past, this has caused slight shoaling in the entry channel.

CLIMATOLOGY

The climate of Seward is maritime in character with rather mild winters and cool summers. The north-south orientation of Resurrection Bay generally limits cloudy skies and precipitation to those days when winds are from the south. The mean annual precipitation for this area is 67.8 inches based on 44 years of record. The protected location makes possible higher summer temperatures and lower winter temperatures than observed at other Pacific Coast areas. Temperatures reach 70 degrees an average of 11 days each year, usually during July and August. The prevailing northerly flow of air during winter months brings cold air from the interior of the Kenai Peninsula into the Seward area with temperatures dropping to 0 degrees or lower almost every winter. With southerly winds, however, temperatures during winter months can be mild.

The orientation of the bay and the valley at the head of the bay restricts the prevailing winds to either a northerly or southerly direction. Wind speeds of 25 mph or higher can be expected an average of 2 or 3 days each month during October through March, about 1 day per month in April and September and less than 1 day in 2 years in summer months. In summer the rare occurrences of high winds may come either from the south or north; however, in the winter season high winds generally blow from a northerly direction. The highest winds occur during the winter with an intense storm in the eastern Gulf of Alaska coupled with a high pressure system over interior Alaska, which brings strong turbulent northerly flow down the valleys into the Seward area.

Fog can be expected an average of 1 or 2 days during the winter increasing through spring and summer to a maximum in August and September when fog occurs an average of 8 to 10 days a month. Thunderstorms are infrequent, occurring an average of less than once in 2 years. Resurrection Bay is ice free year round except near the head of the bay where sheet ice forms as a result of freshwater streams.

Wind Analysis

The topography surrounding Seward causes high winds to be channeled either up Resurrection Bay from the south or down Resurrection River from the northwest. Some rather high winds also originate in the wide valley to the northeast. During the 10 years of record, the highest wind observed with at least 1 hour duration was 44 miles per hour from the north-northwest. The highest observed wind on Resurrection Bay was from the south-southeast at 37 miles per hour. This information is based on data from a U.S. Weather Bureau anemometer at the Seward airport located about 2 miles northeast of the harbor.

The design wind derivation follows procedures as outlined in ETL 1110-2-221 and the Shore Protection Manual(SPM). Wind velocity and duration exceedance frequencies were derived from a statistical analysis of data from a local anemometer (See Figure C-1) and adjusted to overwater wind speeds at the 30-foot level. The adjusted 50-year recurrence wind, the effective fetch and the SMB curves (Figure 3-15 in SPM) were then used to develop the speed-duration curves shown in Figure C-2. The effective fetch was developed using the procedures as outlined in the SPM, section 3.432. The effective fetch was calculated as 4.7 statute miles (See Figure C-3). Figure C-2 indicates a critical adjusted overwater design wind speed of 63 mph and a corresponding duration of 47 minutes.

Wave heights were also evaluated using the JONSWOP method for comparison with the SMB (Sverdrup Munk-Bretschneider) method. A straight-line fetch of 17 statute miles was used in the JONSWOP equations. A comparison of the results for both methods is shown below. The SMB results were used for structure design.

	SMB	JONSWOP
Fetch Length	4.7 mi	7.5 mi
Adjusted critical wind speed	63.0 mph	82.0 mph
Duration	47.0 min	91.0 min
Deep Water Significant Wave Height	6.2 ft	6.8 ft
Wave Period	5.3 sec	4.7 sec

Significant Wave

Water depths in Resurrection Bay exceed 20 to 30 fathoms, therefore a deepwater wave analysis was used. The deepwater significant wave height and wave period for the critical 50-year wind event was determined using Figure 3-15 on page 3-36 of the SPM. The wave length of deepwater waves is given by equation 2-8 on page 2-10 of the SPM. For a 210^{o} wave approach direction, the 50-year significant wave height was calculated as 6.2 feet, with a wave period of 5.3 seconds and a wave length of 144 feet.

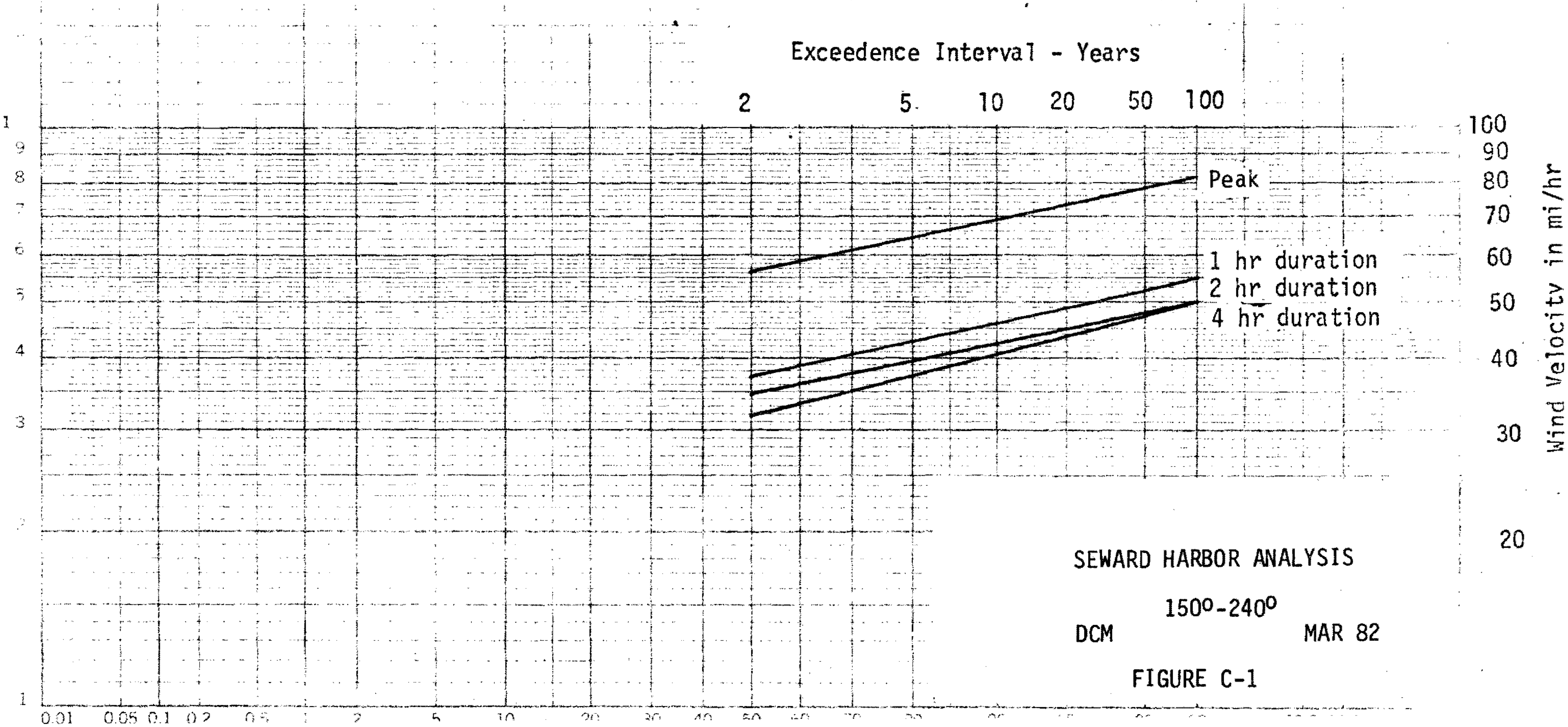
Refraction and Shoaling

A shoaling coefficient was calculated for the Nash Road Site according to the procedures in the SPM, pages 2-29 and 30, for a depth at the structure of 18.3 feet (highest estimated tide) and 6.2-foot wave with a wave length of 144 feet. From Table C-1 (SPM), the shoaling coefficient was calculated as K_s = 0.9178. Refraction diagrams were developed for half tide and high tide conditions from the 210° direction with the following results.

High Tide K_r = 0.8451
Half Tide K_r = 0.8606

NOTES

1. Frequency curves were based on 11 complete years of data between 1970-1981
2. Data was fitted to a Log-Pearson Type III distribution with zero skew.
3. Frequency curves derived using criteria established in W.R.C. Bulletin 17b, with computed probability.
4. The anemometer is located on the Alaska Railroad dock at the head of Resurrection Bay.



SEWARD HARBOR ANALYSIS

150^o-240^o

DCM MAR 82

FIGURE C-1

FIGURE C-10. SMB WIND VELOCITY-DURATION CURVES
REFERENCE ETL 1110-2-221, JULY 1982

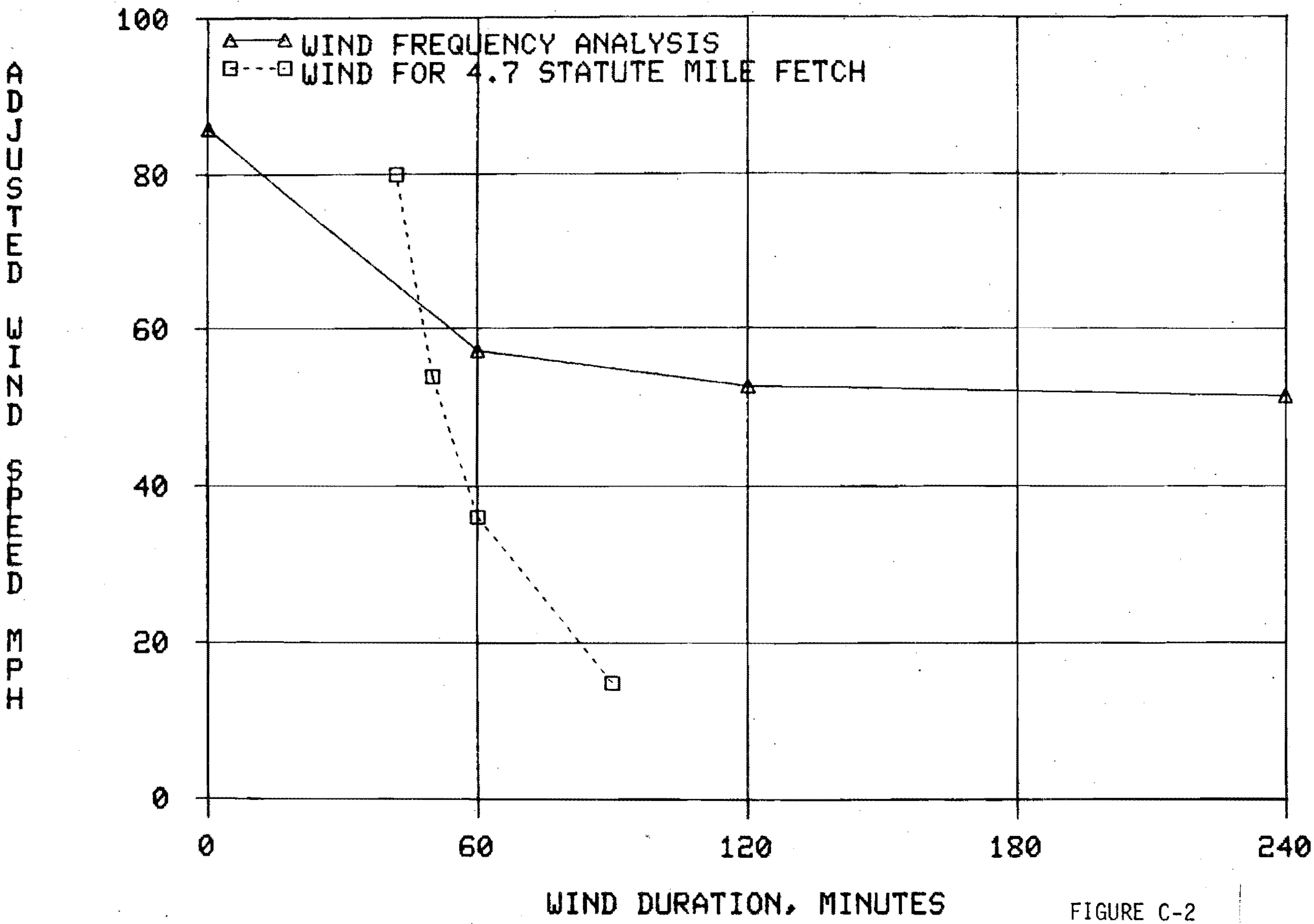
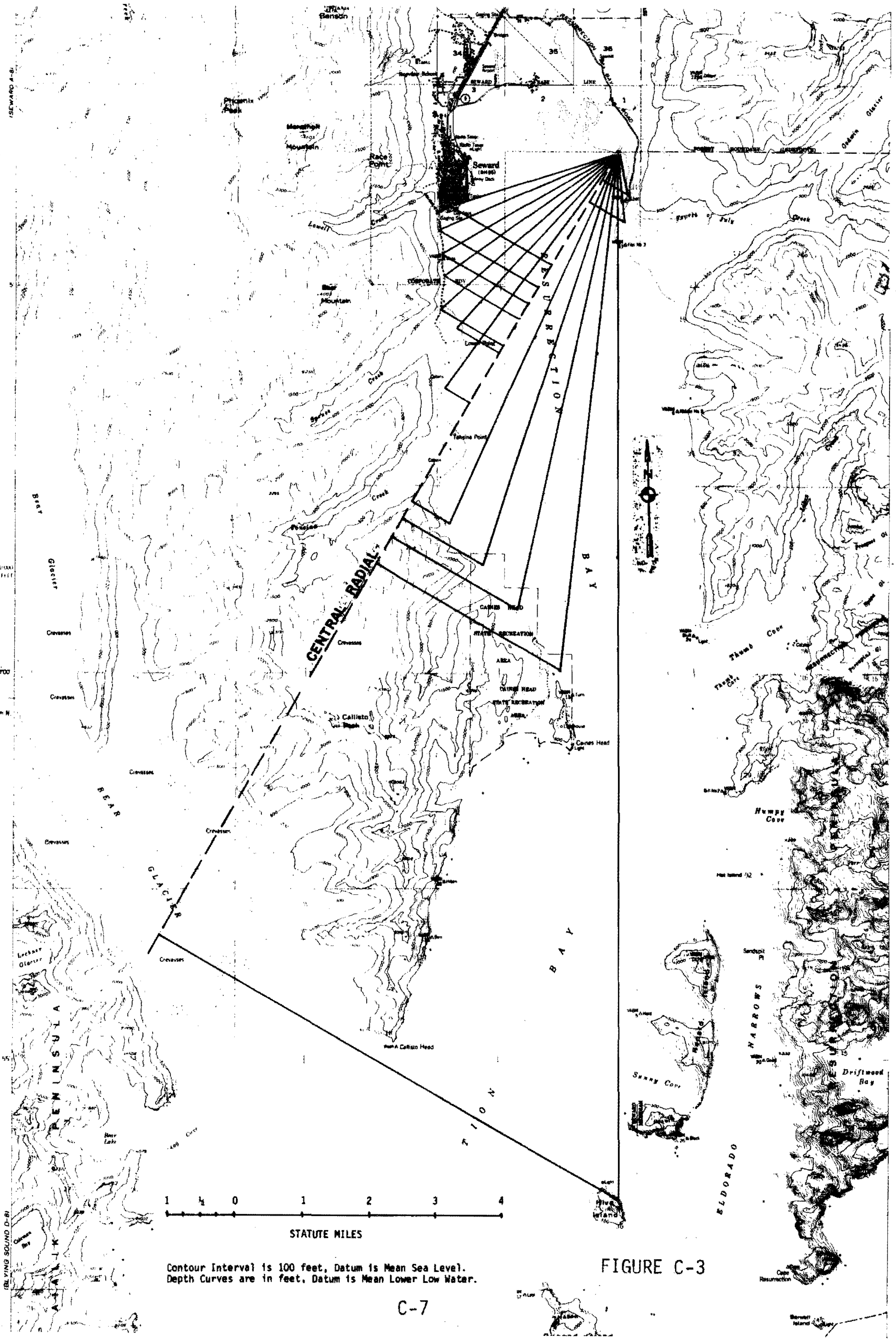


FIGURE C-2



Contour Interval is 100 feet, Datum is Mean Sea Level.
Depth Curves are in feet, Datum is Mean Lower Low Water.

FIGURE C-3

A refraction diagram was developed for high tide from the 183° direction (see Figure C-5). Fourth of July Creek Point effectively cuts off waves from that direction approaching the breakwater however, it is very difficult to estimate the effect on wave height due to refraction and diffraction. A refraction coefficient of 0.85 was assumed.

Breaking Wave Condition

Breaking wave conditions were investigated as outlined in Section 2.62 of the SPM. Using a deepwater wave height of 6.3 feet, a wave length of 144 feet and a beach slope of 0.033 (1:30), the wave height at breaking was calculated to be 6.17 feet, and the depth of water at the breaking wave was calculated to be 6.97 feet. Results indicate that at tidal elevations between +9 to +14.8 feet MLLW, nonbreaking wave conditions would exist at the structure. At tidal elevations between +1 to +9 feet MLLW, breaking wave conditions would exist on parts of the breakwater. Below tidal elevations of +1 MLLW, most waves would break before reaching the structures. A breaking wave condition was assumed for breakwater design.

Design Wave

The design wave was calculated as the product of the 50-year deep water significant wave (6.3 feet), the shoaling coefficient (0.9178), and the refraction coefficient (0.85). The design wave incident at the structure was calculated to be 4.9 feet.

Diffraction Analysis

A diffraction analysis was performed using methods as outlined in para. 2.42 on page 2-81 of the SPM. The predominant winds are from the south to southeasterly directions and should have little effect on the entrance of the harbor. A wave approaching from a bearing of 210° was used in the analysis to represent wave rays from 200° to 222°. The diffraction analysis indicated a wave as high as 1.5 feet could be transmitted into the entrance channel and maneuvering area. Since the predominant winds are from the south to southeast, this occurrence should be quite rare. The mooring areas of the harbor should be adequately protected at all times.

Similar refraction, shoaling and diffraction analyses were accomplished for the south expansion plan and the diffraction diagram is shown in Figure C-7.

BREAKWATER DESIGN

Slope

The inner and outer breakwater slopes were chosen as 1 vertical to 1.5 horizontal, since this was judged to be the minimum stable side slope and is least costly to construct.

Armor Stone Dimensions and Thickness

The unit weight of individual armor stone in the primary and secondary cover layers was determined by equation 7-110 in the SPM. Breaking wave stability coefficients of 2.9 for the head of the breakwater and 3.5 for the trunk of the breakwater were used in the equation. The design wave height of 4.9 feet and a unit weight for the quarry stone of approximately 165 pounds per cubic foot were used. Accordingly, the required weight of the rock at the head of the structure was calculated to be approximately 1,200 pounds and 1,000 pounds along the trunk of the structure. The primary cover layer of quarry stone could range from 75 to 125 percent of the average armor stone weight. Using an average of 1,100 pounds to base the rock size, the maximum stone weight would be 1,375 pounds and the minimum stone weight would be 825 pounds. The secondary layer should be composed of rock one tenth to one fifteenth the weight of the average primary armor stone weight. Material sizes for breakwater construction are summarized below:

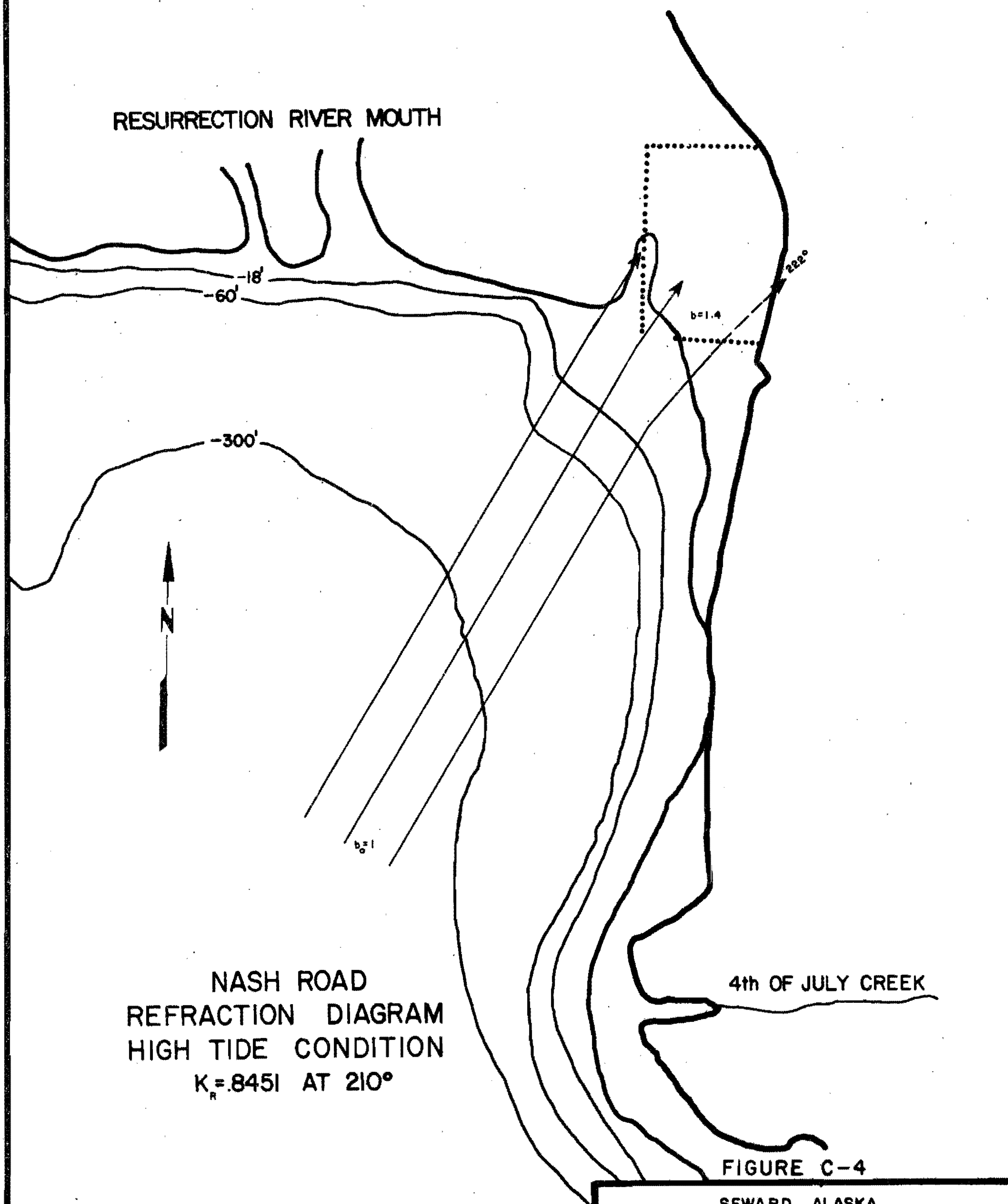


FIGURE C-4

SEWARD, ALASKA
SEWARD HARBOR EXPANSION

NASH ROAD SITE
REFRACTION DIAGRAM
HIGH TIDE CONDITION 210°
U.S. ARMY ENGINEER DISTRICT, ALASKA
APRIL 1982

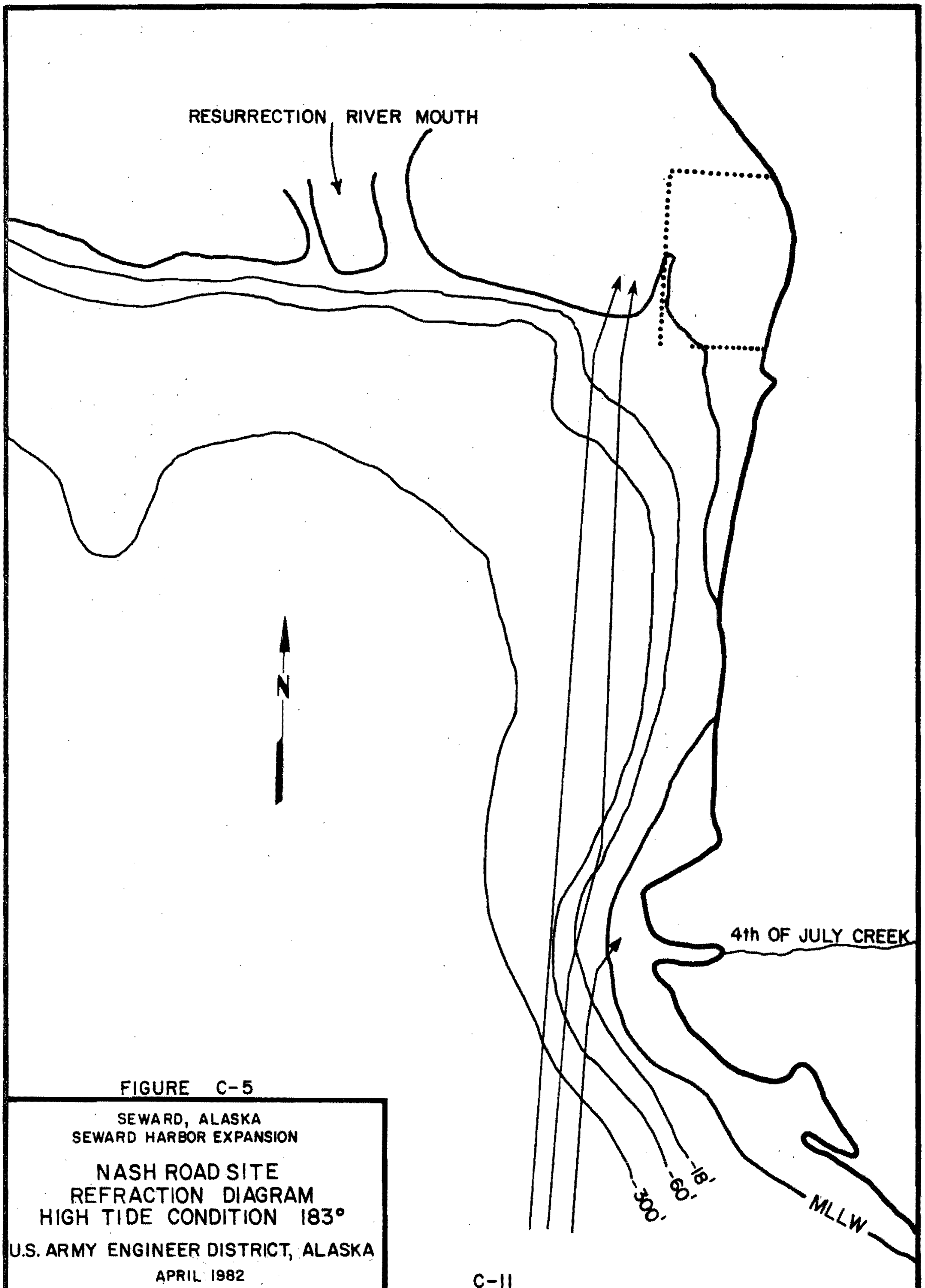


FIGURE C-5

SEWARD, ALASKA
SEWARD HARBOR EXPANSION

NASH ROAD SITE
REFRACTION DIAGRAM
HIGH TIDE CONDITION 183°

U.S. ARMY ENGINEER DISTRICT, ALASKA
APRIL 1982

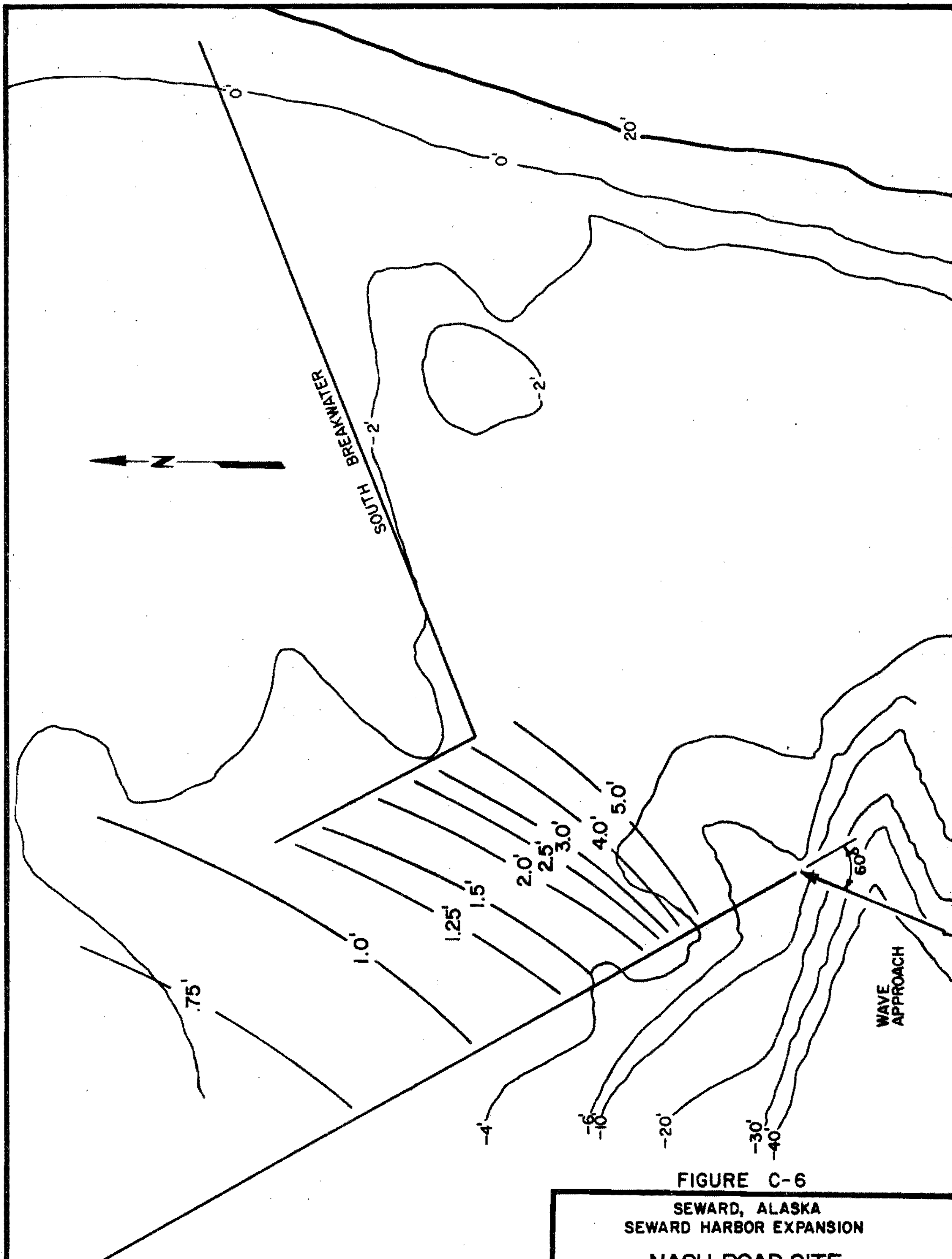


FIGURE C-6

SEWARD, ALASKA
SEWARD HARBOR EXPANSION

NASH ROAD SITE
DIFFRACTION DIAGRAM 210°

U.S. ARMY ENGINEER DISTRICT, ALASKA
APRIL 1982

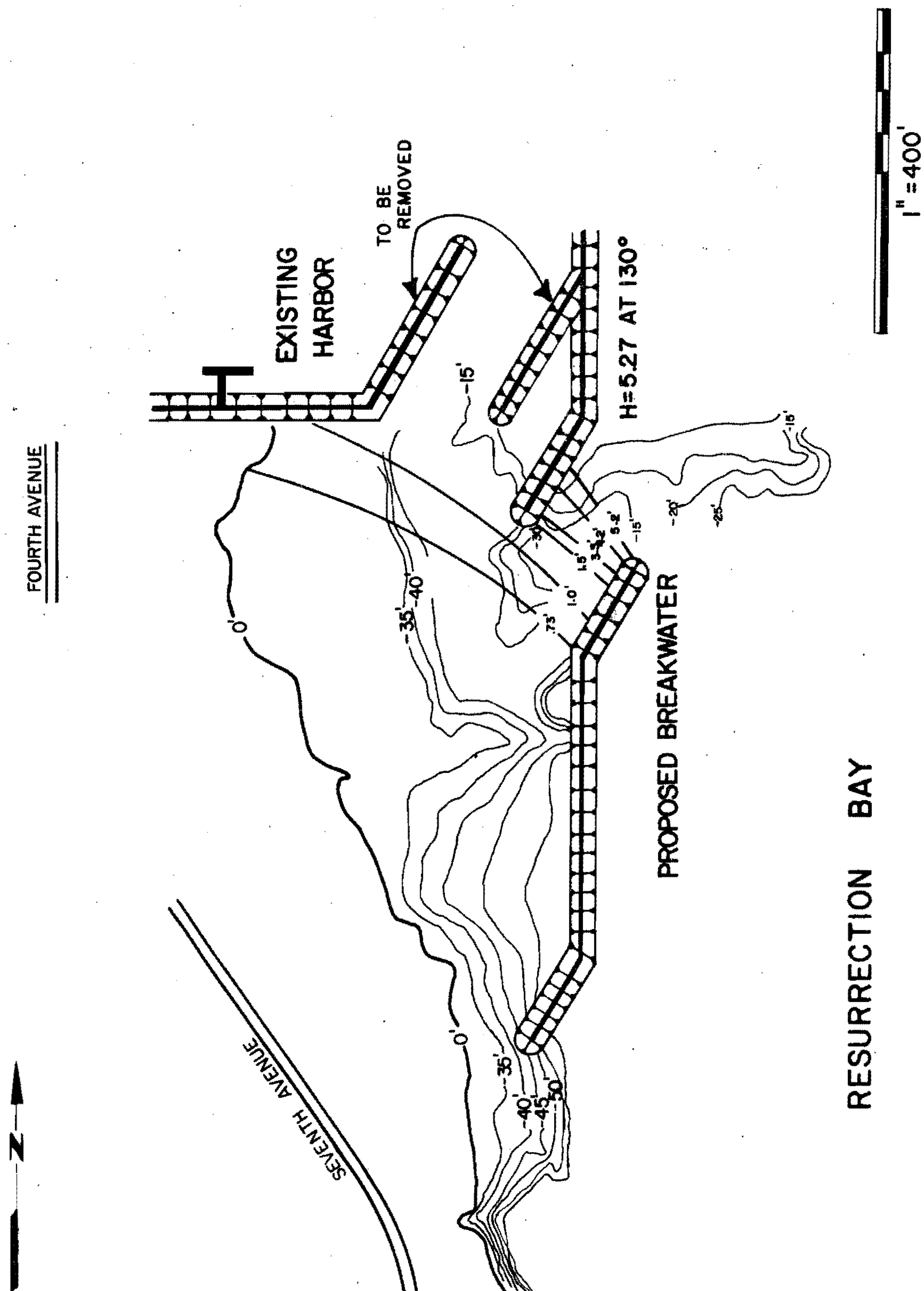


FIGURE C-7

SEWARD, ALASKA
SEWARD HARBOR EXPANSION

SOUTH EXPANSION

DIFFRACTION DIAGRAM 130°

U.S. ARMY ENGINEER DISTRICT, ALASKA
APRIL 1982

1. Armor Layer. Minimum weight of 825 pounds to maximum weight of 1375 pounds with 75 percent being over 1,100 pounds.

2. Secondary Layer. Maximum weight of 825 pounds to minimum weight of 25 pounds well graded.

3. Core. Quarry spalls less than 25 pounds.

The thicknesses of the armor stone layer and secondary stone layer were calculated using equation 7-13, page 7-209 of the SPM for rough quarry stone with random placement two armor units thick. The primary cover layer thickness was calculated to be 4 feet. The secondary thickness layer was calculated to be 2 feet. The entrance channel side slope would also require protection with 2 feet of secondary rock due to the potential for wave action on the entrance channel side slopes low tide.

Wave Runup, Crest Elevation, and Crest Width

Based on the criteria set forth in SPM the runup of the design wave on the breakwater was calculated to be 5.1 feet. The runup added to the highest observed tide of +14.8 feet MLLW and rounded to the nearest foot gave a required breakwater crest elevation of +20 feet MLLW. Since the Nash Road site is more protected than the existing harbor site and the existing harbor breakwater at elevation +18 MLLW has sustained no significant damage since 1965, the crest height was reduced to +18 MLLW. The crest width was calculated to be 6 feet, which would accomodate at least 3 armor units across the top.

Minimum Entry Width

The entrance channel width was designed to accommodate vessels 40 feet in beam. The minimum channel width for two-way traffic, allowing for one beam width clearance between vessels and one beam width side clearance for each vessel, is equivalent to five beam widths, or 200 feet.

Harbor Depth

The harbor depths were based upon the following relationship:

$$h = R + C + I + Z + D - L$$

where:

h = depth
R = depth measurement tolerance, 1.0'
C = min keel clearance, 0.5'
I = ship response to waves, 0.5'

Z - squat and trim allowance,
entrance channel 2.0'
mooring basin 1.0'

D = draft, 0.1 times ships length

Design Fleet Length (ft.)	Draft (ft.)
18 - 26	3'
27 - 44	5'
45 - 84	9'
84 - 100	10'

L = design water level,

substituting the values we get

$h = 1.0' + 0.5' + 0.5' + Z + D - L$

$h = 2.0' + Z + D - L$

Entrance channel $h = 4 + D - L$

Mooring basin $h = 3 + D - L$

Using L = - 4' MLLW as the design water level

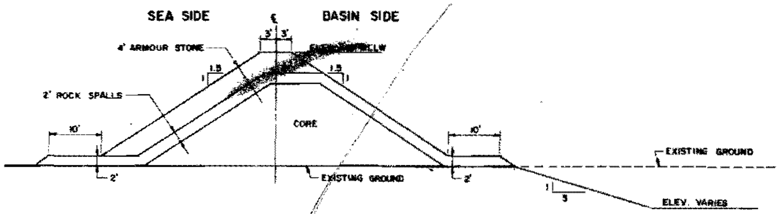
Draft (ft.)	Mooring Basin (ft. MLLW)		Entrance Channel MLLW ft.
3	-10		-11
5	-12	controlling	-13
9	-16	depths	-17
10	-17		-18 controlling depths

The above harbor depths would allow 98.7 percent of the fleet to use the harbor 100 percent of the time, without any difficulties.
The remaining 1.3 percent could encounter difficulty within the mooring basin. Fleet breakdown is shown below.

	Boat Lengths (ft.)				
Types	18 - 26	27 - 44	45 - 84	85 - 100	Total
Existing Transient	123	78	37	12	250
Existing Wait Listed	161	56	5	2	224
Existing Trailored Commercial	252	9			61
Future					
Future Charter	5	15	15		35
Future Recreational	405	92	6		503
Total	746	250	63	14	1073
% of Total	69.5	92.8	98.7	100%	

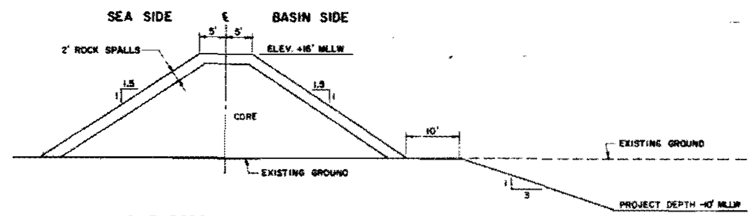
The breakwater design cross sections are shown on Plates 1 and 2.

CORPS OF ENGINEERS U. S. ARMY



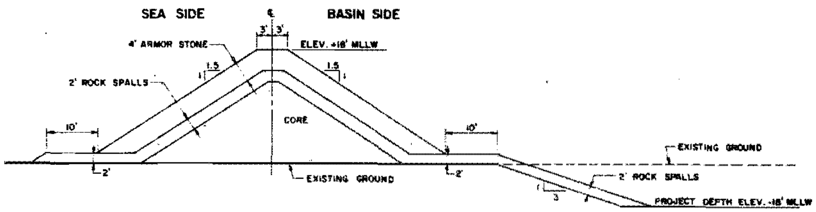
WEST BREAKWATER STA. 1+00 TO 25+00

10 5 0 10
SCALE FEET



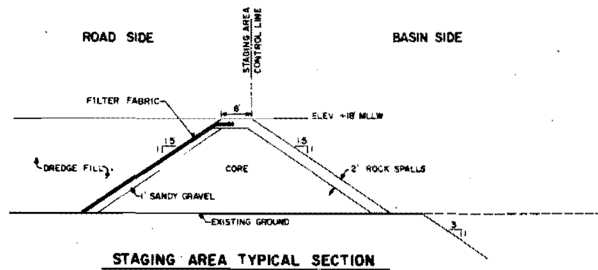
SILT BARRIER STA. 0+00 TO 11+00

10 5 0 10
SCALE FEET



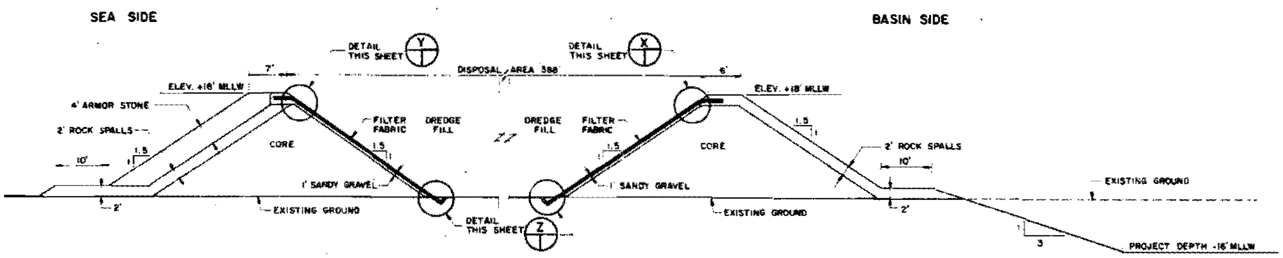
WEST BREAKWATER STA.-3+00 TO 1+00

10 5 0 10
SCALE FEET



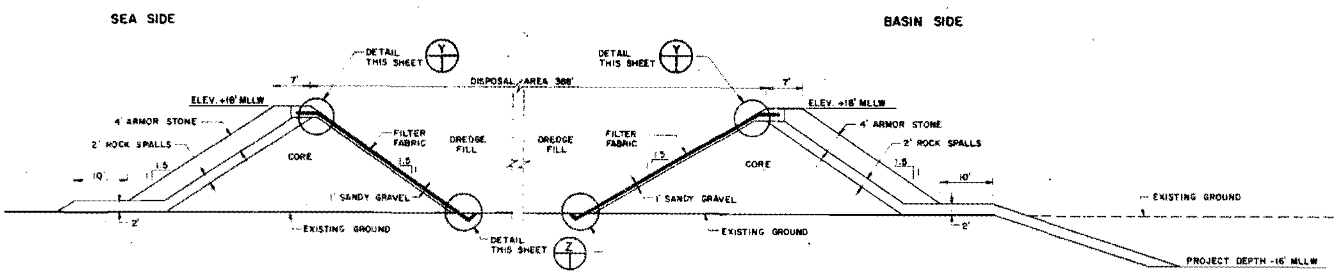
STAGING AREA TYPICAL SECTION

10 5 0 10
SCALE FEET



SOUTH BREAKWATER STA. 7+00 TO 13+00

10 5 0 10
SCALE FEET



SOUTH BREAKWATER STA. 13+00 TO 14+00

10 5 0 10
SCALE FEET

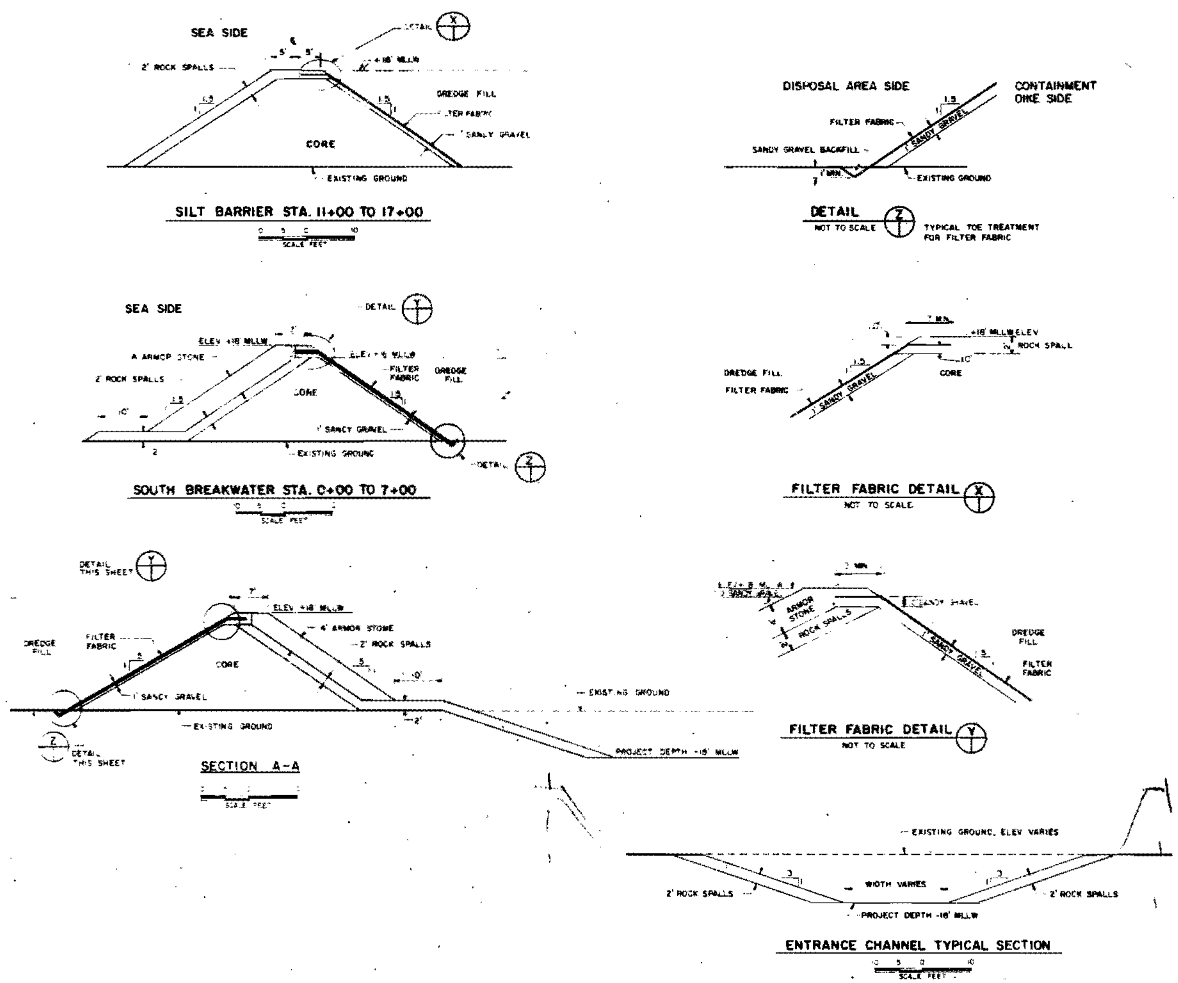
ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

SEWARD, ALASKA
SMALL BOAT HARBOR
PROPOSED PLAN
NASH ROAD SITE

SCALE AS SHOWN

PLATE I

CORPS OF ENGINEERS U. S. ARMY



ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

SEWARD, ALASKA
SMALL BOAT HARBOR
PROPOSED PLAN
NASH ROAD SITE

PLATE 2

APPENDIX D

FOUNDATION AND MATERIALS

APPENDIX D

FOUNDATIONS AND MATERIALS

TABLE OF CONTENTS

Item	Page
Purpose and Scope of Investigation	D-1
Location and Physical Features	D-1
Previous Explorations	D-1
Field Investigation and Laboratory Tests	D-1
Discussion and Recommendations	D-2
Plate 1 (Bore Hole Location Map)	D-4
Exploration Logs	D-5
Gradation Curves	D-11
Test Results	D-45

FOUNDATION INVESTIGATION
SEWARD SMALL BOAT HARBOR
NASH ROAD SITE

PURPOSE AND SCOPE OF INVESTIGATION

This investigation was initiated to obtain design data for preparation of a detailed project report. The investigation includes analysis of previous exploration in the vicinity and the accomplishment and analysis of necessary additional explorations to determine the character of material to be dredged and the suitability of foundation conditions for rockfill breakwater construction.

LOCATION AND PHYSICAL FEATURES

The Nash Road site is located in the northeast corner of Resurrection Bay near the end of Nash Road. Elevation of the existing bottom ranges from about 0 to -2 MLLW, with a rapid drop-off near the end of the proposed entrance channel. The surface soils are silty sands and gravels, and the adjoining beach is covered with gravel. The land to the east and northeast slopes upward from the beach, with very little area available for dredged disposal. Most of the site is accessible by tracked vehicle when the tide is below elevation 0 MLLW.

PREVIOUS EXPLORATIONS

The Nash Road site was investigated by the Seattle District Corps of Engineers in 1964, following the destruction of the Seward port facilities in the Good Friday earthquake. A total of nine wash borings were completed in the vicinity; six of these were close to the proposed harbor, and varied in depth from 38 to 73 feet. Samples and blow counts were taken using a standard 2-inch O.D. split spoon sampler and the soils were visually classified in the field.

The soils encountered in several of these borings were classified as clay, however, it appears that the classifications were based on visual inspection in the field, and that no samples were taken to laboratory for testing.

FIELD INVESTIGATION AND LABORATORY TESTS

Six additional test borings were drilled in April 1981 using an 8-inch hollow stem auger. Each of the holes was drilled to a depth of 30 feet, and 2-inch drive samples were taken at 5-foot intervals for penetration resistance and laboratory classification. Three shelby-tube samples were taken in the area previously classified as clay to verify the classification and to provide shear and consolidation test samples. Location of the test holes is shown on the accompanying drawings, and logs of the holes and gradation curves for the laboratory analyzed samples are attached. The shelby tube samples (3) were sent to Alaska Testlab for analysis, and a copy of their report is attached.

DISCUSSION AND RECOMMENDATIONS

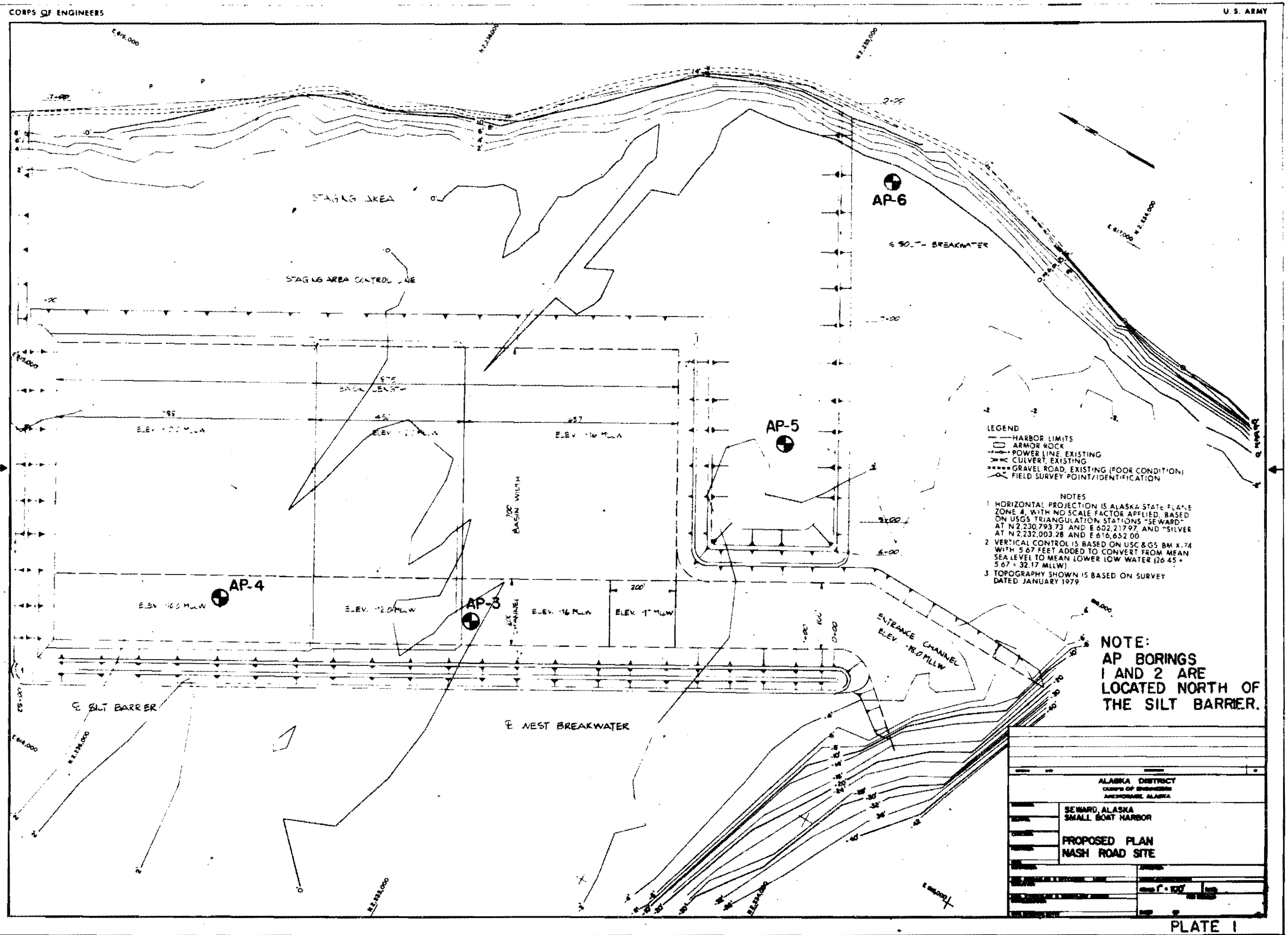
On the basis of this investigation, it is determined that the soils in the area of the proposed small boat harbor consist of silty sand and sandy silt. No clay was found in any of the test borings. The gravelly layers encountered in holes AP-2 and AP-6 were of the same type as found on the adjoining beach, and could be continuous beneath the sand and silt deposits. Blow counts for the soil ranged from eight blows per foot to 57 blows per foot, averaging about 12, which indicates a medium relative density, and which will provide adequate bearing strength for the relatively light loads imposed by the breakwaters. Triaxial shear tests of the sandy silt samples from test hole AP-5 gave an average friction angle of 20^{o}, which confirms the adequacy of the weakest soil layers to support the proposed breakwater. Based on consolidation tests made on these same samples, the expected settlement of a breakwater constructed to elevation +18 MLLW is conservatively estimated to be slightly more than one foot. Most of this will occur during the placement of fill, so that little settlement should be expected after construction is completed. Little or no foundation treatment will be required prior to placing fill for the breakwater and silt barrier, as the near surface materials are clean and free of objectionable materials. No cobbles or boulders were found in the test borings, and no problems are anticipated in dredging the materials in the harbor area. It is recommended that basin and channel side slopes be dredged to one vertical on three horizontal. Some of the dredged material can be utilized to construct a parking or staging area along the beach. This material should be contained by a rock spalls dike at least ten feet wide at the top and brought up in stages as the fill progresses. It may be possible to use additional remaining dredged material for the construction of proposed port facilities at Fourth of July Creek, which will be built about one mile to the south of this project.

The primary source of armor rock is located at an existing quarry at the head of 4th of July Creek, 3-4 miles from the Seward Small Boat Harbor site. There is an estimated total volume of 3 million cubic yards of rock available at this site. Samples tested by MRD Lab No. 82/30C revealed the rock to be a dark gray, fine-grained, metagraywacke cut by thin veinlets of white quartz and calcite with very little evidence of weathering. Test results from NPD Lab No. 1787 are as follows:

Test	Results
Specific Gravity, BSSD	2.71
Absorption, %	0.3
Los Angeles Abrasion % Loss @ 100 rev	3.1
% Loss @ 500 rev	11.9
Soundness by Accelerated Freezing and Thawing (% Loss by Weight @ 300 cycles)	0.1
Ethylene Glycol Immersion	No Loss
Soundness by Wetting-Drying (% Loss by weight @ 300 cycles)	0.2

The city of Seward, Alaska is currently constructing a port facility at the mouth of 4th of July Creek and plans to use 110,000 cubic yards of the quarried rock in the port construction. The largest riprap required for the port will be in the 1,300 to 2,100 pounds size range. It is not known at this time when the city will complete their riprap requirements.

An alternate source of armor material is the city's Lowell Point quarry located approximately 1-1/2 miles south of town. This site produced the armor rock used in the existing boat harbor. Future development at the Lowell Point site is not recommended for the following reasons: (a) longer haul distance to boat harbor site and (b) the existing quarry has an extremely high working face with no access to the top.


CORPS OF ENGINEERS
U. S. ARMY
STAGING AREA
STAGING AREA CONTROL LINE
AP-6
AP-5
AP-4
AP-3
SOUTH BREAKWATER
BASIN LENGTH
BASIN WIDTH
ELEV. -16 MLLW
ELEV. -12.0 MLLW
ELEV. -1' MLLW
ENTRANCE CHANNEL ELEV. -18.0 MLLW
SILT BARRIER
WEST BREAKWATER
LEGEND
HARBOR LIMITS
ARMOR ROCK
POWER LINE, EXISTING
CULVERT, EXISTING
GRAVEL ROAD, EXISTING (POOR CONDITION)
FIELD SURVEY POINT/IDENTIFICATION
NOTES
1 HORIZONTAL PROJECTION IS ALASKA STATE PLANE ZONE 4, WITH NO SCALE FACTOR APPLIED, BASED ON USGS TRIANGULATION STATIONS "SEWARD" AT N 2,230,793.73 AND E 602,217.97, AND "SILVER" AT N 2,232,003.28 AND E 616,652.00
2 VERTICAL CONTROL IS BASED ON USC&GS BM X 74 WITH 5.67 FEET ADDED TO CONVERT FROM MEAN SEA LEVEL TO MEAN LOWER LOW WATER (26.45 + 5.67 = 32.17 MLLW)
3 TOPOGRAPHY SHOWN IS BASED ON SURVEY DATED JANUARY 1979
NOTE:
AP BORINGS 1 AND 2 ARE LOCATED NORTH OF THE SILT BARRIER.
ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA
SEWARD, ALASKA
SMALL BOAT HARBOR
PROPOSED PLAN
NASH ROAD SITE
PLATE I

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION
U.S. ARMY ENGINEER DISTRICT, ALASKA

EXPLORATION LOG

PROJECT: Seward Small Boat Harbor — SHEET 1 OF 1

LOCATION (Coordinates or Station): N. 2,235,550 E. 614,700

DRILLING AGENCY: [X] CORPS OF ENGINEERS [ ] OTHER

HOLE NO.: FIELD 1 PERMANENT AP-1

NAME OF DRILLER: Mitchell, Martinez — WEATHER: Clear

TYPE OF HOLE: TEST PIT [ ] AUGER HOLE [X] CHURN DRILL [ ]

DEPTH TO: — DEPTH DRILLED INTO: — TOTAL DEPTH OF HOLE: 30'

SIZE AND TYPE OF BIT: 8" Hollow Stem

DATUM FOR ELEVATION SHOWN: [ ] TBM. [ ] MSL.

TYPE OF EQUIPMENT: Mobile B-50

TOTAL NO OF SAMPLES: 5 — TYPE OF SAMPLES: SPT — DEPTH TO GROUND-WATER: 0

DATE HOLE: STARTED 4-6-81 COMPLETED 4-6-81

EL. TOP OF HOLE: +2 — Geologist: Walters — Chief, Geology Section: — Chief, Foundations & Materials Branch: — Date:

DEPTH FEET	% WATER CONTENT	SAMPLE NO.	SOIL LEGEND	CLASSIFICATION	MAX. SIZE PARTICLE	FORMATION DESCRIPTION & REMARKS
5		1-1	SW-SM	Silty Gravelly Sand w/occ shells, Grey		N = 17
10		1-2	SM	Silty Sand w/occ shells, Grey		N = 10
15		1-3				N = 21
20		1-4	ML	Sandy Silt		N = 19
25		1-5				N = 14
30		1-6				N = 24
				Bottom of Hole		

NPA FORM ... (REV) DEC ...

PROJECT Seward Small Boat Harbor — PERMANENT HOLE NO. AP-1

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION
U.S. ARMY ENGINEER DISTRICT, ALASKA

EXPLORATION LOG

PROJECT	Seward Small Boat Harbor
SHEET	1 OF 1
LOCATION (Coordinates or Station)	N. 2,235,950 E. 615,640
DRILLING AGENCY	[X] CORPS OF ENGINEERS [ ] OTHER
HOLE NO. FIELD	2
HOLE NO. PERMANENT	AP-2
NAME OF DRILLER	Mitchell, Martinez
WEATHER	Clear
TYPE OF HOLE	TEST PIT [ ] AUGER HOLE [X] CHURN DRILL [ ]
DEPTH TO	
DEPTH DRILLED INTO	
TOTAL DEPTH OF HOLE	30'
SIZE AND TYPE OF BIT	8" Hollow Stem
DATUM FOR ELEVATION SHOWN	[ ] TBM. [ ] MSL.
TYPE OF EQUIPMENT	Mobile B-50
TOTAL NO. OF SAMPLES	6
TYPE OF SAMPLES	SPT
DEPTH TO GROUND-WATER	0
DATE HOLE STARTED	4-6-81
DATE HOLE COMPLETED	4-6-81
EL. TOP OF HOLE	+2
Geologist	Walters
Chief, Geology Section	
Chief, Foundations & Materials Branch	
Date	

DEPTH FEET	% WATER CONTENT	SAMPLE NO.	SOIL LEGEND	CLASSIFICATION	MAX. SIZE PARTICLE	FORMATION DESCRIPTION & REMARKS
5		2-1				N = 7
			SM	Gravelly Silty Sand w/occ Shells, Grey	2"	
		2-2				N = 8
15		2-3				N = 13 Stopped 4-6-81
						Continued 4-9-81
20	25.8	2-4	SP/SM	Silty Sand	1"	N = 57
			GP	Gravel Layer	4"	
25	21.2	2-5				N = 23
			SM	Silty Gravelly Sand	1"	
30	18.2	2-6				6' of Heave
				Bottom of Hole		

NPA FORM 19 (REV.)
DEC.

PROJECT Seward Small Boat Harbor PERMANENT HOLE NO. AP-2

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: Seward Small Boat Harbor — SHEET 1 OF 1 LOCATION (Coordinates or Station): N. 2,234,460 E. 615,150 DRILLING AGENCY: [X] CORPS OF ENGINEERS [ ] OTHER
HOLE NO. FIELD 3 PERMANENT AP-3	NAME OF DRILLER: Mitchell, Martinez — WEATHER: Clear
TYPE OF HOLE: TEST PIT [ ] AUGER HOLE [X] CHURN DRILL [ ]	DEPTH TO: — DEPTH DRILLED INTO: — TOTAL DEPTH OF HOLE: 30'
SIZE AND TYPE OF BIT: 8" Hollow Stem — DATUM FOR ELEVATION SHOWN: [ ] TBM. [ ] MSL.	TYPE OF EQUIPMENT: Mobile B-50
TOTAL NO. OF SAMPLES: 6 — TYPE OF SAMPLES: SPT — DEPTH TO GROUND-WATER: 0	DATE HOLE STARTED 4-7-81 COMPLETED 4-7-81
EL. TOP OF HOLE: -1 — Geologist: Walters — Chief, Geology Section:	Chief, Foundations & Materials Branch: — Date:

DEPTH FEET	% WATER CONTENT	SAMPLE NO.	SOIL LEGEND	CLASSIFICATION	MAX SIZE PARTICLE	FORMATION DESCRIPTION & REMARKS
5		3-1	SP	Gravelly Sand w/occ Shells, Grey		N = 6
10		3-2	SM	Silty Fine Sand w/occ Shells, Grey		N = 13
15	30.9	3-3	ML	Sandy Silt		N = 11
20	28.0	3-4	SM	Silty Sand		Sample washed out of core barrel. Took sample from auger flights. N = 5
25	34.2	3-5	ML	Sandy Silt		N = 7
30	32.9	3-6				N = 4
				Bottom of Hole		

NPD FORM 10 (REV)

PROJECT Seward Small Boat Harbor — PERMANENT HOLE NO. AP-3

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: Seward Small Boat Harbor	SHEET 1 OF 1
	LOCATION (Coordinates or Station): N. 2,234,950 E. 614,910	
	DRILLING AGENCY: [X] CORPS OF ENGINEERS [ ] OTHER	

HOLE NO. FIELD 4	PERMANENT AP-4	NAME OF DRILLER: Mitchell, Martinez	WEATHER: Clear
TYPE OF HOLE: TEST PIT [ ] AUGER HOLE [X] CHURN DRILL [ ]		DEPTH TO:	DEPTH DRILLED INTO:	TOTAL DEPTH OF HOLE: 30'
SIZE AND TYPE OF BIT: 8" Hollow Stem	DATUM FOR ELEVATION SHOWN: [ ] TBM. [ ] MSL.	TYPE OF EQUIPMENT: Mobile B-50	
TOTAL NO. OF SAMPLES: 6	TYPE OF SAMPLES: SPT	DEPTH TO GROUND-WATER: 0	DATE HOLE STARTED: 4-7-81 COMPLETED: 4-7-81
EL. TOP OF HOLE: 0	Geologist: Walters	Chief, Geology Section:	Chief, Foundations & Materials Branch: Date:

DEPTH FEET	% WATER CONTENT	SAMPLE NO.	SOIL LEGEND	CLASSIFICATION	MAX SIZE PARTICLE	FORMATION DESCRIPTION & REMARKS
5	32.5	4-1	SM	Silty Fine Sand w/occ Shells, Grey		N = 8
10	29.7	4-2	ML	Sandy Silt		N = 9
15	31.1	4-3	SM	Silty Sand		N = 9
20	33.0	4-4	ML	Sandy Silt		N = 9
25	27.4	4-5				N = 14
30	32.7	4-6				N = 8
				Bottom of Hole		

NPA FORM 19 (REV)

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION
U.S. ARMY ENGINEER DISTRICT, ALASKA

EXPLORATION LOG

PROJECT: Seward Small Boat Harbor	SHEET 1 OF 1
LOCATION (Coordinates or Station): N. 2,233,950 E. 616,040	
DRILLING AGENCY: [X] CORPS OF ENGINEERS [ ] OTHER	
HOLE NO. FIELD 5 PERMANENT AP-5	
NAME OF DRILLER: Mitchell, Martinez	WEATHER: Clear
TYPE OF HOLE: TEST PIT [ ] AUGER HOLE [X] CHURN DRILL [ ]	DEPTH TO / DEPTH DRILLED INTO / TOTAL DEPTH OF HOLE: 30'
SIZE AND TYPE OF BIT: 8" Hollow Stem	DATUM FOR ELEVATION SHOWN: [ ] TBM [ ] MSL
TYPE OF EQUIPMENT: Mobile B-50	
TOTAL NO OF SAMPLES: 6	TYPE OF SAMPLES: SPT, Shelby
DEPTH TO GROUND-WATER: 0	DATE HOLE STARTED 4-8-81 COMPLETED 4-8-81
EL. TOP OF HOLE: -2	Geologist: Walters
Chief, Geology Section:	Chief, Foundations & Materials Branch: Date:

DEPTH FEET	% WATER CONTENT	SAMPLE NO	SOIL LEGEND	CLASSIFICATION	MAX SIZE PARTICLE	FORMATION DESCRIPTION & REMARKS
5	28.4	5-1				N = 8
10	29.8	5-2				N = 7
			ML	Sandy Silt w/occ Shells Grey		
15	30.1	5-3				N=7
20	32.9	5-4				Shelby Sample
25	36.5	5-5				Shelby Sample
30	37.9	5-6				Shelby Sample
				Bottom of Hole		

NPA FORM DEC 10 (REV)

PROJECT Seward Small Boat Harbor PERMANENT HOLE NO. AP-5

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION
U.S. ARMY ENGINEER DISTRICT, ALASKA

EXPLORATION LOG

PROJECT: Seward Small Boat Harbor | SHEET 1 OF 1

LOCATION (Coordinates or Station): N. 2,234,350 E. 616,720

DRILLING AGENCY: CORPS OF ENGINEERS / OTHER

HOLE NO. FIELD: 6 PERMANENT: AP-6

NAME OF DRILLER: Mitchell, Martinez

WEATHER: Clear

TYPE OF HOLE: TEST PIT [ ] AUGER HOLE [X] CHURN DRILL [ ]

DEPTH TO: | DEPTH DRILLED INTO: | TOTAL DEPTH OF HOLE: 30'

SIZE AND TYPE OF BIT: 8" Hollow Stem

DATUM FOR ELEVATION SHOWN: TBM. [ ] MSL. [ ]

TYPE OF EQUIPMENT: Mobile B-50

TOTAL NO OF SAMPLES: 6 | TYPE OF SAMPLES: SPT | DEPTH TO GROUND-WATER: 0

DATE HOLE STARTED: 4-8-81 COMPLETED: 4-8-81

EL. TOP OF HOLE: 0 | Geologist: Walters | Chief, Geology Section: | Chief, Foundations & Materials Branch: | Date:

DEPTH FEET	% WATER CONTENT	SAMPLE NO.	SOIL LEGEND	CLASSIFICATION	MAX SIZE PARTICLE	FORMATION DESCRIPTION & REMARKS
5	29.8	6-1				N = 4
			ML	Sandy Silt w/occ Shells, Grey		
10	28.2	6-2				N = 7
15	30.6	6-3				N = 6
20	32.5	6-4				N = 6
			SM	Gravelly Silty Sand	1"	
25	20.5	6-5				N = 12
30	14.4	6-6	SM	Silty Gravelly Sand	1"	N = 26
				Bottom of Hole		

NPA FORM 259 (REV)

PROJECT Seward Small Boat Harbor PERMANENT HOLE NO. AP-6

DISPOSITION FORM

For use of this form, see AR 340-15; the proponent agency is The Adjutant General's Office.

REFERENCE OR OFFICE SYMBOL	SUBJECT
NPAEN-FM-M	Seward Small Boat Harbor

TO NPAEN-FM-S (Walters) FROM NPAEN-FM-M DATE 30 Apr 81 CMT

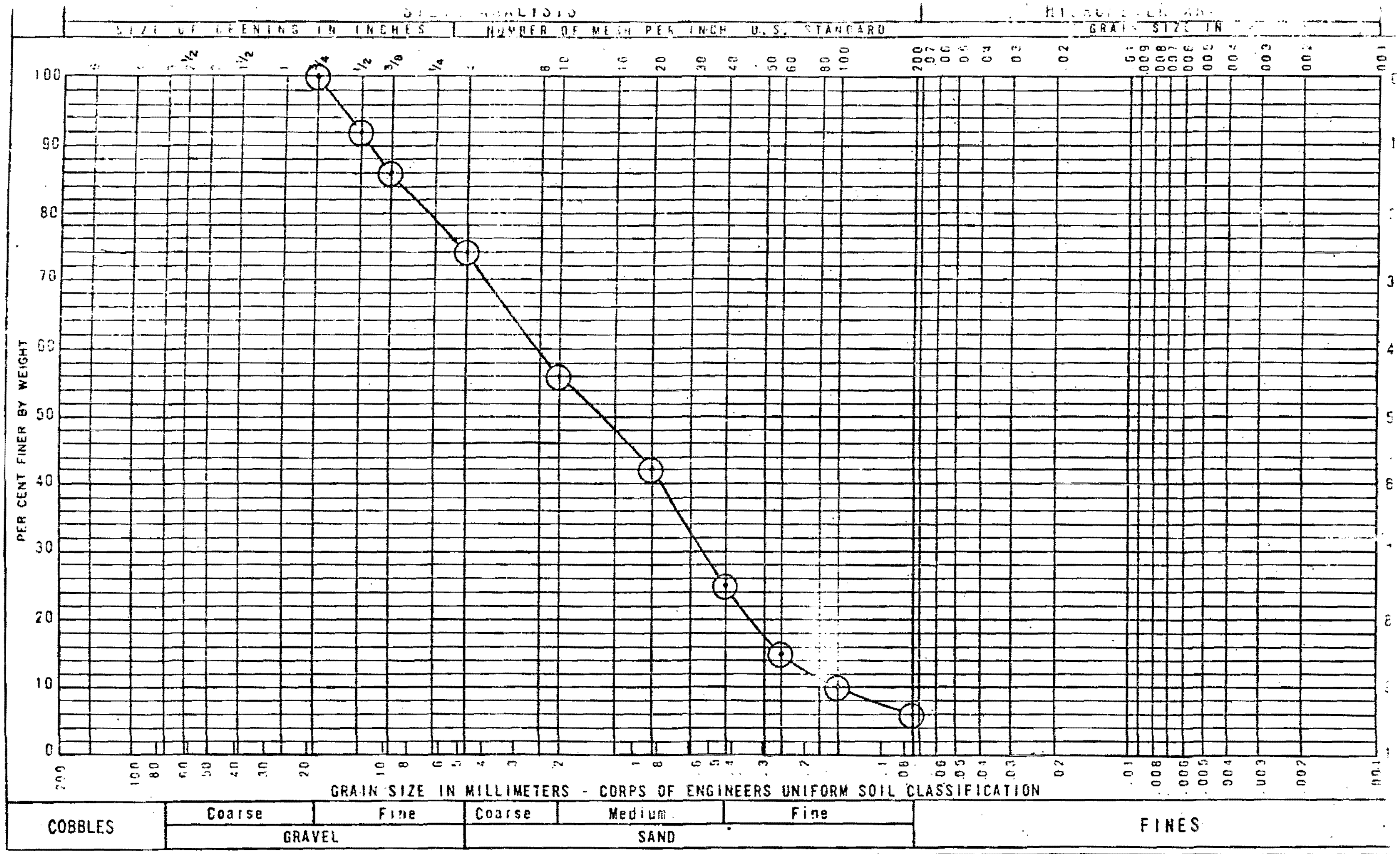
Colladay/dml/2-4435

1. Reference Work Request 81-31, dated 13 April 1981, subject as above.

2. Attached you will find the results for thirty three (33) soil samples submitted for gradation curves, moistures, and soils classifications as requested.

33 Incl
as

DELWYN F. THOMAS
Chief, Materials and Instrumentation



SAMPLE NO	DEPTH - FT	CLASSIFICATION	NAT WC	LL	PI
LS-1919	5.0'	SW-SM Silty Gravelly Sand			

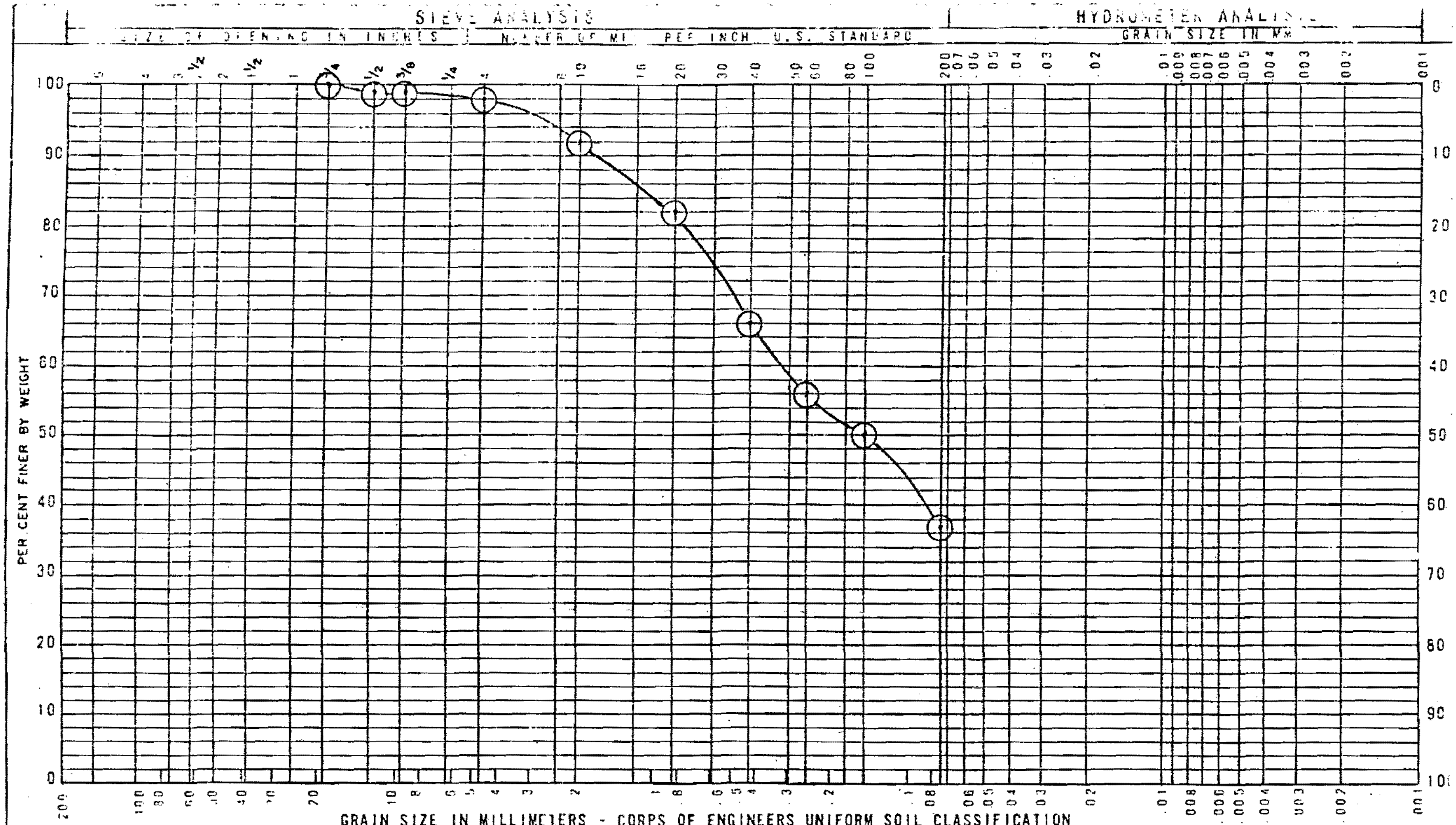
PROJECT Seward Small Boat Harbor
Sample data 1-1
Submitted by H. Walters
Expl or gp sample no
W O No. 81-31
2-29-81
Date of report
Chief Soil Mechanics Engr.

NPD RF JULY 1952 321

GRADATION CURVES

CORPS OF ENGINEERS, TESTING LABORATORY ANCHORAGE, ALASKA

Plotted
Checked



COBBLES	GRAVEL: Coarse	GRAVEL: Fine	SAND: Coarse	SAND: Medium	SAND: Fine	FINES

SAMPLE NO	DEPTH - FT	CLASSIFICATION	NAT WC	LL	PI	
LS-1920	10.0'	SM-Silty Sand				

PROJECT Seward Small Boat Harbor
Sample data 1-2
Submitted by H. Walters
Expl. or gp. sample no.
W O No. 81-31
4-29-81
Date of report
Chief, Soil Mechanics Branch

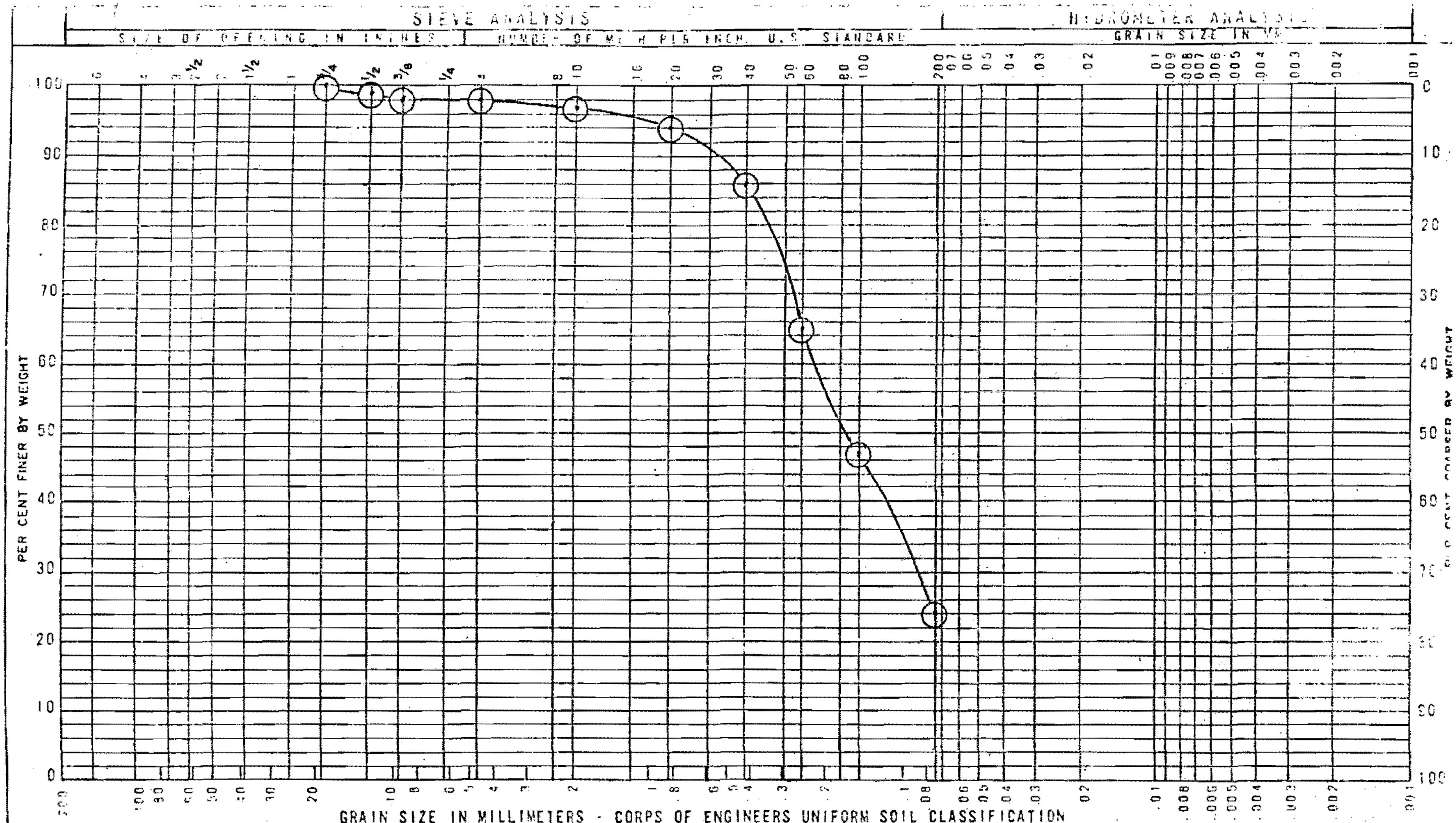
NPD RF 321
JULY 1952

GRADATION CURVES

CORPS OF ENGINEERS, TESTING LABORATORY ANCHORAGE, ALASKA

Plotted
Checked

D-14



COBBLES	GRAVEL		SAND			FINES
	Coarse	Fine	Coarse	Medium	Fine	

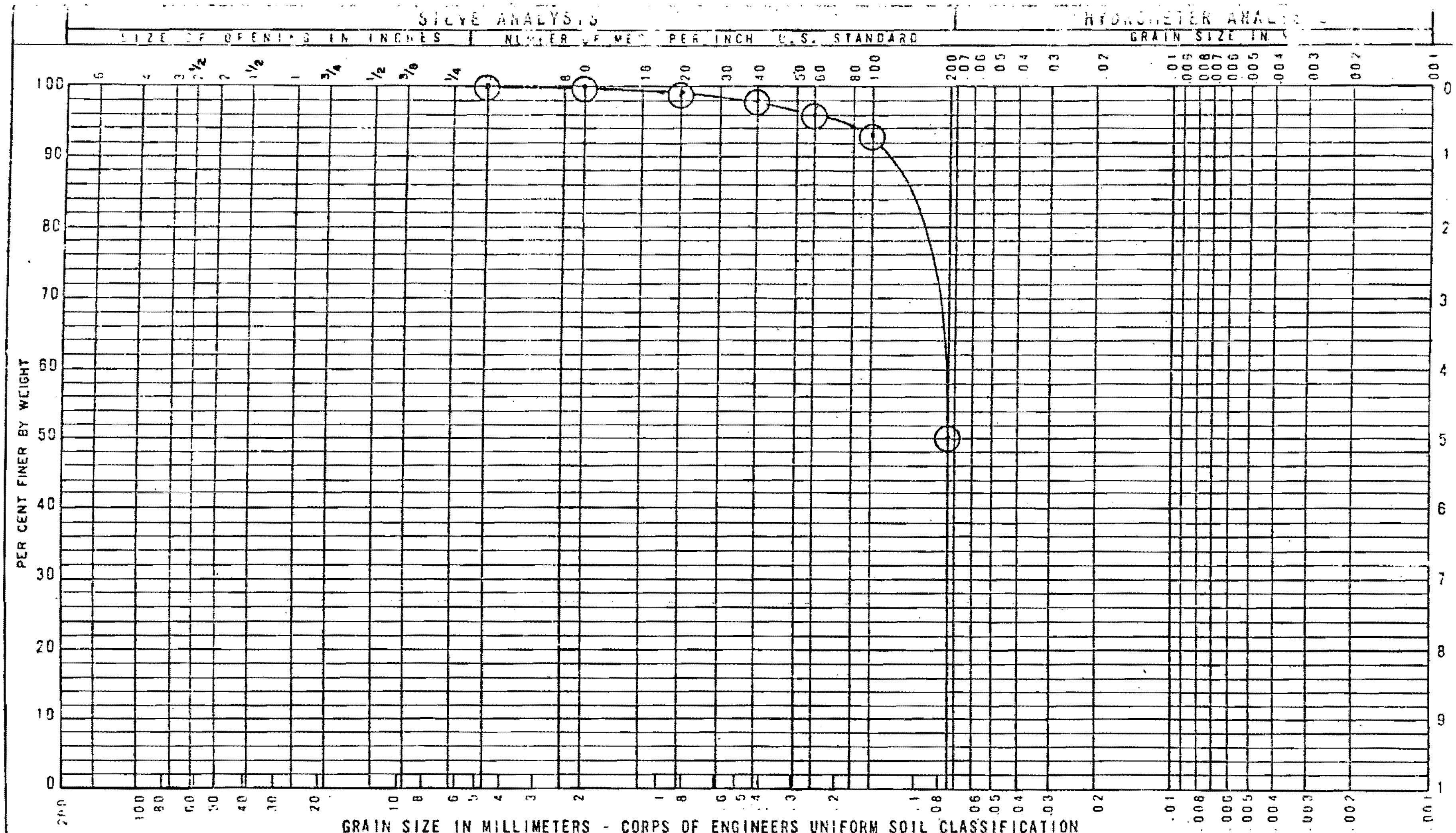
SAMPLE NO	DEPTH - FT	CLASSIFICATION	NAT WC	LL	PI
LS-1921	15.0'	SM-Silty Sand			

PROJECT Seward Small Boat Harbor
Sample data 1-3
Submitted by H. Walters
Expl or gp. sample no.
W O No. 81-31

NPD RF JULY 1952 321

GRADATION CURVES
CORPS OF ENGINEERS, TESTING LABORATORY, ANCHORAGE, ALASKA

Plotted WEH
Checked
4-29-81
Date
Warren E. Holladay
Chief, Soil Mech. ...



COBBLES	GRAVEL Coarse	GRAVEL Fine	SAND Coarse	SAND Medium	SAND Fine	FINES

SAMPLE NO	DEPTH - FT	CLASSIFICATION	NAT WC	LL	PI	
LS-1922	20.0'	ML-Sandy silts				

PROJECT Seward Small Boat Harbor
Sample data 1-4
Submitted by H. Walters
Expl. or gp sample no.
W O No. 81-31

NPD RF 321 JULY 1952

GRADATION CURVES

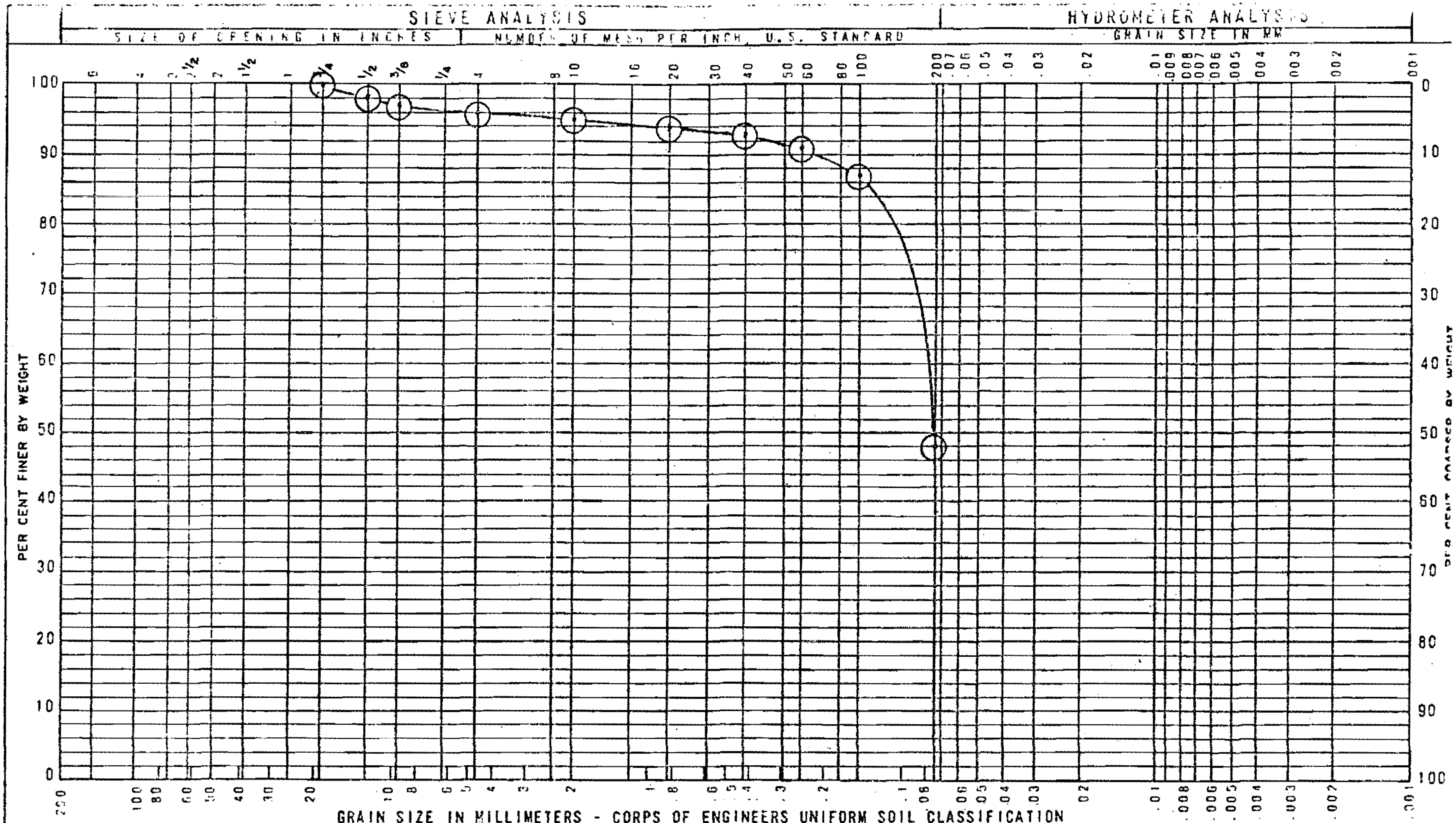
CORPS OF ENGINEERS TESTING LABORATORY, ANCHORAGE, ALASKA

Plotted
Checked

4-29-81
Date of report

Warren E. Galloda
Chief, Soil ... Branch

D-15



COBBLES	GRAVEL: Coarse	GRAVEL: Fine	SAND: Coarse	SAND: Medium	SAND: Fine	FINES

SAMPLE NO.	DEPTH - FT	CLASSIFICATION	NAT W.C.	LL	PI	
LS-1923	25.0'	ML-Sandy Silt				

PROJECT Seward Small Boat Harbor
Sample data 1-5
Submitted by H. Walters
Expl or gp sample no.
W.O No. 81-31

NPD RF 321
JULY 1952

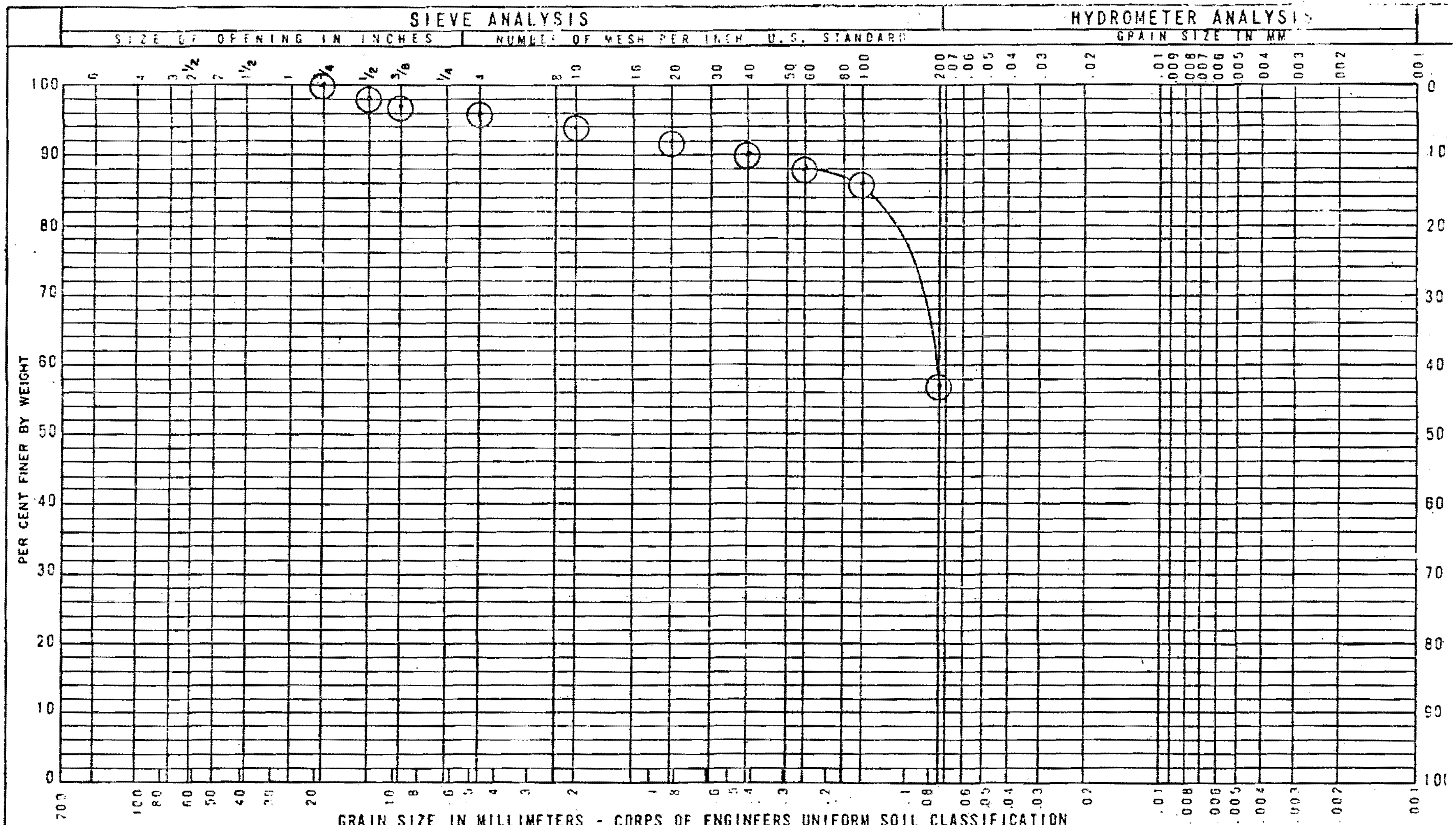
GRADATION CURVES

CORPS OF ENGINEERS, TESTING LABORATORY, ANCHORAGE, ALASKA

Plotted
Checked

4-29-81
Date of report

Warren E. Holladay
Chief, Soil Mechanics Branch



COBBLES	GRAVEL		SAND			FINES
	Coarse	Fine	Coarse	Medium	Fine	

SAMPLE NO	DEPTH - FT	CLASSIFICATION	NAT WC	LL	PI
LS-1924	30.0'	ML-Sandy silts			

PROJECT Seward Small Boat Harbor

Sample data 1-6

Submitted by H. Walters

Expl. or gp. sample no.

W O No. 81-31

4-29-81 Date of report

Chief, Soil Mechanics Branch

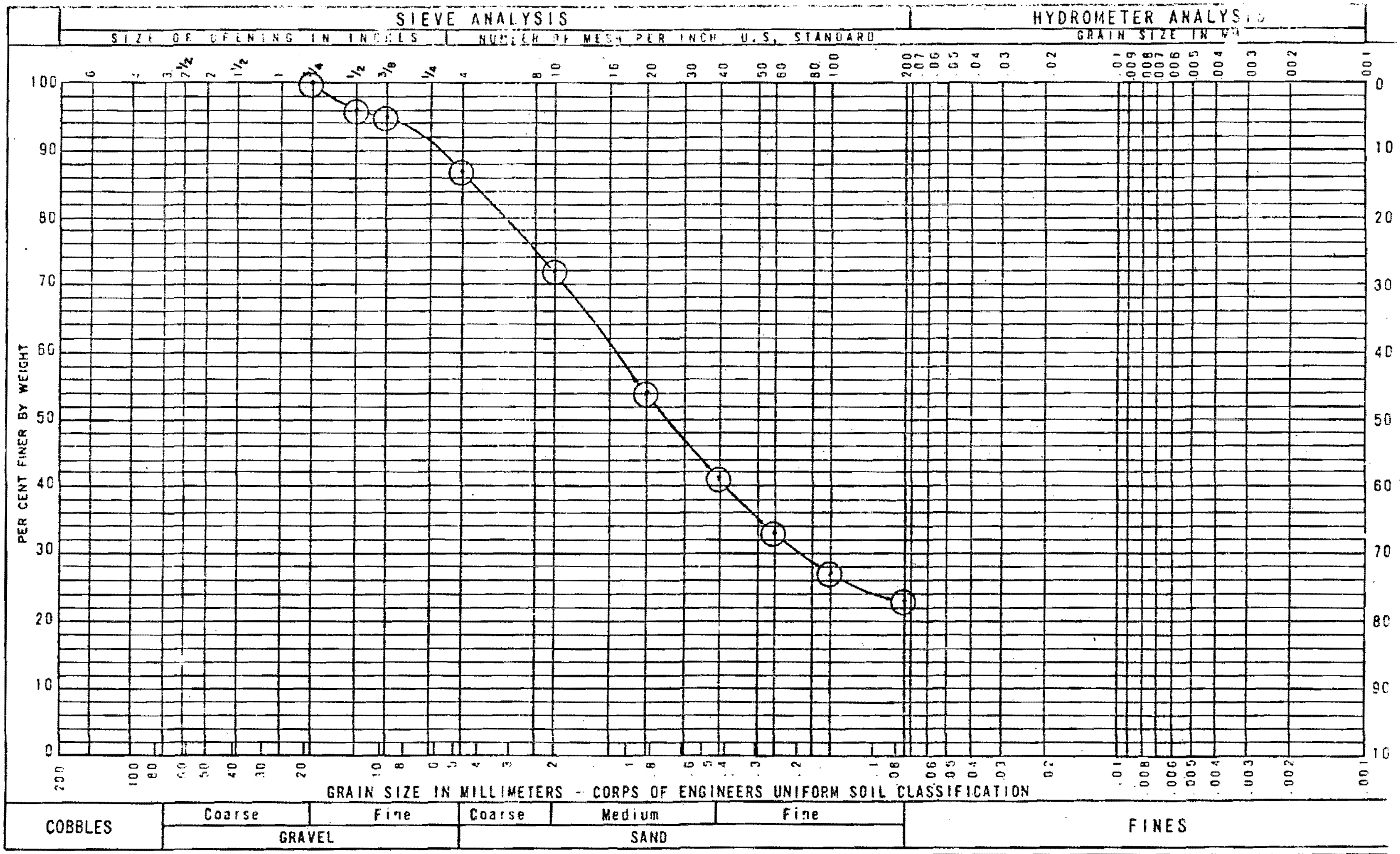
Plotted

Checked

NPD RF 321
JULY 1952

GRADATION CURVES

CORPS OF ENGINEERS TESTING LABORATORY ANCHORAGE, ALASKA



SAMPLE NO.	DEPTH - FT	CLASSIFICATION	NAT W.C.	LL	PI	
LS-1925	5.0'	SM-Gravelly silty sand				

PROJECT Seward Small Boat Harbor

Sample data 2-1

Submitted by H. Walters

Expl. or gp sample no.

W O No. 81-31

NPD RF JULY 1952 321

GRADATION CURVES

CORPS OF ENGINEERS TESTING LABORATORY, ANCHORAGE, ALASKA

Plotted WSG

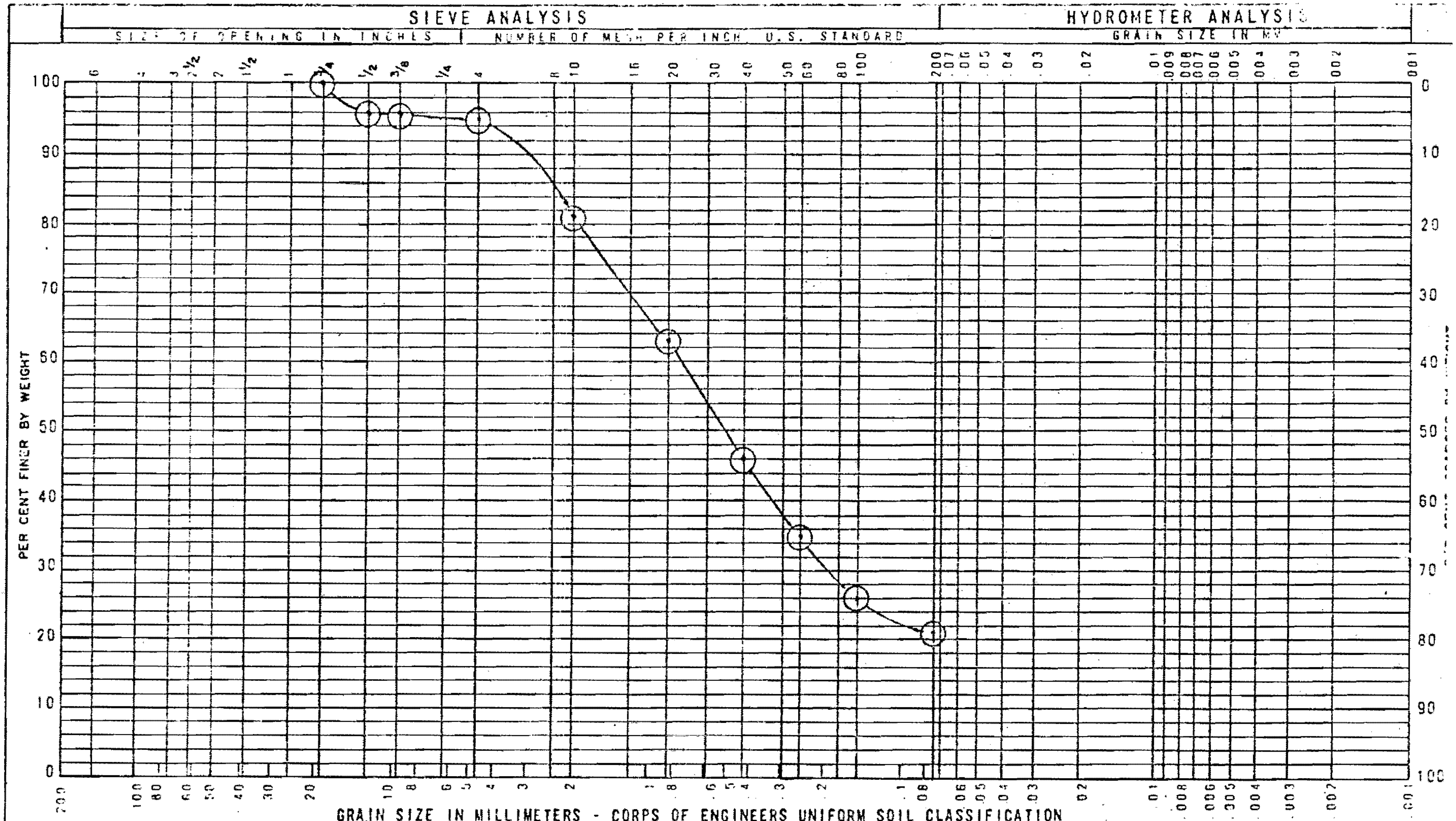
Checked

4-29-81

Date of report

Warren E. Gilliland

Chief Soil Mechanics Branch



COBBLES	GRAVEL		SAND			FINES
	Coarse	Fine	Coarse	Medium	Fine	

SAMPLE NO	DEPTH - FT.	CLASSIFICATION	NAT WC	LL	PI
LS-1926	10.0'	SM-Gravelly Silty Sands			

PROJECT Seward Small Boat Harbor
Sample data 2-2
Submitted by H. Walters
Expl. or gp. sample no.
W O No. 81-31

NPD RF JULY 1952 321

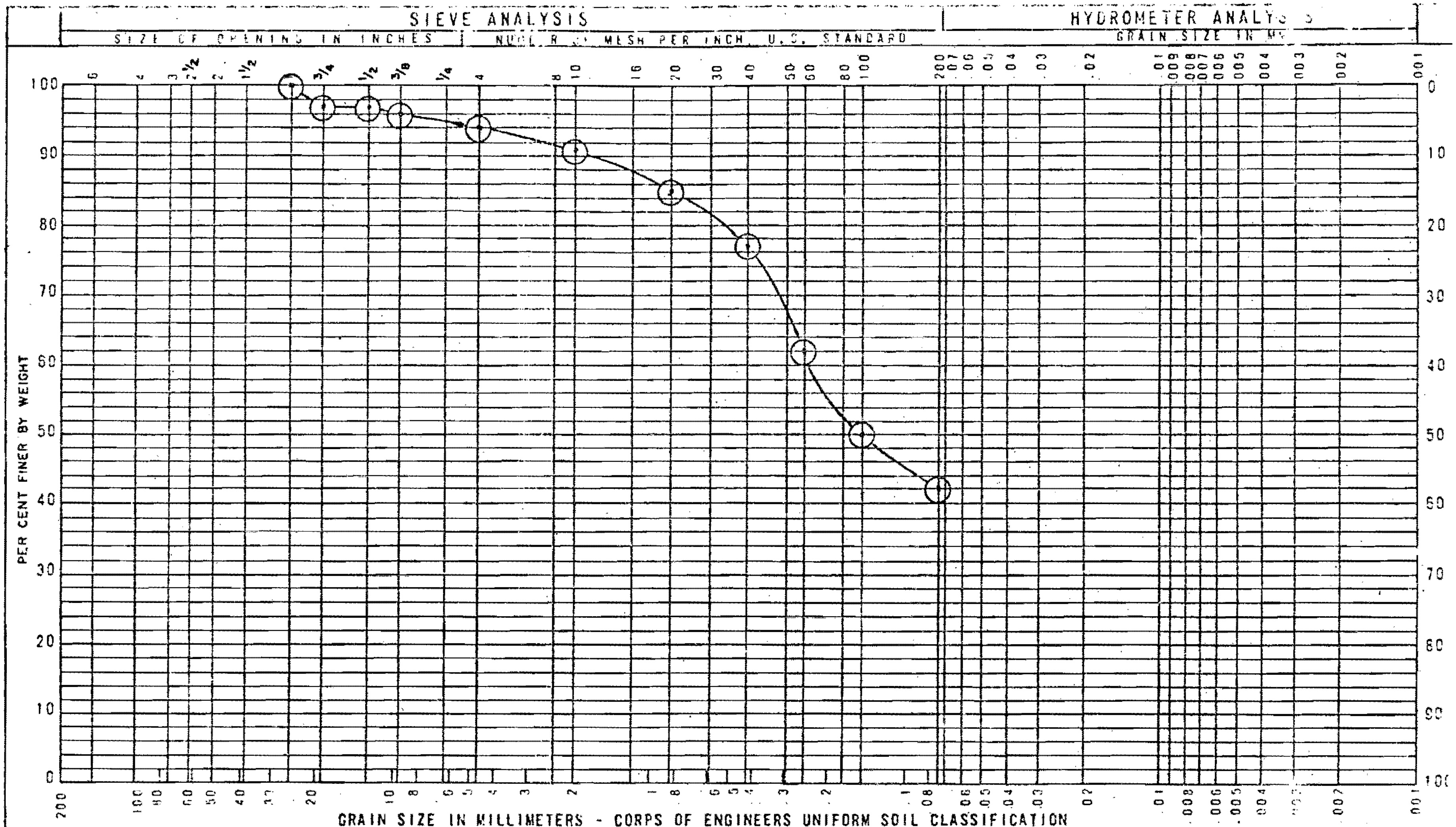
GRADATION CURVES

CORPS OF ENGINEERS TESTING LABORATORY, ANCHORAGE, ALASKA

Plotted: HEH
Checked:

4-29-81
Date of report

Warren E. Holladay
Chief Soil Mechanics Section



COBBLES	GRAVEL Coarse	GRAVEL Fine	SAND Coarse	SAND Medium	SAND Fine	FINES

SAMPLE NO.	DEPTH - FT	CLASSIFICATION	NAT WC	LL	PI	
LS-1927	15.0'	SM-Gravelly Silty Sand				

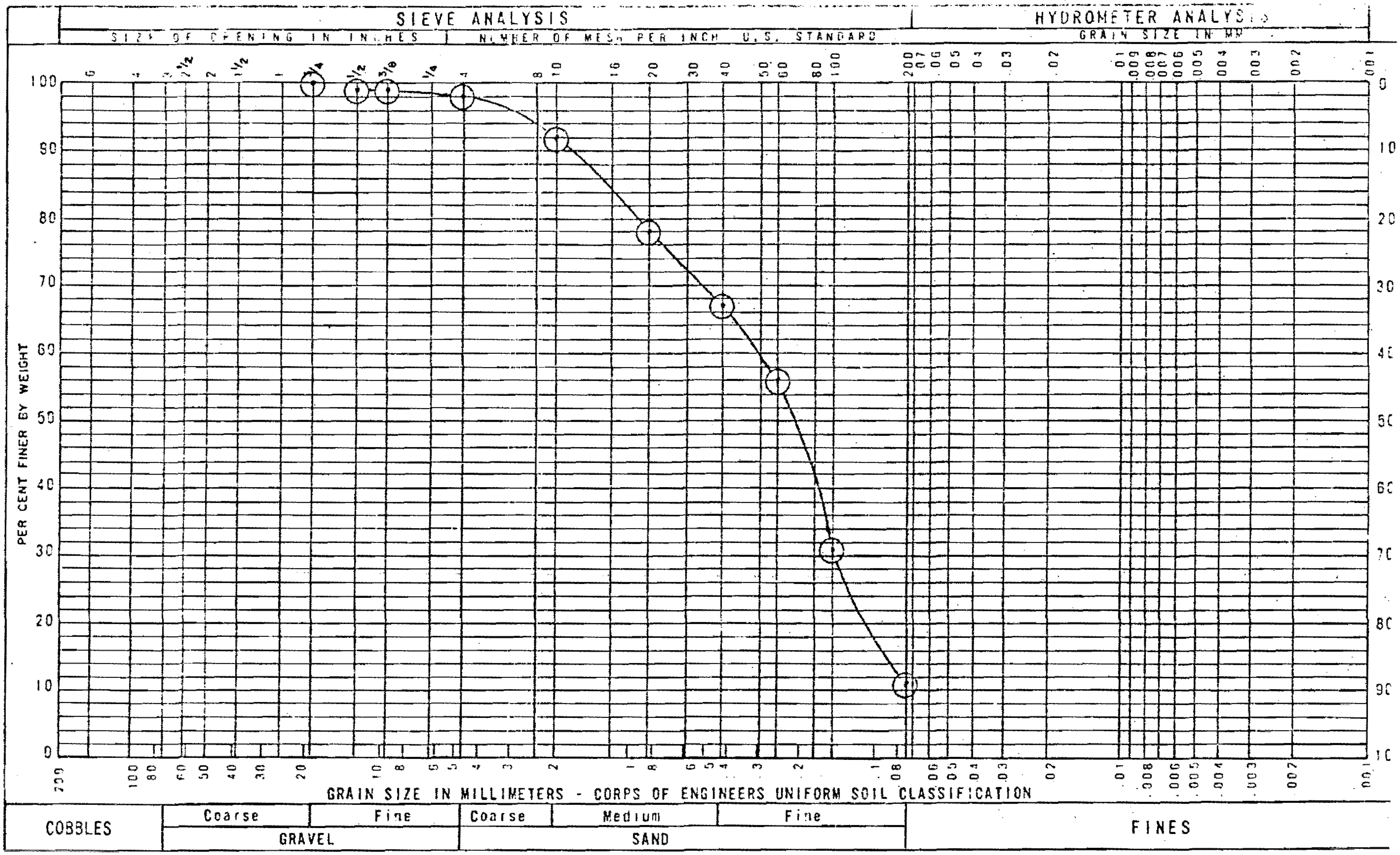
PROJECT Seward Small Boat Harbor
Sample data 2-3
Submitted by H. Walters
Expl. or gp. sample no
W O No. 81-31

NPD RF 321
JULY 1952

GRADATION CURVES

CORPS OF ENGINEERS, TESTING LABORATORY ANCHORAGE ALASKA

Plotted: [illegible]
Checked:
4-29-81
Warren E. Holladay



SAMPLE NO	DEPTH - FT	CLASSIFICATION	NAT WC	LL	PI	
LS-1926	20.0'	SP-SM Silty Sand	25.8			

PROJECT Seward Small Boat Harbor

Sample data 2-4

Submitted by H. Walters

Expl. or gp sample no.

W O No. 81-31

NPD RF 321
JULY 1952

GRADATION CURVES

CORPS OF ENGINEERS TESTING LABORATORY, ANCHORAGE, ALASKA

Plotted WEA

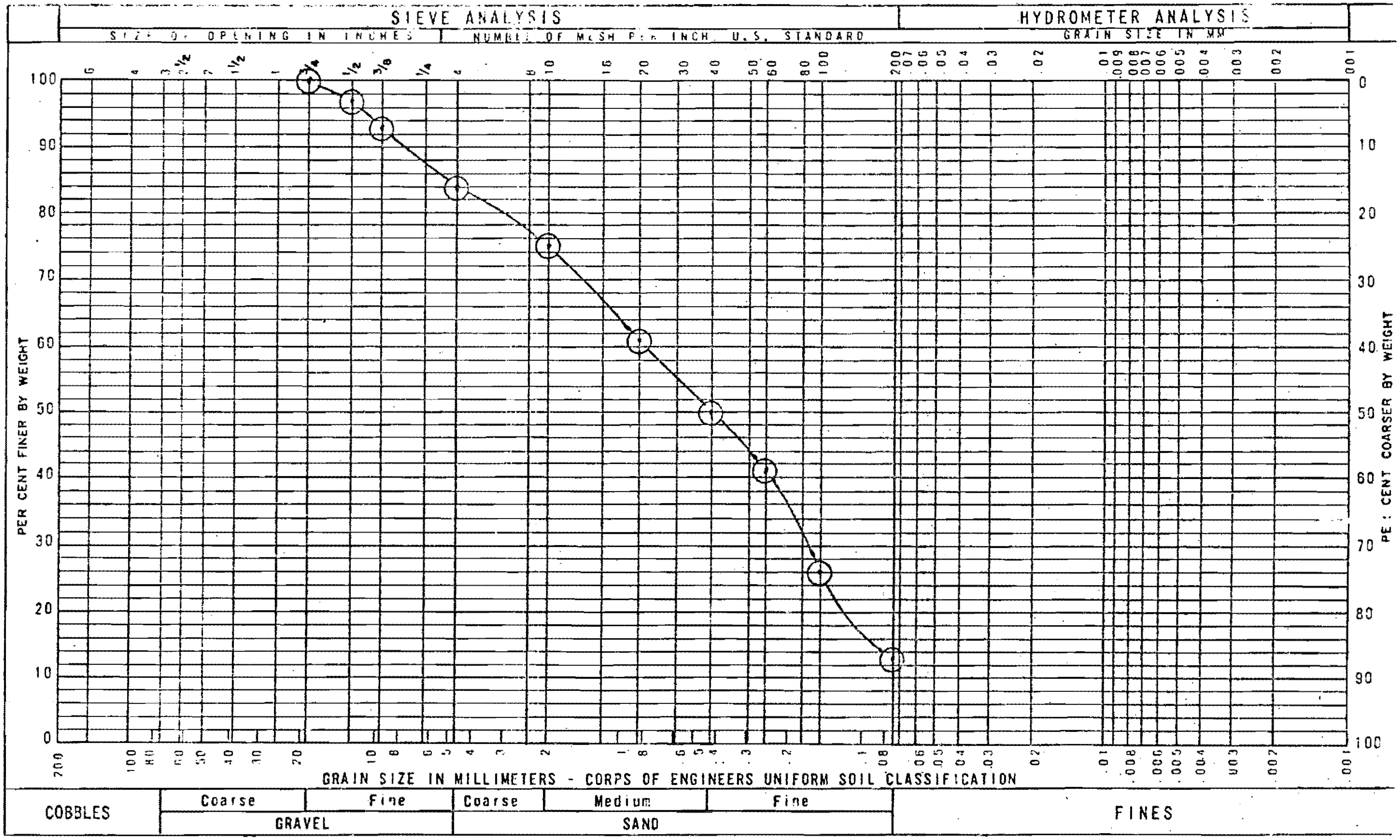
Checked

4-29-81

Date

Warren E. Gillaspie (signature)

Chief Soil Mechanics Engineer



SAMPLE NO	DEPTH - FT.	CLASSIFICATION	NAT WC	LL	PI
LS-1929	25.0'	SM-Silty Gravelly Sand	21.2		

PROJECT Seward Small Boat Harbor
Sample data 2-5
Submitted by H. Walters
Expl. or gp sample no.
W O No. 81-31

NPD RF 321 JULY 1952

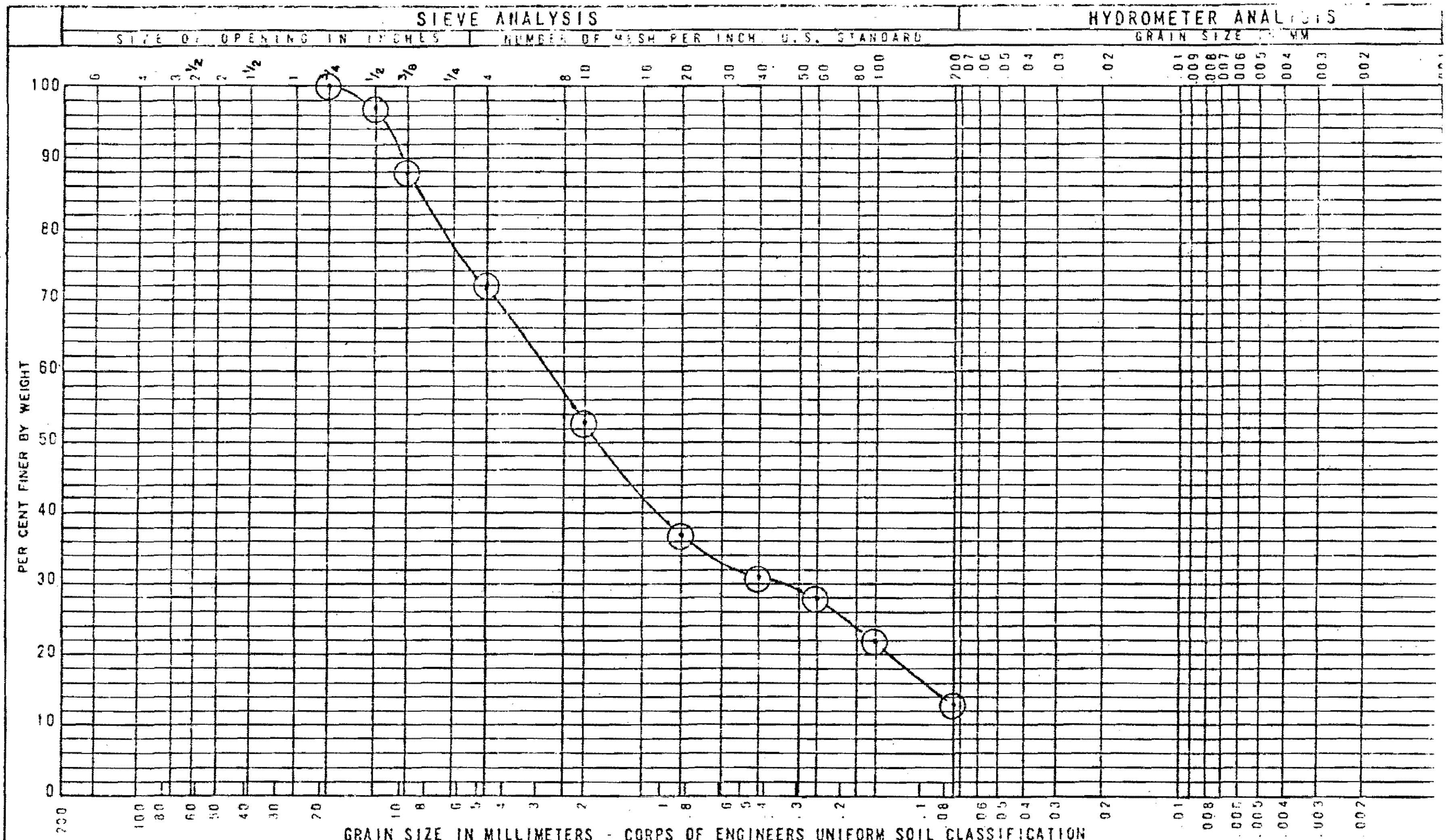
GRADATION CURVES

CORPS OF ENGINEERS TESTING LABORATORY, ANCHORAGE, ALASKA

Plotted
Checked

4-29-81
Date of report

Chief Soils Engr. & Geologist



COBBLES	GRAVEL		SAND			FINES
	Coarse	Fine	Coarse	Medium	Fine	

SAMPLE NO	DEPTH - FT	CLASSIFICATION	NAT WC	LL	PI
LS-1930	30.0'	SM-Silty Gravelly Sand	18.2		

PROJECT Seward Small Boat Harbo

Sample data 2-6

Submitted by H. Walters

Expl or gp sample no

W O No 81.31

NPD RF 321
JULY 1952

GRADATION CURVES

CORPS OF ENGINEERS, TESTING LABORATORY, ANCHORAGE, ALASKA

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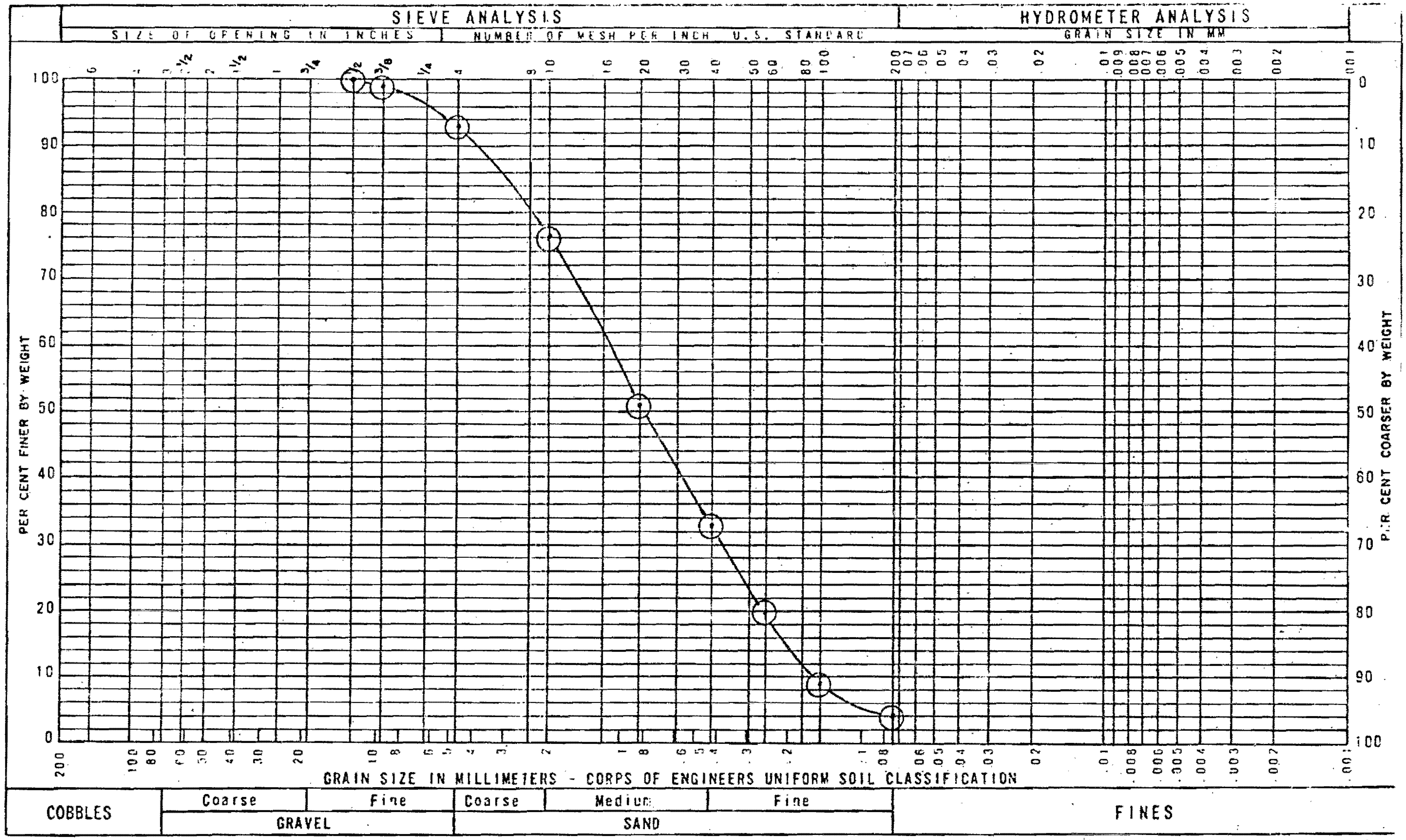
Checked

4-29-81

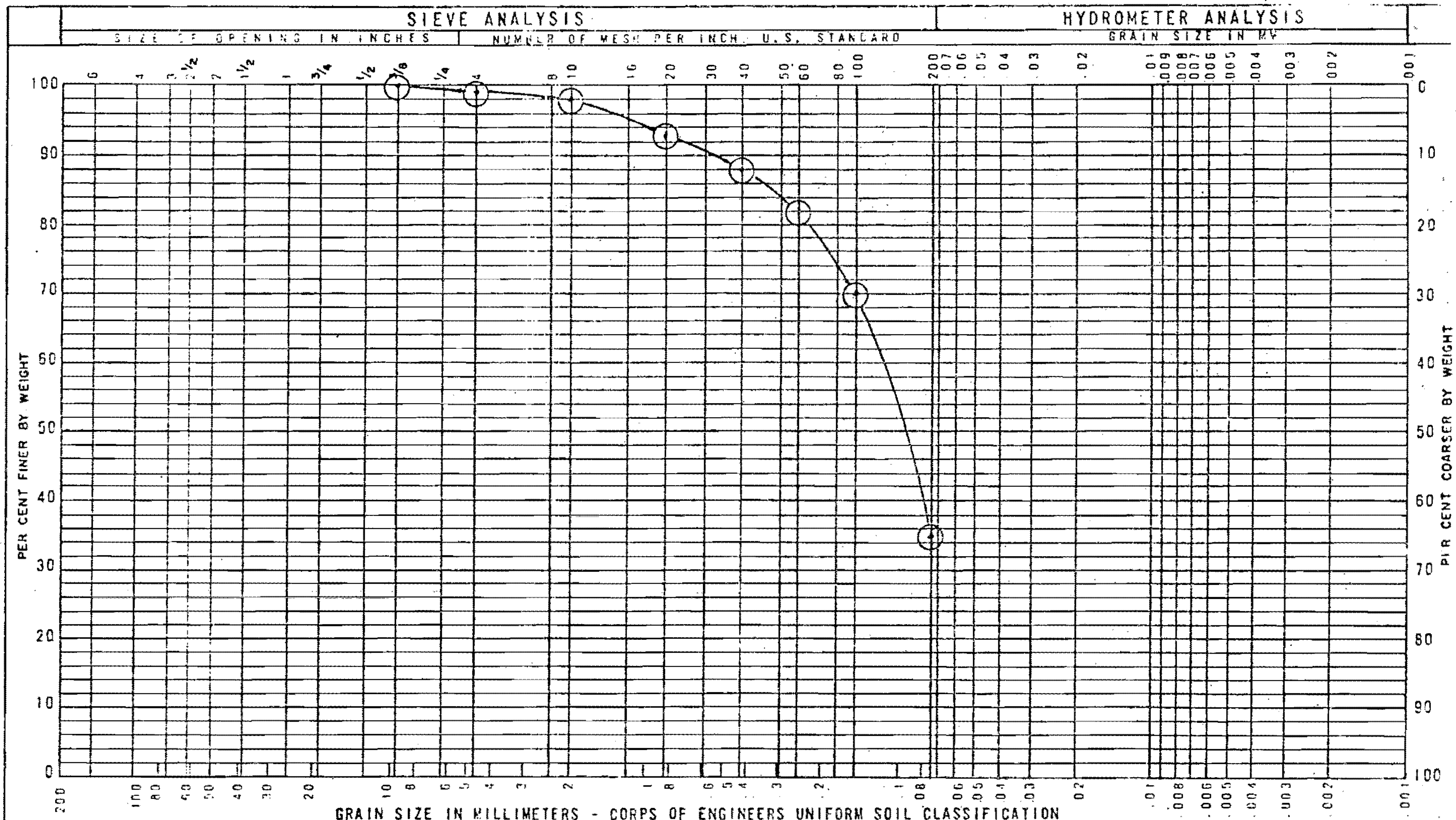
Chief, Soil Mechanics Br.



SAMPLE NO	DEPTH - FT	CLASSIFICATION	NAT WC	LL	PI	
LS-1931	5.0'	SP-Gravelly Sand				

PROJECT	Seward Small Boat Harbor
Sample data	3-1
Submitted by	H. Walters
Expl. or gp sample no.	
W O No.	81-31

NPD RF JULY 1952 321	GRADATION CURVES CORPS OF ENGINEERS TESTING LABORATORY, ANCHORAGE, ALASKA	Plotted WCS Checked	4-29-81 Date of report	Warren E. Holladay Chief Soil Mechanics Branch



COBBLES	GRAVEL		SAND			FINES
	Coarse	Fine	Coarse	Medium	Fine	

SAMPLE NO	DEPTH - FT.	CLASSIFICATION	NAT W.C.	LL	PI
LS-1932	10.0'	SM-Silty Sand			

PROJECT Seward Small Boat Harbor

Sample date 3-2

Submitted by H. Walters

Expl. or pp. sample no

W O No. 81-31

NPD RF 321
JULY 1952

GRADATION CURVES

CORPS OF ENGINEERS, TESTING LABORATORY, ANCHORAGE, ALASKA

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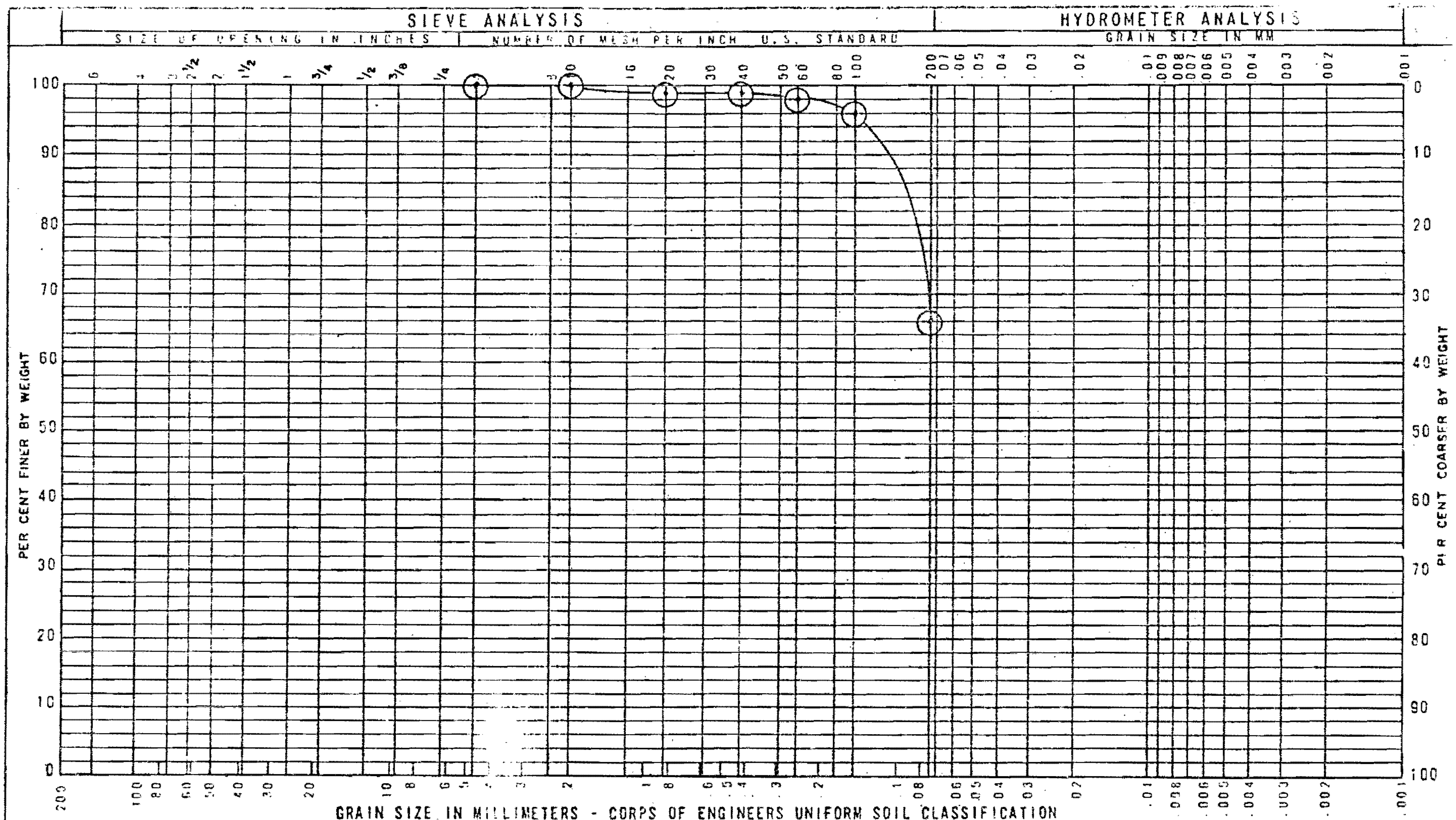
Checked

4-29-81
Date of report

Warren E. [signature]
Chief, Soil Mechanics Branch



COBBLES	GRAVEL		SAND			FINES
	Coarse	Fine	Coarse	Medium	Fine	

SAMPLE NO	DEPTH - FT	CLASSIFICATION	NAT WC	LL	PI
LS-1933	15.0'	ML-Sandy Silt	30.9		

PROJECT Seward Small Boat Harbor

Sample data 3-3

Submitted by H. Walters

Expl. or gp. sample no.

W O No. 81-31

NPD RF JULY 1962 321

GRADATION CURVES

CORPS OF ENGINEERS TESTING LABORATORY ANCHORAGE, ALASKA

Plotted WEH

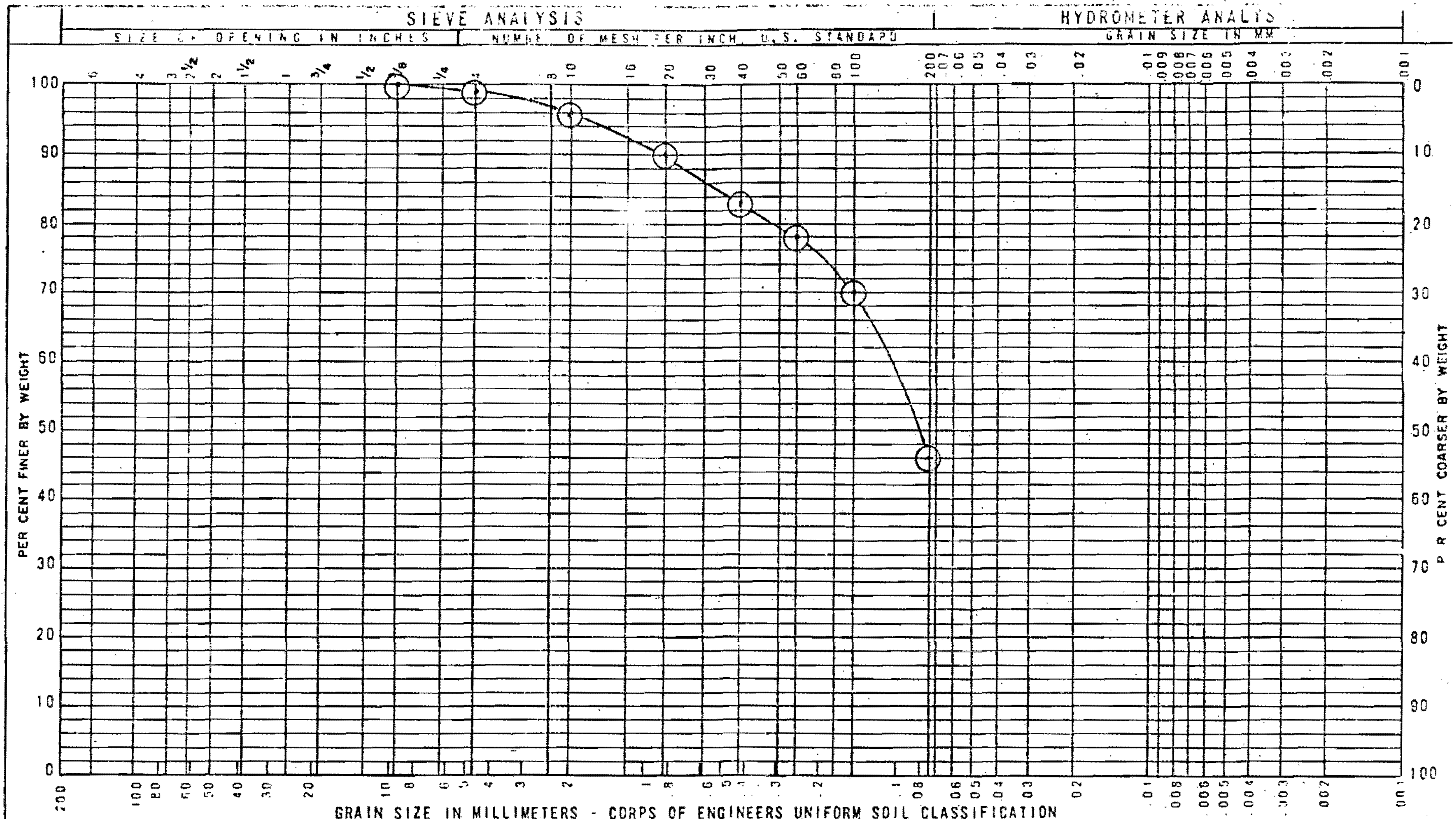
Checked

4-29-81

Date of report

Warren E. Holladay

Chief Soil Mechanics Branch



COBBLES	GRAVEL		SAND			FINES
	Coarse	Fine	Coarse	Medium	Fine	

SAMPLE NO.	DEPTH - FT.	CLASSIFICATION	NAT W.C.	LL	PI	
LS-1934	20.0'	SM-Silty Sand	28.0			

PROJECT Seward Small Boat Harbor

Sample data 3-4

Submitted by H. Walters

Expl or gp. sample no.

W O No. 81-31

4-29-81
Date of report

Warren E. Halladay
Chief, Soil Mechanics Branch

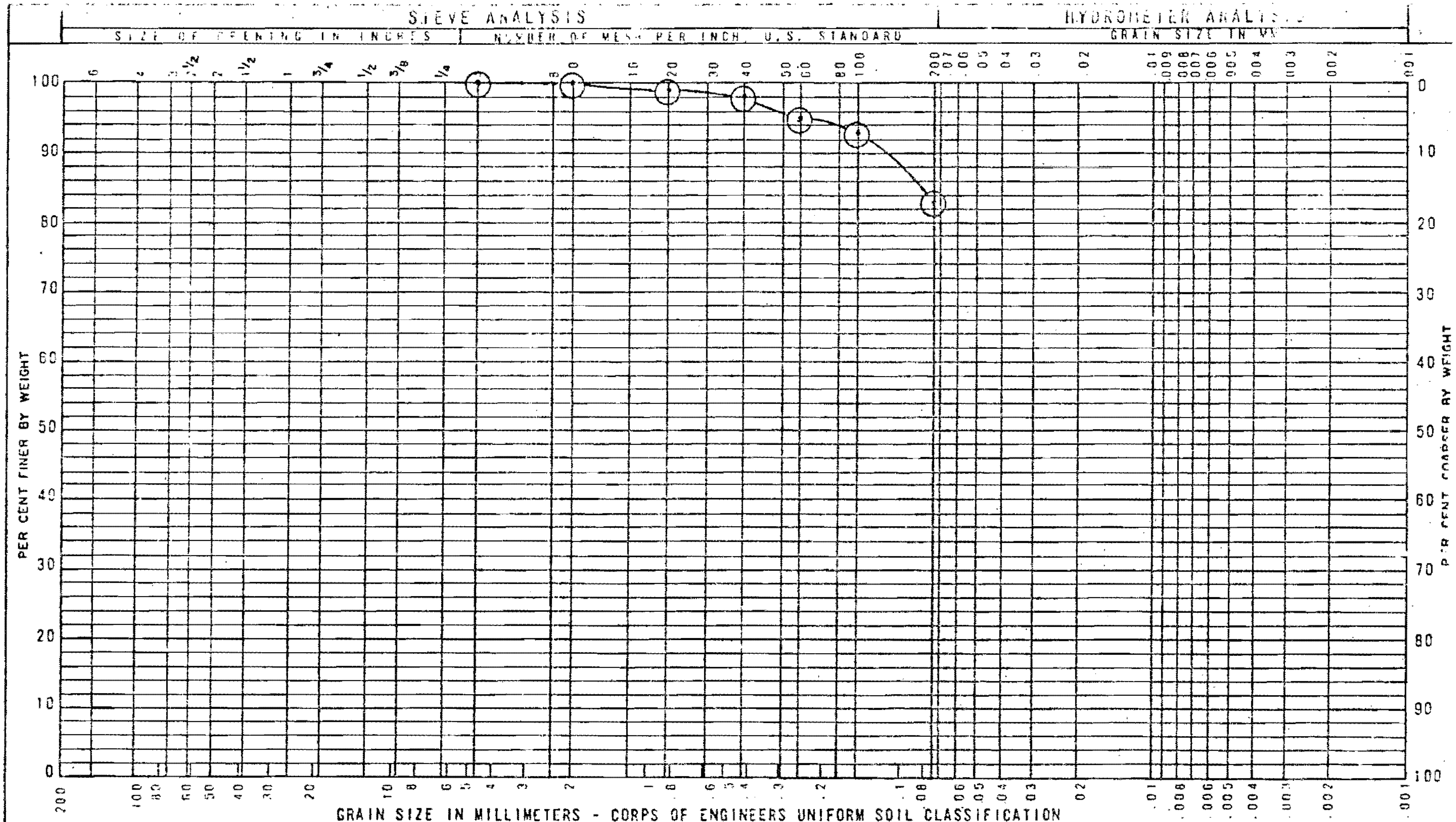
Plotted [signature]

Checked

NPD RF JULY 1952 321

GRADATION CURVES

CORPS OF ENGINEERS, TESTING LABORATORY, ANCHORAGE, ALASKA



COBBLES	GRAVEL		SAND			FINES
	Coarse	Fine	Coarse	Medium	Fine	

SAMPLE NO	DEPTH - FT	CLASSIFICATION	NAT W.C.	LL	PI	
LS-1935	25.0'	ML-Sandy Silt	34.2			

PROJECT Seward Small Boat Harbor

Sample data 3-5

Submitted by H. Walters

Expl or gp. sample no.

W O No. 81-31

Date of report 4-29-81

Chief, Soils Mechanics Branch

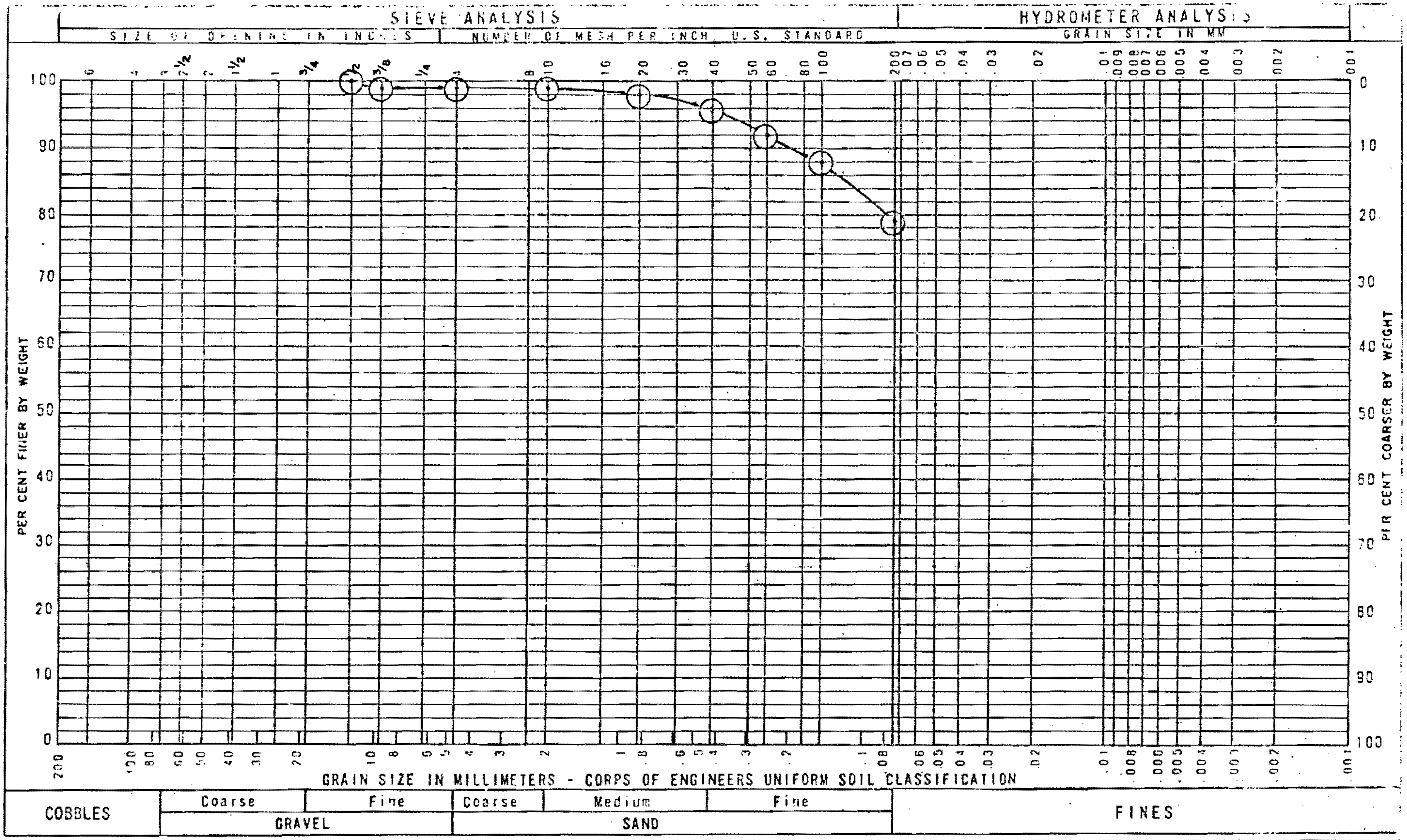
NPO RF 321
JULY 1952

GRADATION CURVES

CORPS OF ENGINEERS, TESTING LABORATORY ANCHORAGE ALASKA

Plotted

Checked



SAMPLE NO	DEPTH - FT	CLASSIFICATION	NAT W.C.	LL	PI	
LS-1936	30.0'	ML-Sandy Silt	32.9			

PROJECT	Seward Small Boat Harbor
Sample data	3-6
Submitted by	H. Walters
Expl. or gp. sample no.	
W. O. No.	8-31

NPD RF 321 JULY 1962

GRADATION CURVES

CORPS OF ENGINEERS, TESTING LABORATORY, ANCHORAGE, ALASKA

Plotted HED

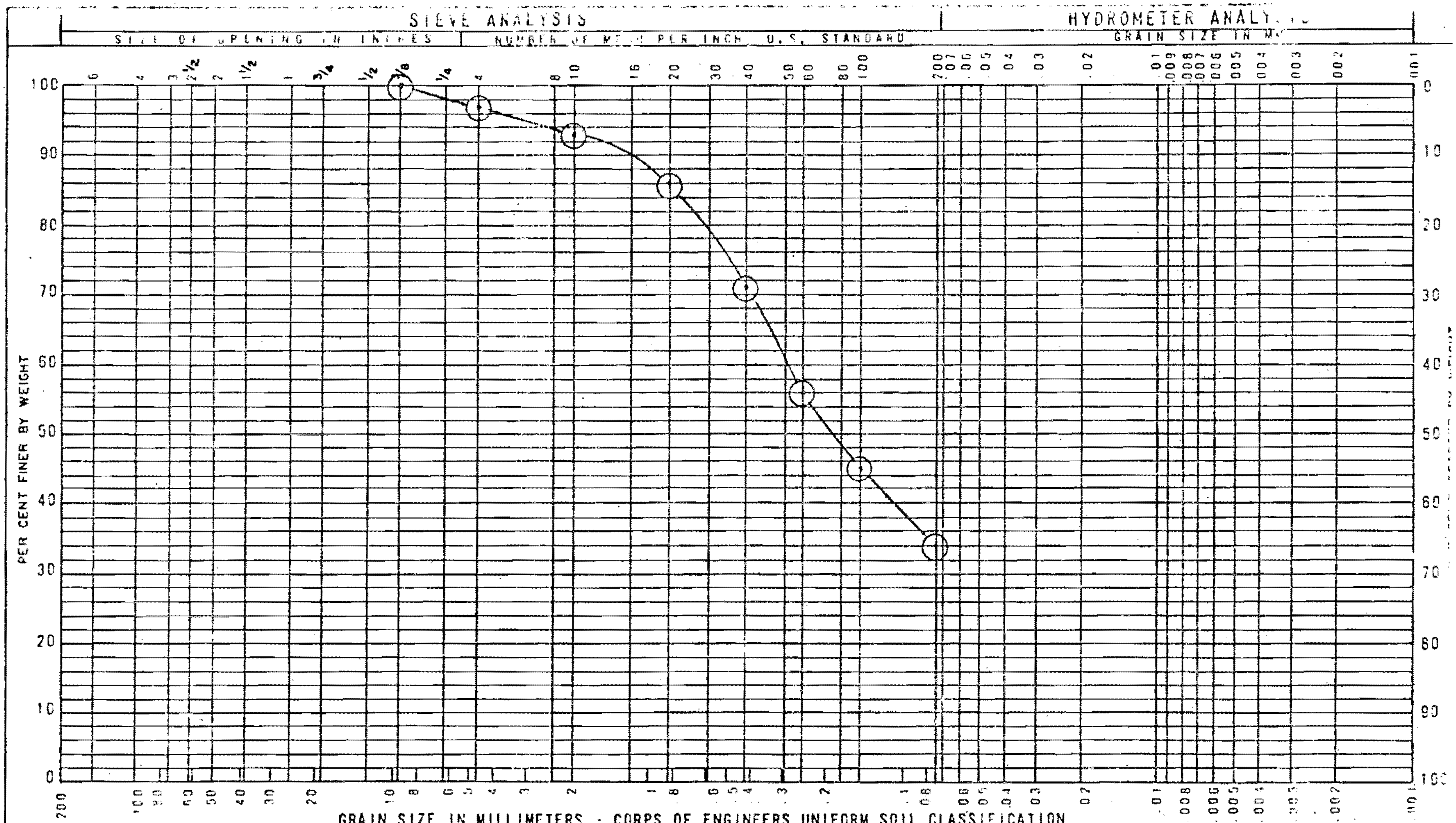
Checked

4-29-81

Date of report

Warren E. Holladay

Chief, Soil Mechanics Branch



COBBLES	GRAVEL Coarse	GRAVEL Fine	SAND Coarse	SAND Medium	SAND Fine	FINES

SAMPLE NO.	DEPTH - FT.	CLASSIFICATION	NAT W.C.	LL	PI	
LS-1937	5.0'	SM-Silty Sand	32.5			

PROJECT Seward Small Boat Harbor
Sample data 4-1
Submitted by H. Walters
Expl or gp sample no
W O No. 81-31

NPD RF JULY 1952 321

GRADATION CURVES

CORPS OF ENGINEERS, TESTING LABORATORY, ANCHORAGE, ALASKA

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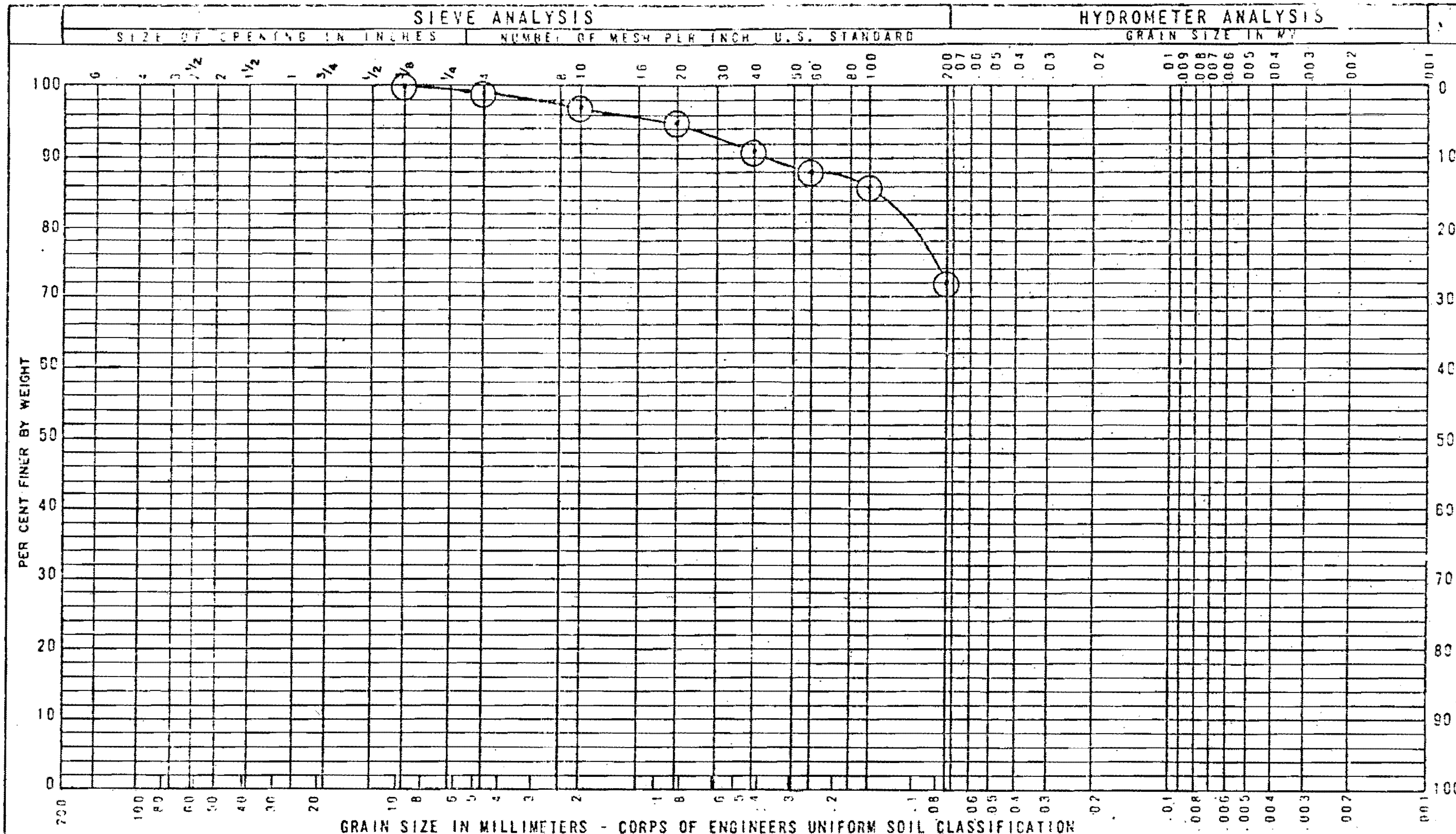
Checked

4-30-81
Date of report

Warren E. Goodwin [signature]
Chief, Soil Mechanics Branch



COBBLES	GRAVEL Coarse	GRAVEL Fine	SAND Coarse	SAND Medium	SAND Fine	FINES

SAMPLE NO	DEPTH - FT	CLASSIFICATION	NAT WC	LL	PI
LS-1938	10.0'	ML-Sandy Silt	29.7		

PROJECT Seward Small Boat Harbor
Sample data 4-2
Submitted by H. Walters
Expl. or gp. sample no. 81-31
W O No.

NPD RF 32' JULY 19__

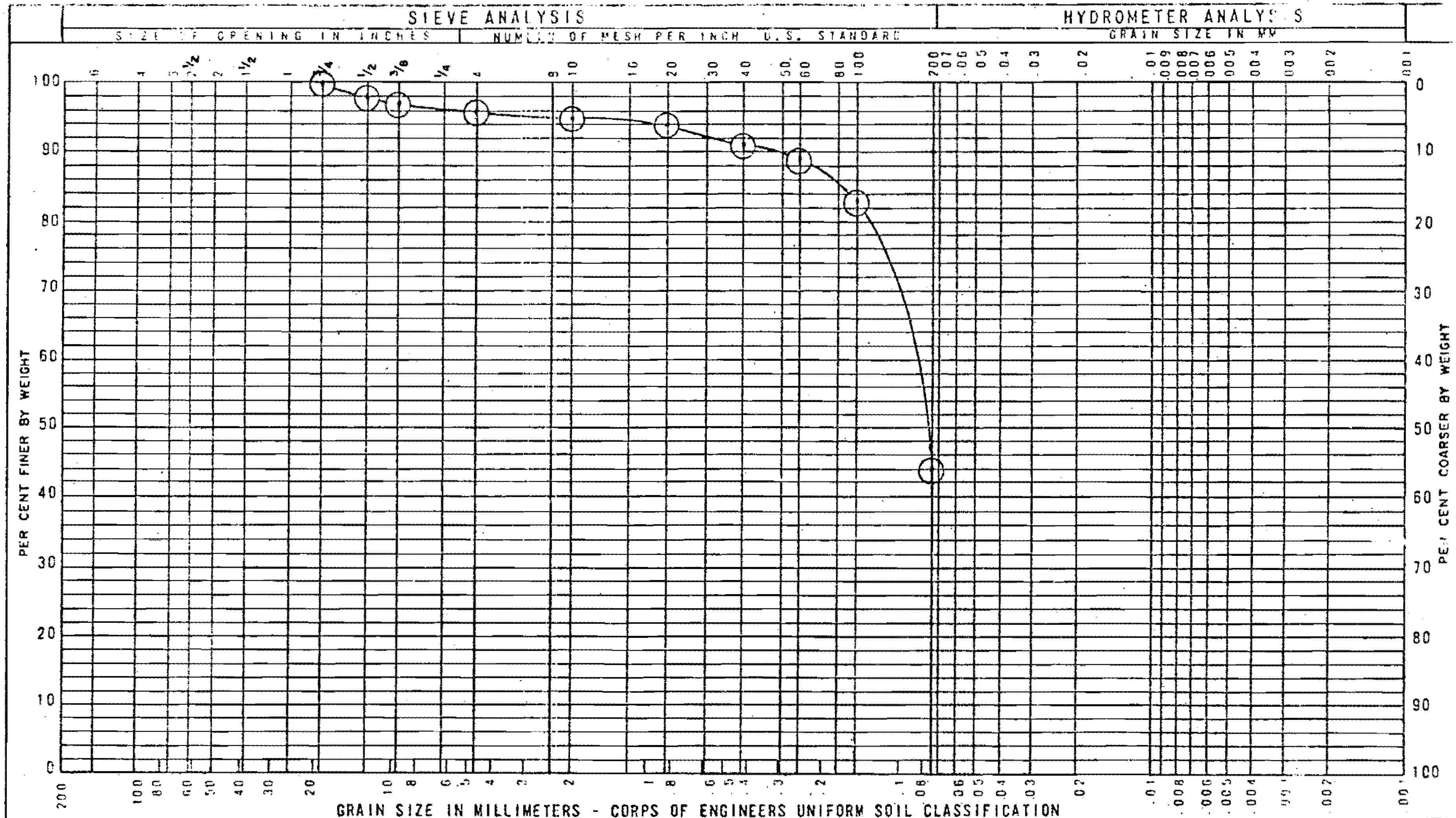
GRADATION CURVES
CORPS OF ENGINEERS, TESTING LABORATORY, ANCHORAGE, ALASKA

Plotted HEH
Checked

40/30/81
Date of Rep't

Warren E. [signature]
Chief, Soils ...

D-31



COBBLES	Coarse	Fine	Coarse	Medium	Fine	FINES
	GRAVEL		SAND			

SAMPLE NO.	DEPTH - FT.	CLASSIFICATION	NAT W.C.	LL	PI
LS-1939	15.0	SM-Silty Sand	31.1		

PROJECT Seward Small Boat Harbor

Sample data 4-3

Submitted by H. Walters

Expl. or gp. sample no.

W O No. 81-31

NPD RF JULY 1952 321

GRADATION CURVES

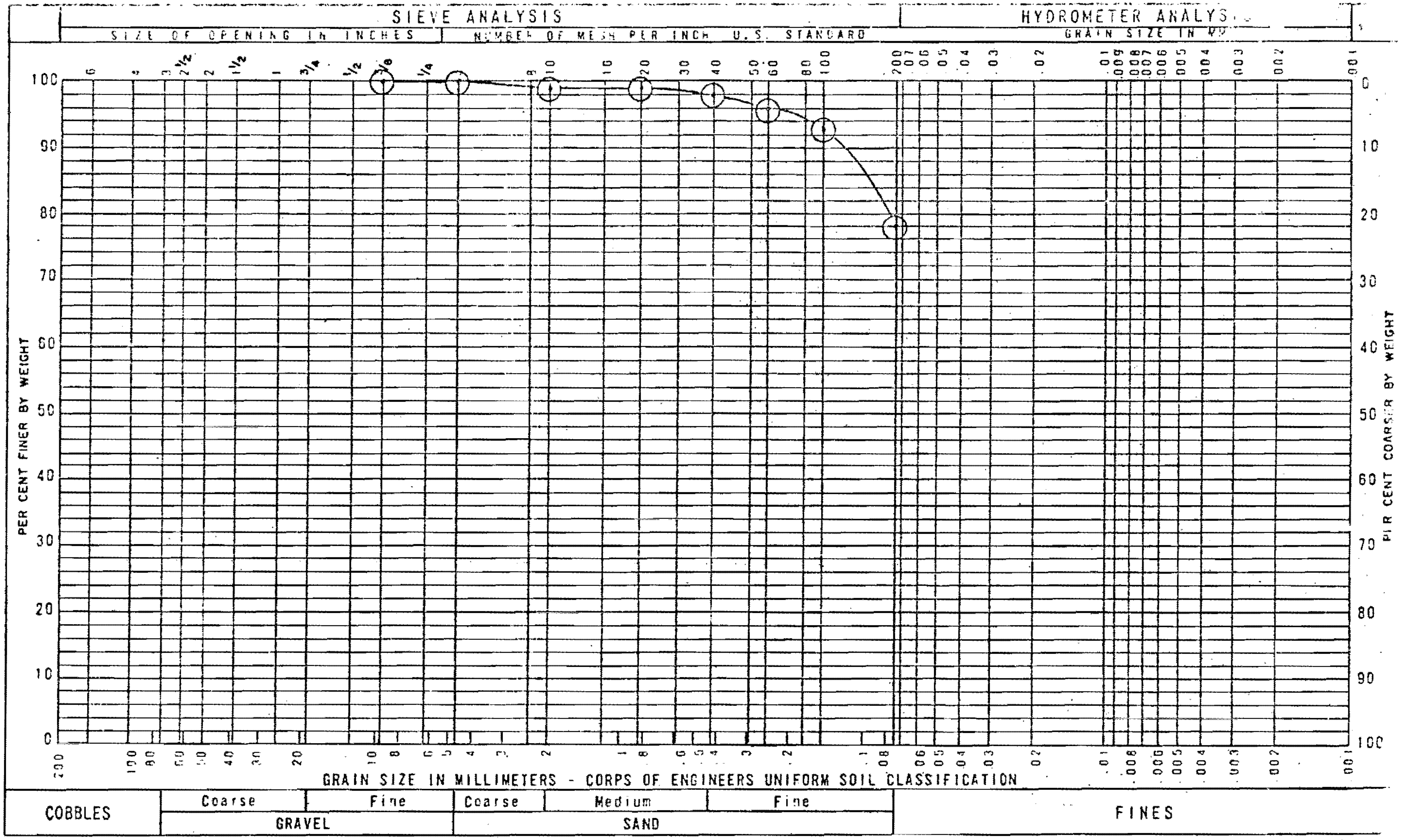
CORPS OF ENGINEERS TESTING LABORATORY ANCHORAGE ALASKA

Plotted [illegible]

Checked

4-30-81 Date of report

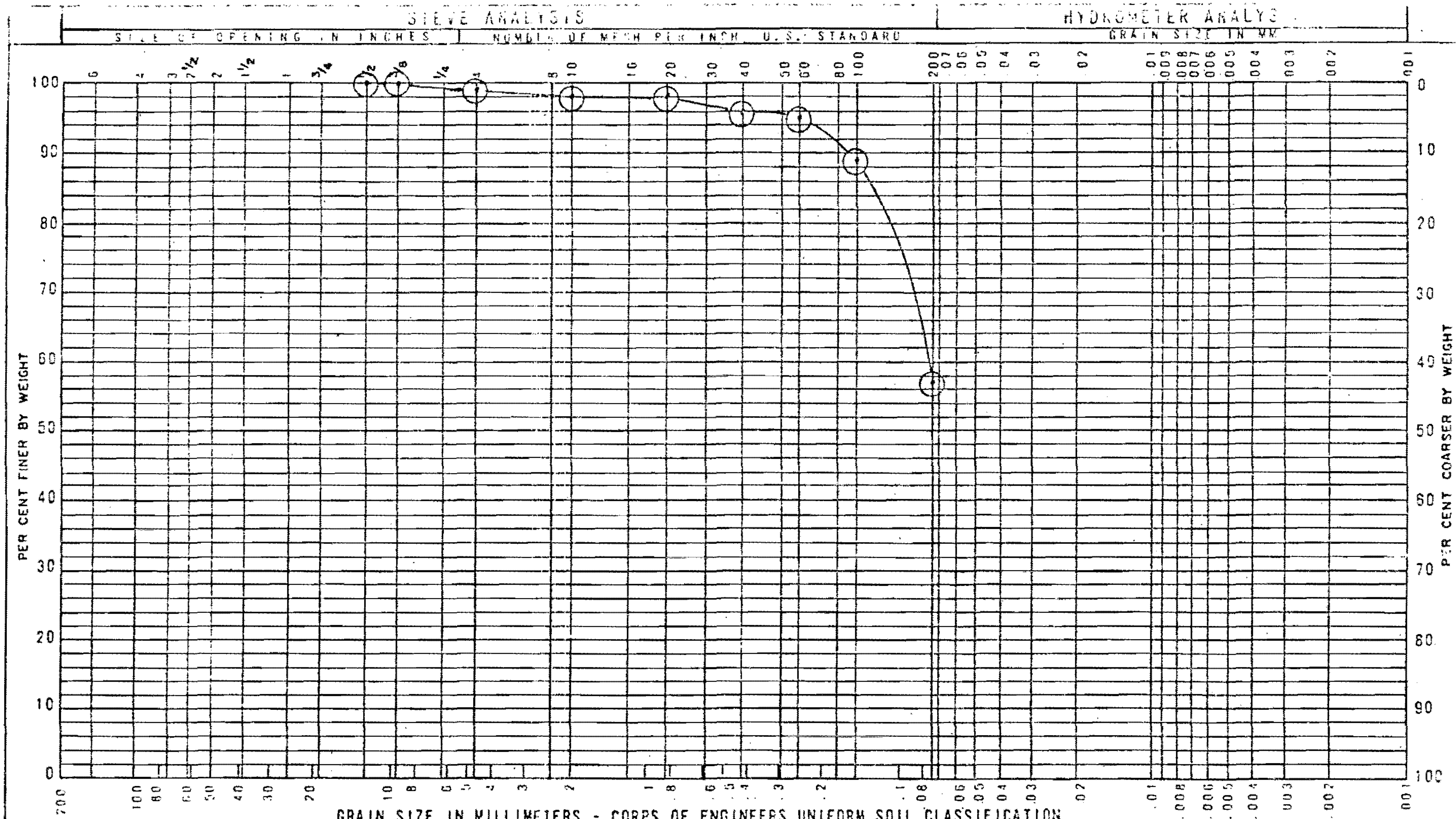
Warren E. [illegible] Chief, Soils



SAMPLE NO.	DEPTH - FT	CLASSIFICATION	NAT WC	LL	PI	
LS-1940	20.0'	ML-Sandy Silt	33.0			

PROJECT Seward Small Boat Harbor
Sample data 4-4
Submitted by H. Walters
Expl or gp sample no.
W O No. 81-31

NPD RF 321 JULY 1952	GRADATION CURVES CORPS OF ENGINEERS, TESTING LABORATORY, ANCHORAGE, ALASKA	Plotted [illegible] Checked	4-30-81 Date of report	Warren E. [illegible] Chief Soil Mechanics Branch



COBBLES	GRAVEL Coarse	GRAVEL Fine	SAND Coarse	SAND Medium	SAND Fine	FINES

SAMPLE NO	DEPTH - FT.	CLASSIFICATION	NAT WC	LL	PI	
LS-T941	25.0'	ML-SL Sandy silt	27.4			

PROJECT Seward Small Boat Harbor
Sample data 4-5
Submitted by H. Walters
Expl. or gp. sample no.
W O No. 81-31

NPD RF JULY 1952 321

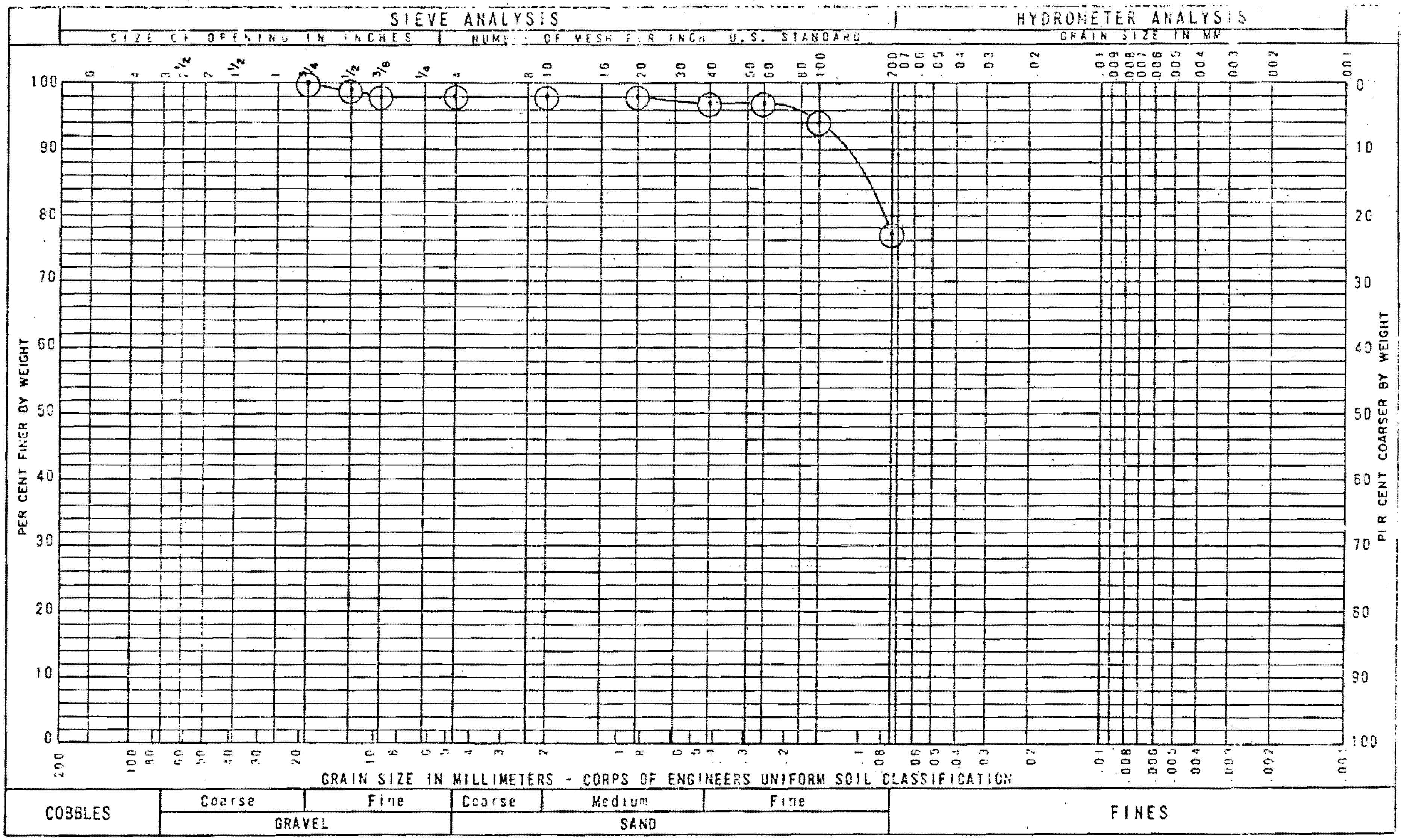
GRADATION CURVES

CORPS OF ENGINEERS, TESTING LABORATORY, ANCHORAGE, ALASKA

Plotted
Checked

4-30-81
Date of report

Chief, Soil Mechanics Branch



SAMPLE NO	DEPTH - FT	CLASSIFICATION	NAT WC	LL	PI
LS-1942	30.0'	ML-Sandy silt	32.7		

PROJECT Seward Small Boat Harbor

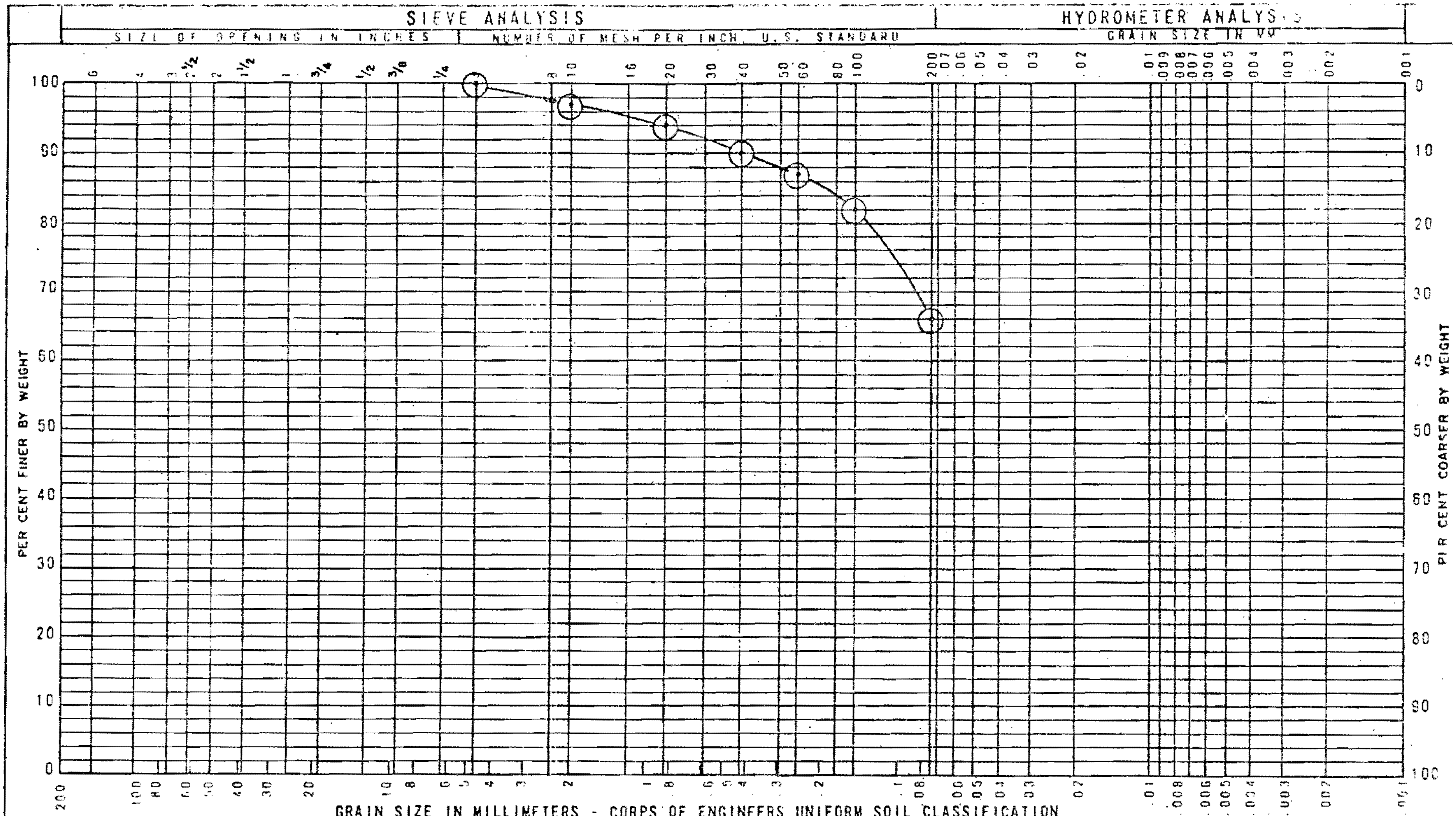
Sample date 4-6

Submitted by H. Walters

Expl or gp sample no

W O No. 81-31

NPD RF 321 JULY 1 52	GRADATION CURVES CORPS OF ENGINEERS TESTING LABORATORY ANCHORAGE ALASKA	Plotted / Checked	4-30-81 Date of report	Chief Soil Mechanics Sec



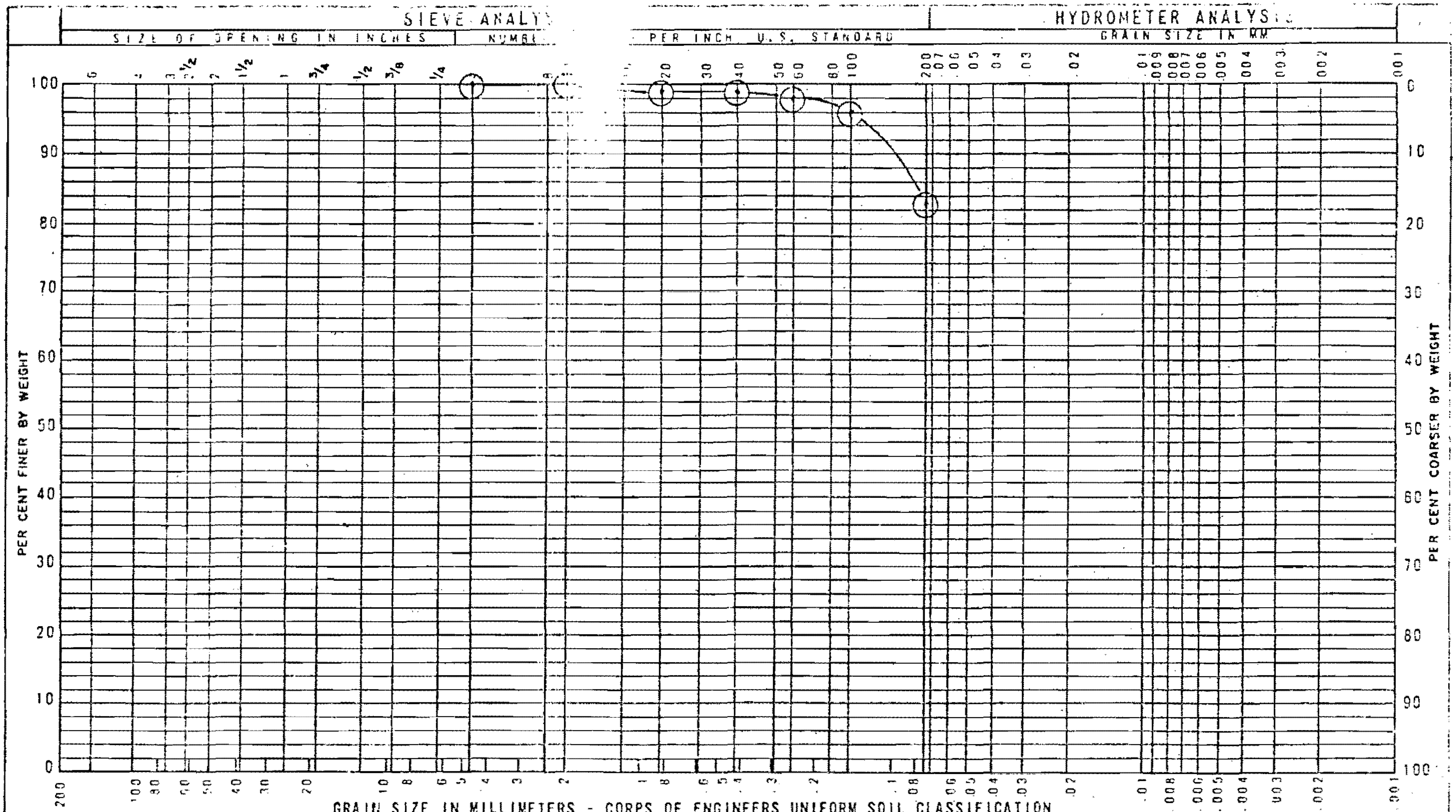
COBBLES	GRAVEL: Coarse	GRAVEL: Fine	SAND: Coarse	SAND: Medium	SAND: Fine	FINES

SAMPLE NO.	DEPTH - FT.	CLASSIFICATION	NAT WC	LL	PI
LS-1943	5.0'	ML-Sandy Silt	28.4		

PROJECT Seward Small Boat Harbor
Sample data 5-1
Submitted by H. Walters
Expl or gp sample no.
W O No. 81-31

NPD RF ...21 JULY 19..	GRADATION CURVES CORPS OF ENGINEERS TESTING LABORATORY, ANCHORAGE ALASKA	Plotted [signature] Checked	4-30-81 Date of report	[signature] Chief, Soil Mechanics Branch

D-37



COBBLES	GRAVEL		SAND			FINES
	Coarse	Fine	Coarse	Medium	Fine	

SAMPLE NO	DEPTH FT	CLASSIFICATION	NAT WC	LL	PI
LS-1944	10.0'	ML-Sandy silt	29.8		

PROJECT Seward Small Boat Harbor
Sample data 5-2
Submitted by H. Walters
Expl or gp sample no
W O No 81-31

NPD RF JULY 1952 321

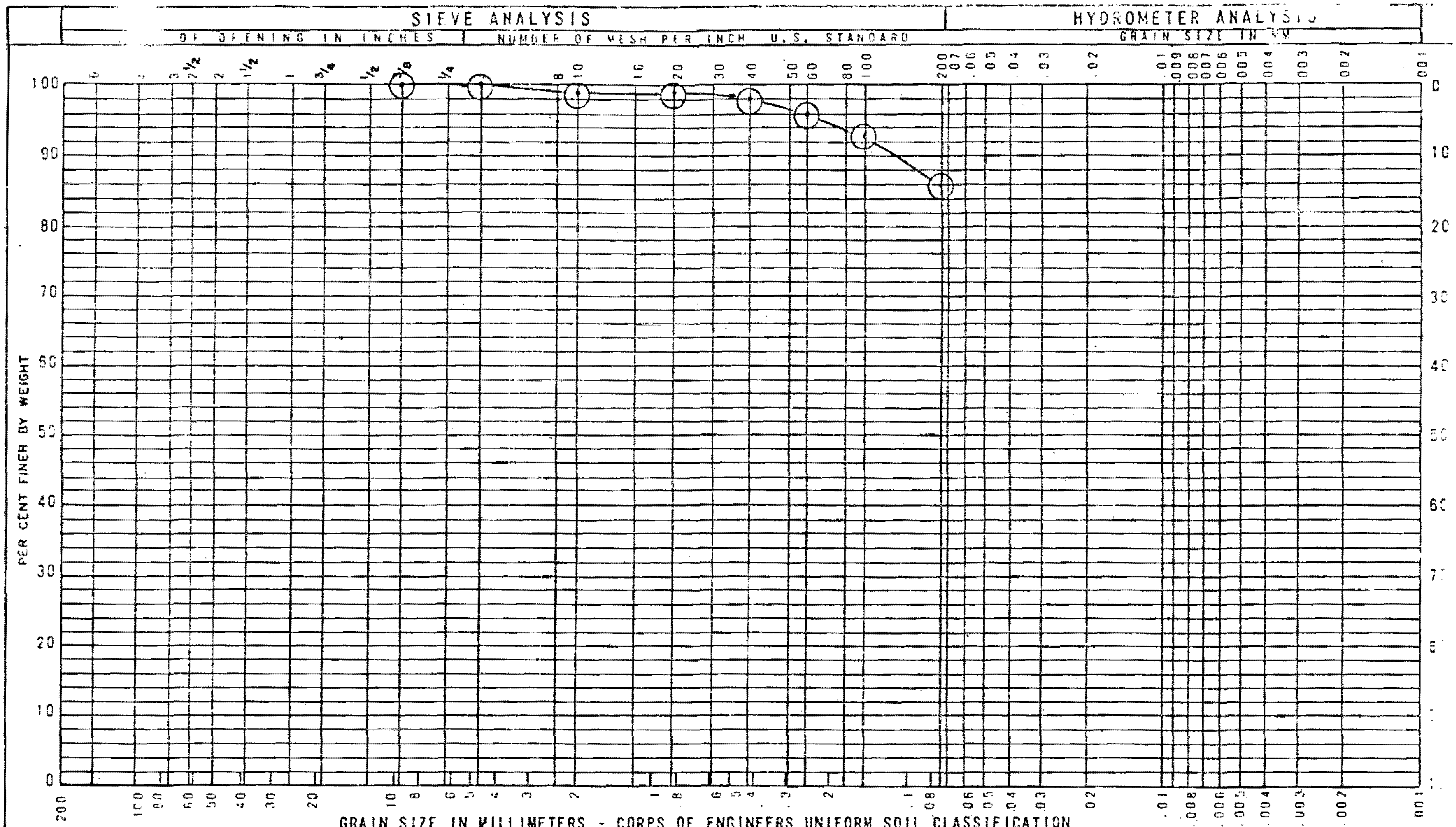
GRADATION CURVES

CORPS OF ENGINEERS TESTING LABORATORY, ANCHORAGE, ALASKA

Plotted VEB
Checked

4-30-81
Date of report

[signature]
Chief Soil Mechanics Section



COBBLES	GRAVEL		SAND			FINES
	Coarse	Fine	Coarse	Medium	Fine	

SAMPLE NO	DEPTH - FT	CLASSIFICATION	NAT WC	LL	PI
LS-1945	15.0'	ML-Sandy Silt	30.1		

PROJECT Seward Small Boat Harbor
Sample data 5-3
Submitted by H. Walters
Expl. or gp. sample no.
W O No. 81-31

NPD RF 321
JULY 1952

GRADATION CURVES

CORPS OF ENGINEERS TESTING LABORATORY, ANCHORAGE, ALASKA

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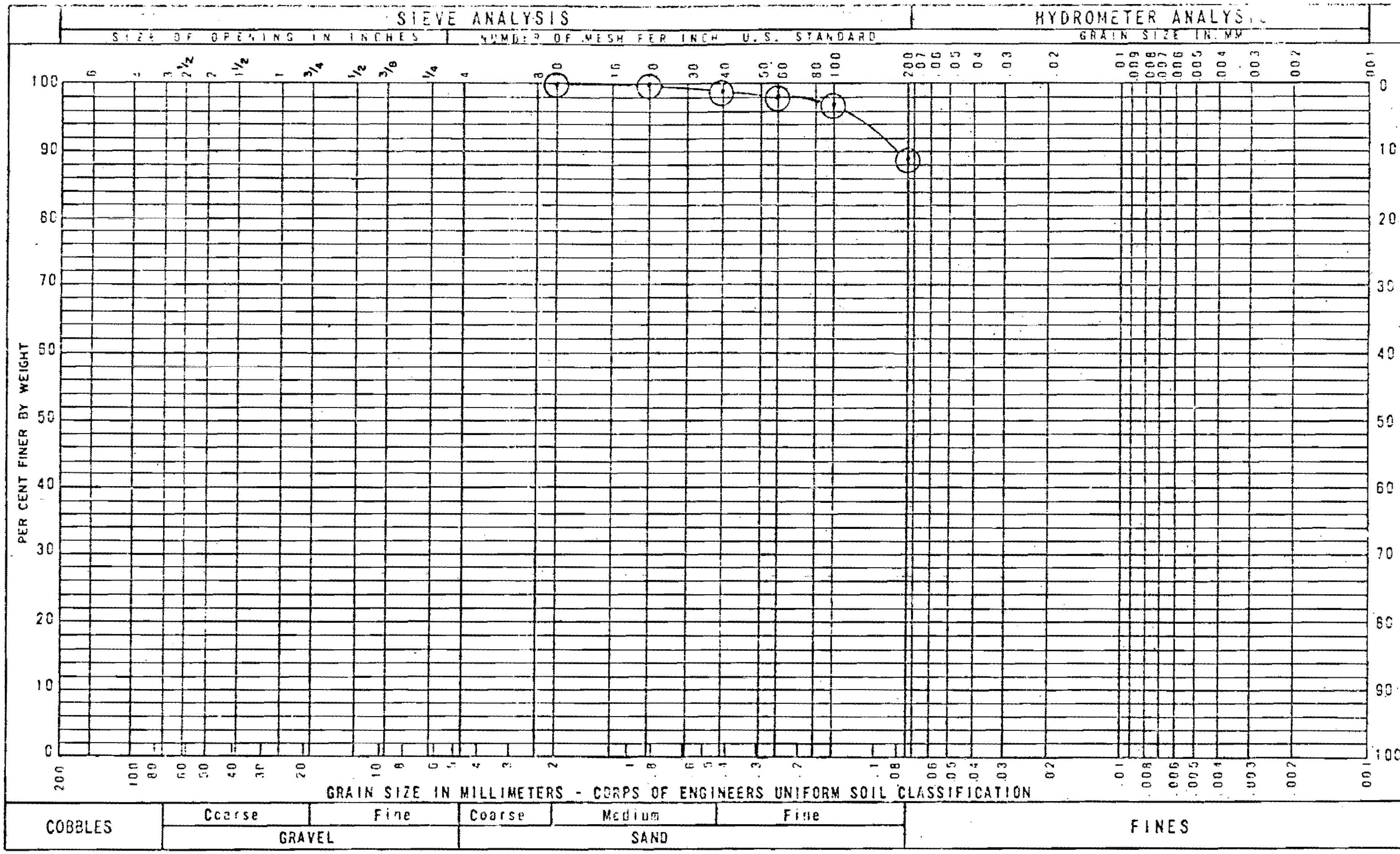
Checked

4-30-81
Date of report

Warren E. [signature]
Chief, Soil Mechanics Branch



SAMPLE NO.	DEPTH - FT.	CLASSIFICATION	NAT WC	LL	PI	
LS-1946	5.0'	ML-Sandy Silt	29.8			

PROJECT Seward Small Boat Harbor

Sample data 6-1

Submitted by H. Walters

Expl. or gp sample no.

W O No 81-31

NPD RF 321
JULY 1950

GRADATION CURVES

CORPS OF ENGINEERS, TESTING LABORATORY, ANCHORAGE, ALASKA

Plotted [illegible]

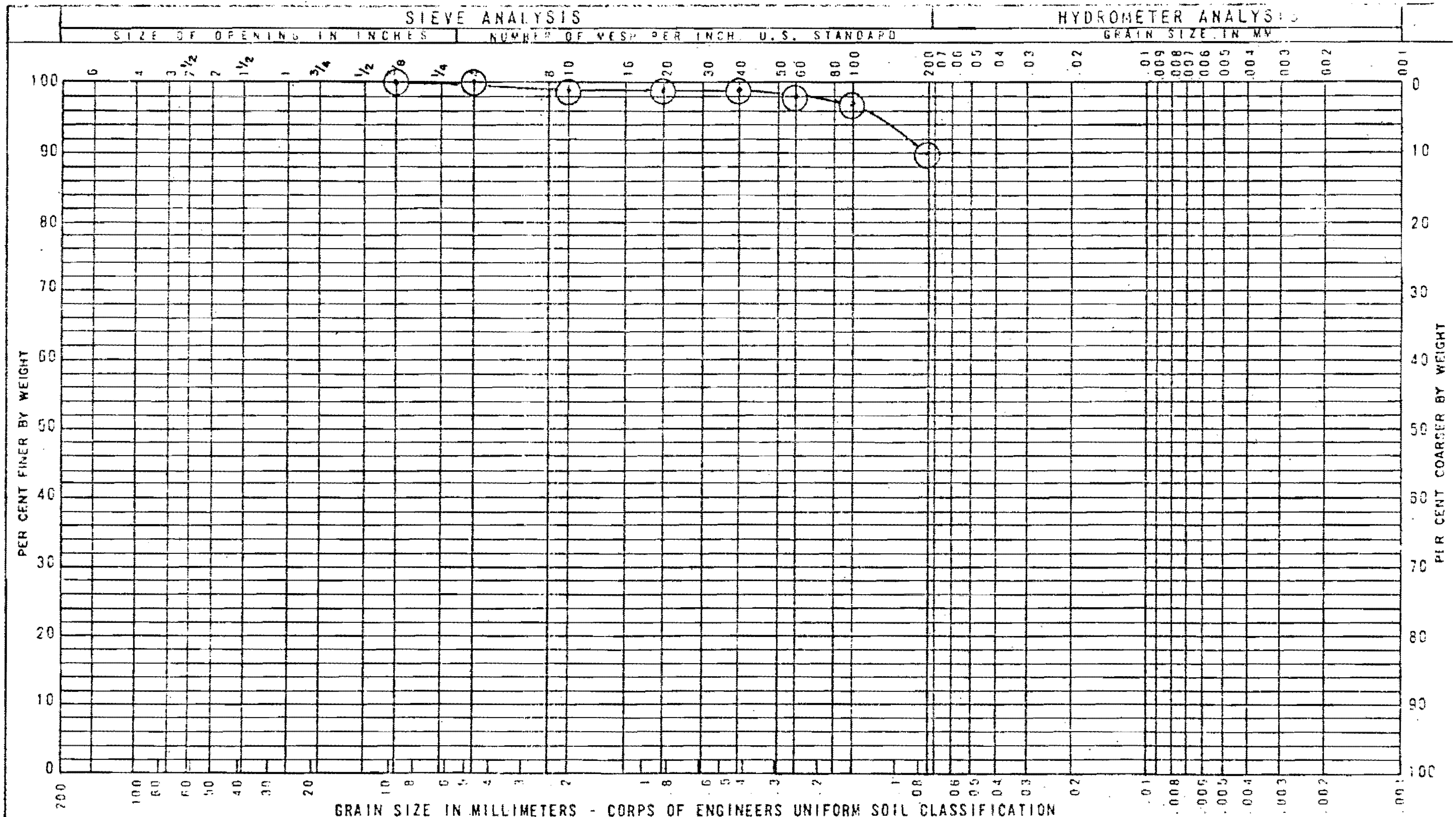
Checked

4-30-81

Date of report

Warren E. [illegible]

Chief, Soil [illegible]



COBBLES	GRAVEL		SAND			FINES
	Coarse	Fine	Coarse	Medium	Fine	

SAMPLE NO	DEPTH - FT	CLASSIFICATION	NAT W.C.	LL	PI
LS-1947	10.0'	ML-Sandy Silt	28.2		

PROJECT Seward Small Boat Harbor
Sample data 6-2
Submitted by H. Walters
Expl or gp sample no
W O No. 81-31

NPD RF 321
JULY 1952

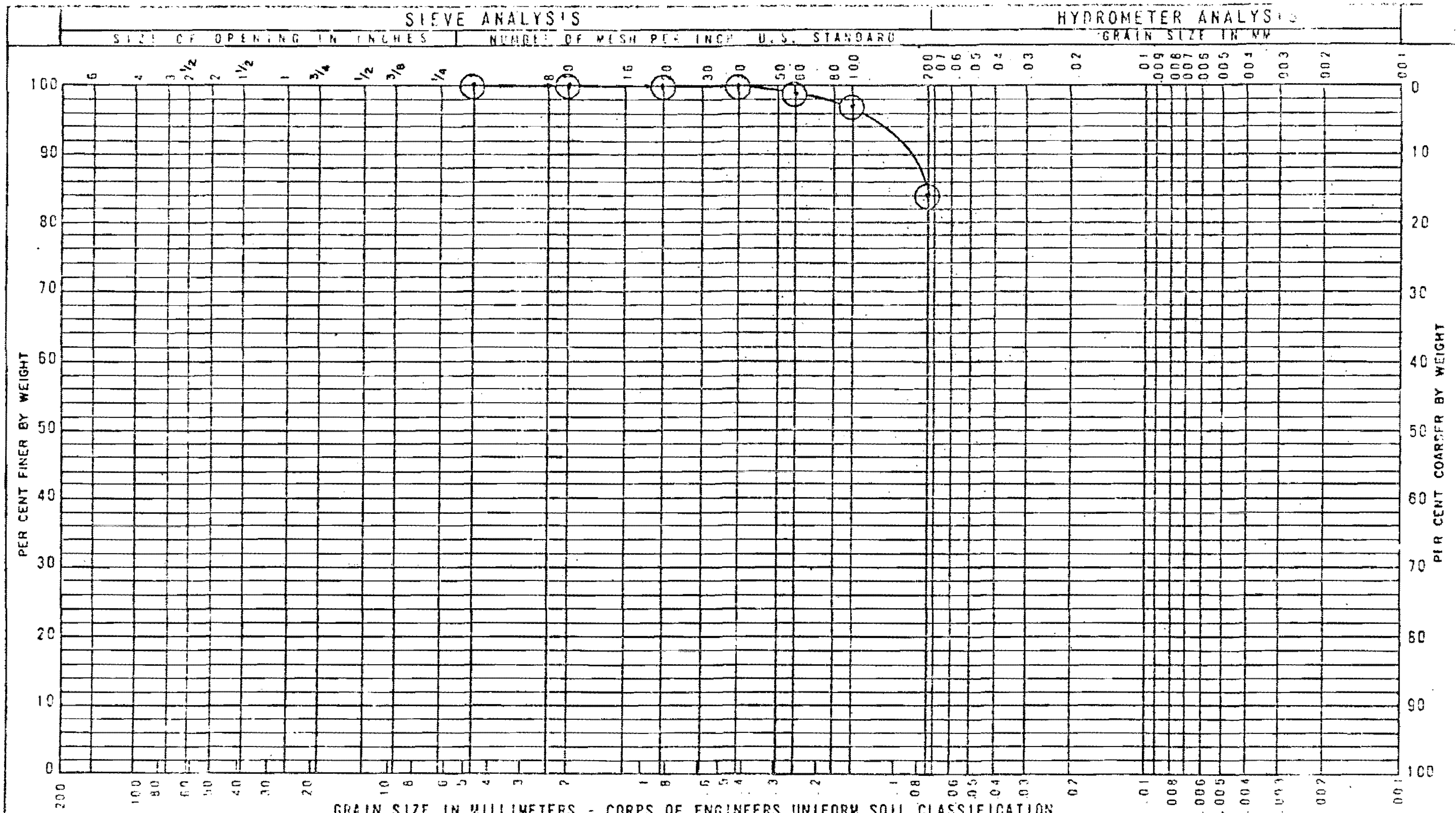
GRADATION CURVES

CORPS OF ENGINEERS, TESTING LABORATORY, ANCHORAGE, ALASKA

Plotted [illegible]
Checked

4-30-81
Date of report

Warren E. [illegible]
Chief, Soil Mech. [illegible]



COBBLES	GRAVEL Coarse	GRAVEL Fine	SAND Coarse	SAND Medium	SAND Fine	FINES

SAMPLE NO	DEPTH - FT.	CLASSIFICATION	NAT WC	LL	PI
LS-1946	15.0'	ML- Sandy Silt	30.6		

PROJECT Seward Small Boat Harbor
Sample data 6-3
Submitted by H. Walters
Expl. or gp. sample no.
W O No. 81-31

GRADATION CURVES

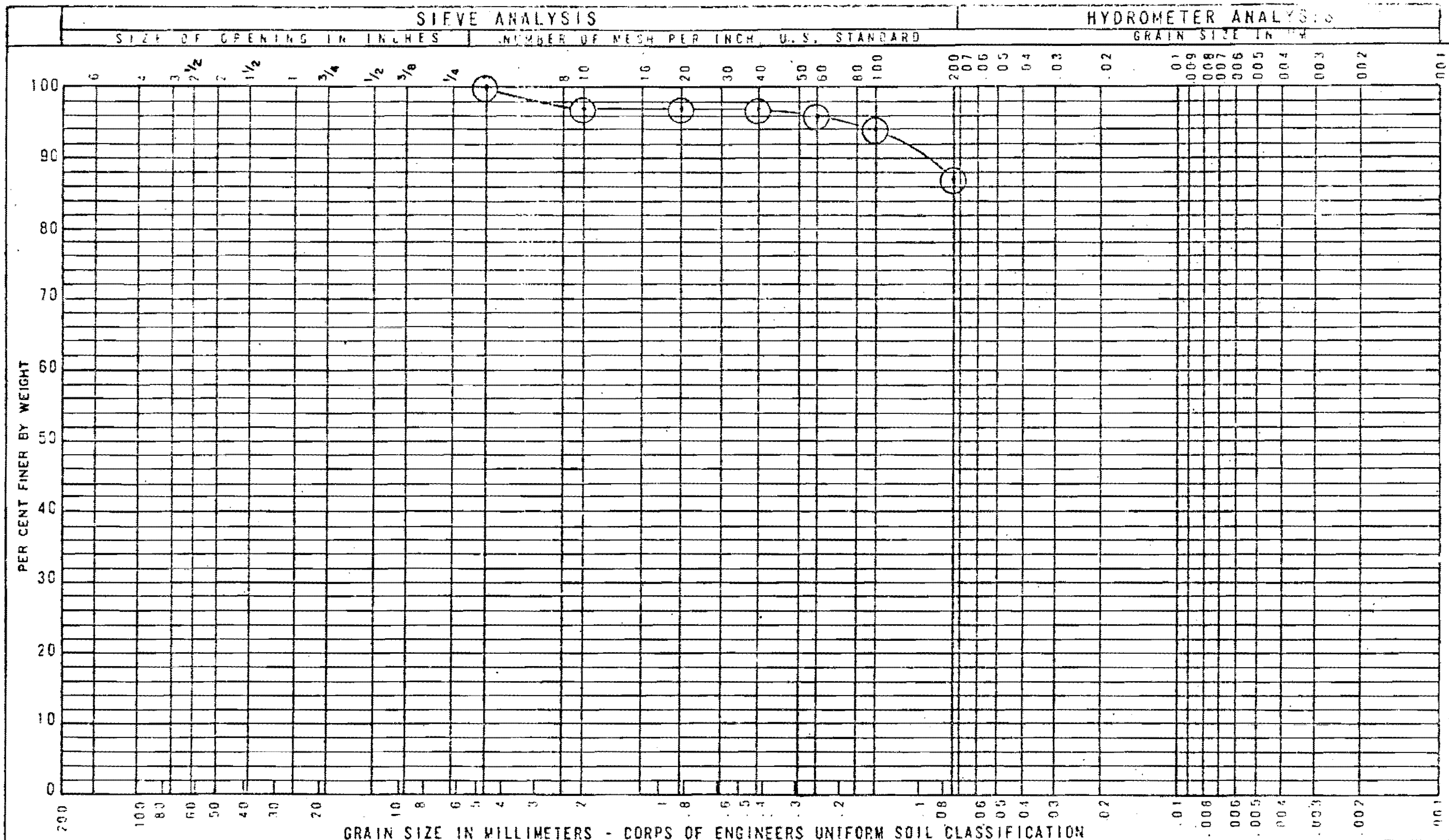
CORPS OF ENGINEERS TESTING LABORATORY ANCHORAGE ALASKA

NPD RF JULY 1952 321

Plotted [illegible]
Checked

4-30-81
Date of report

[signature]
Chief, Soils [illegible]



COBBLES	GRAVEL		SAND			FINES
	Coarse	Fine	Coarse	Medium	Fine	

SAMPLE NO	DEPTH - FT.	CLASSIFICATION	NAT WC	LL	PI	
LS-1949	20.0'	ML-Sand Silt	32.5			

PROJECT Seward Small Boat Harbor
Sample data 6-4
Submitted by H. Watters
Expl or gp. sample no
W O No. 81-31

NPD RF JULY 1952 321

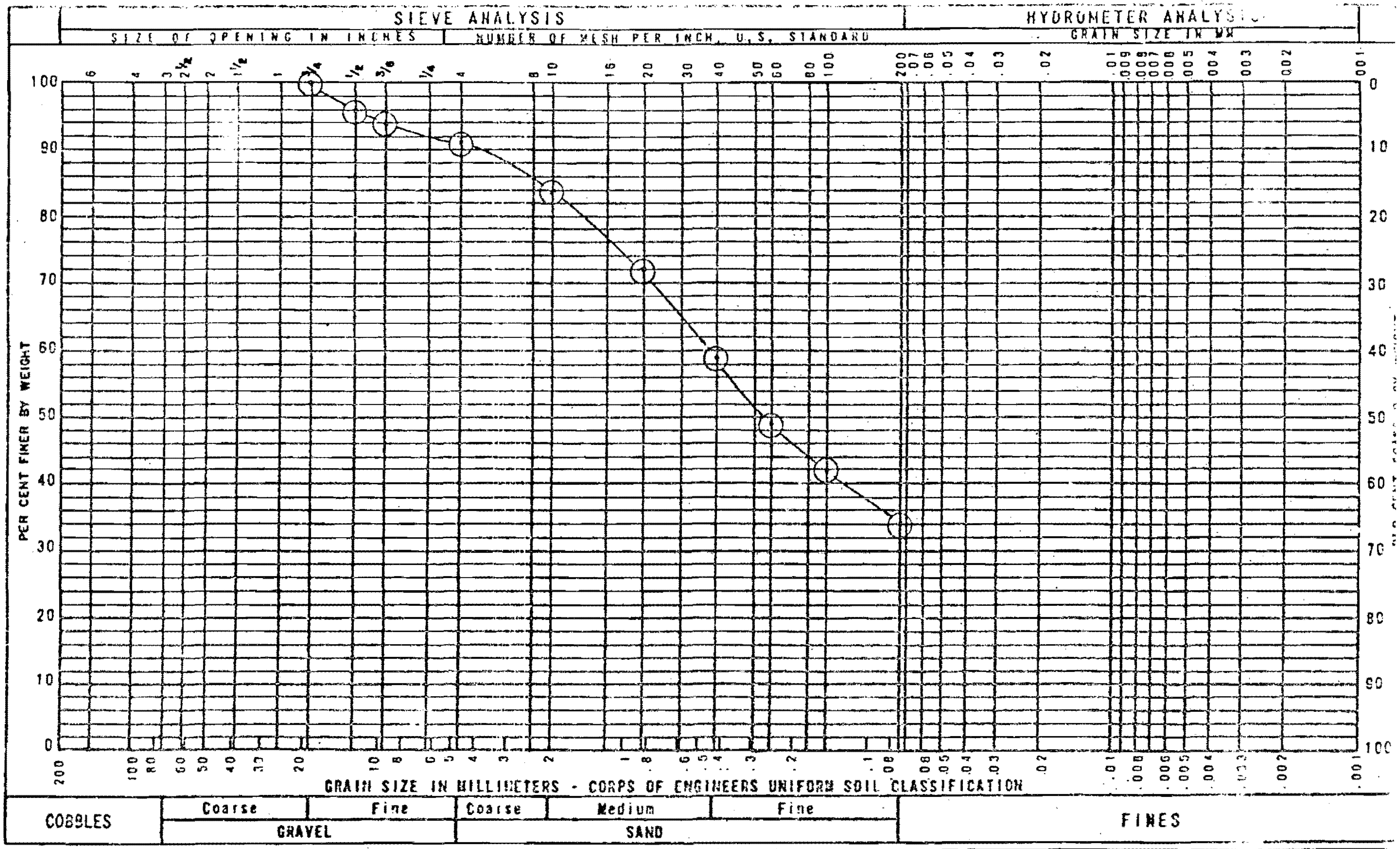
GRADATION CURVES

CORPS OF ENGINEERS TESTING LABORATORY, ANCHORAGE, ALASKA

Plotted REY
Checked

4-30-81
Date of report

Warren E. Wada
Chief Soils Section



SAMPLE NO.	DEPTH - FT.	CLASSIFICATION	NAT WC	LL	PI
LS-1950	25.0'	SM-Gravelly Silty Sand	20.5		

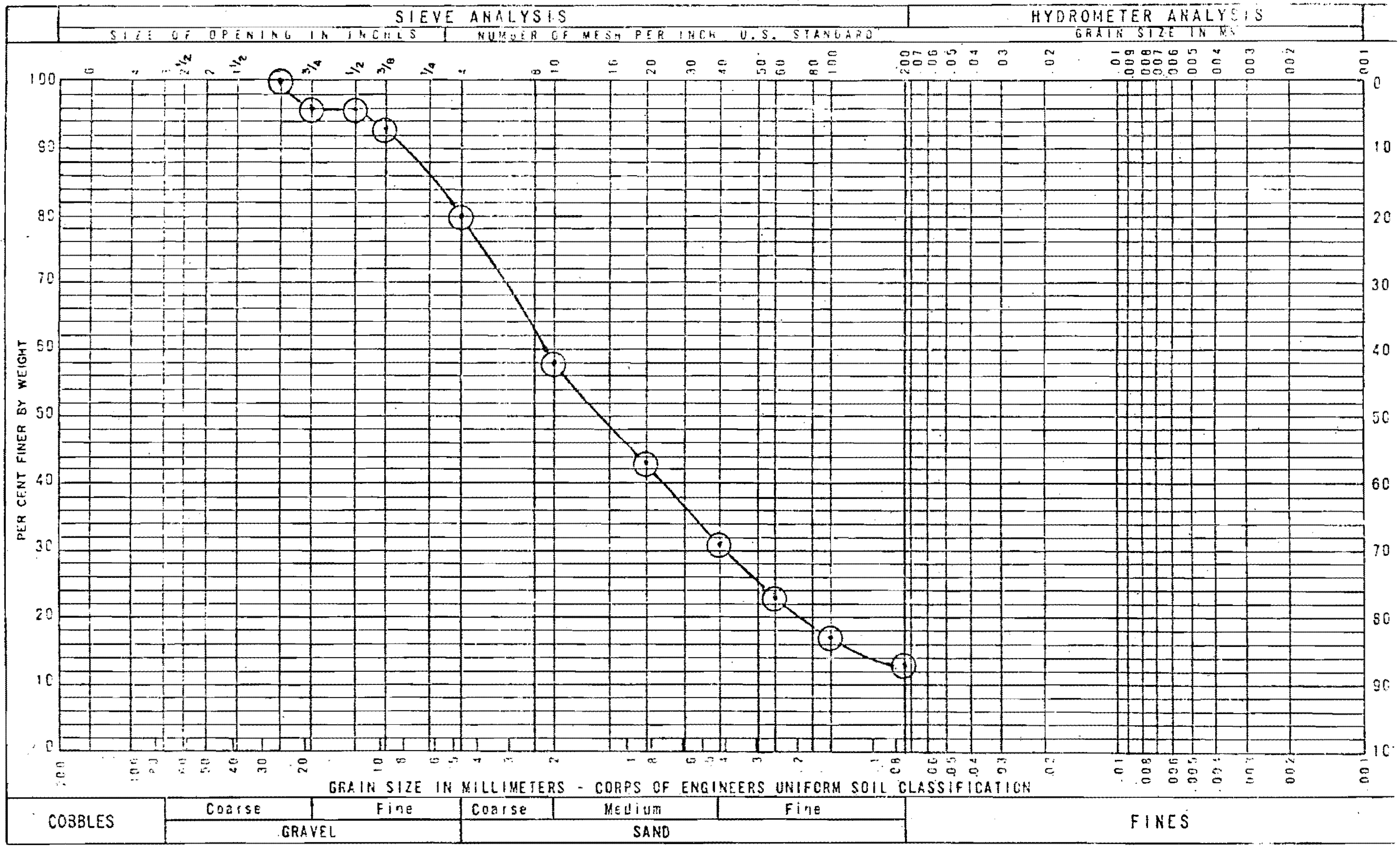
PROJECT Seward Small Boat Harbor
Sample data 6-5
Submitted by H. Walters
Expl. or gp. sample no.
W O No. 81-31
4-30-81 Date of report
Chief, Soil Mechanics Branch

NPD RF JULY 1952 321

GRADATION CURVES

CORPS OF ENGINEERS, TESTING LABORATORY, ANCHORAGE, ALASKA

Plotted
Checked



SAMPLE NO	DEPTH - FT	CLASSIFICATION	NAT WC	LL	PI	
LS-1951	30.0'	SM-Silty Gravelly Sand	14.4			

PROJECT	Seward Small Boat Harbor
Sample data	6-6
Submitted by	H. Walters
Expl. or gp sample no	
W O No.	81-31

NPD RF 321 JULY 1952

GRADATION CURVES

CORPS OF ENGINEERS TESTING LABORATORY ANCHORAGE, ALASKA

Plotted VED

Checked

4-30-81

Warren E. [illegible]

Chief, Soils [illegible]

Alaska Testlab

4040 "B" Stree[illegible] Anchorage, Alaska 99503 Phone (907) [illegible]-1551 (Telecopier [illegible]

May 18, 1981
W.O. #A19755

District Engineer
Corps of Engineers
P.O. Box 7002
Anchorage, Alaska 99510

Attention: Mr. Del Thomas

Reference: Shelby Tube Samples
DAC W85-81-M-0491

Dear Mr. Thomas:

Enclosed please find the results of triaxial, consolidation, and classification tests, which were performed on three samples of a marine silt.

Please call if you have any questions regarding these results.

Very truly yours,

ALASKA TESTLAB

Mark Holum

Mark Holum
Geotechnical Engineer

Approved:

M.R. Nichols

Melvin R. Nichols, P.E.
Partner

MH:lflq

Enclosures

TRIAXIAL TESTS

Several factors influenced the traxial test results and produced conditions which allow various interpretations. The foremost problem is interpreting a group of tests which were performed on several distinct soils.

Differences between the three soil samples include different composition as seen in the various amounts of shells, silt, and organic material. The overconsolidation ratios of the samples also vary.

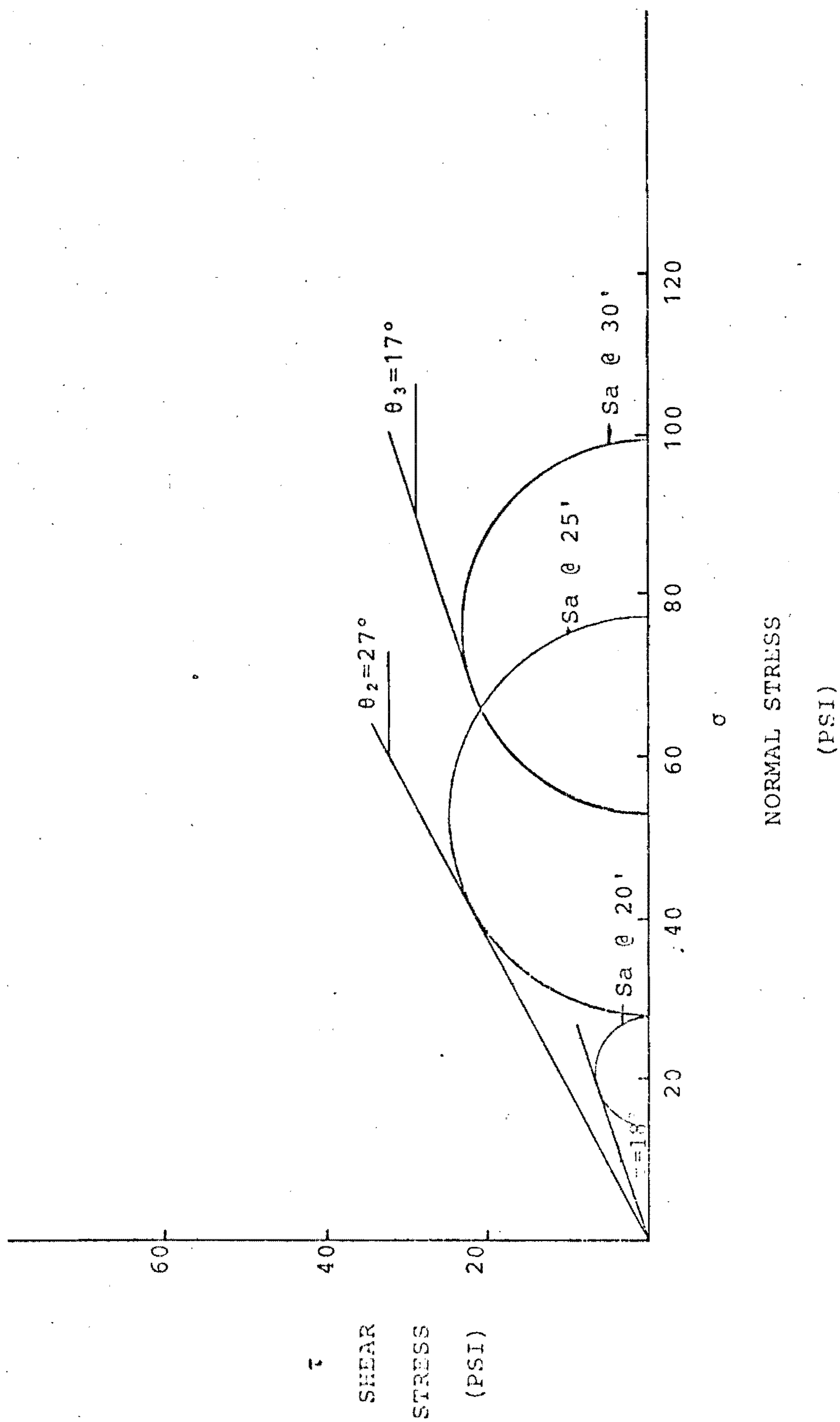
Pore pressure measurements were not taken during the tests. Hence all data represent total stresses. The plot of the total stress generally indicates a material with a small angle of internal friction ($\phi = 17° \sim 27°$) with little or no cohesion, if it is assumed that no significant soil structure differences exist between the three samples. However, the sample taken at a depth of 24' failed at a high strain which probably also indicates a high pore pressure. Hence the effective friction angle may be higher or lower than 27°.

Plots of strain and deviator stress indicate the deepest sample (30') behaves as an overconsolidated soil, but the other two samples are normally consolidated. Hence, the Casagrande method of determining maximum consolidation pressure appears to give inconsistent results. This point is discussed in the consolidation section.

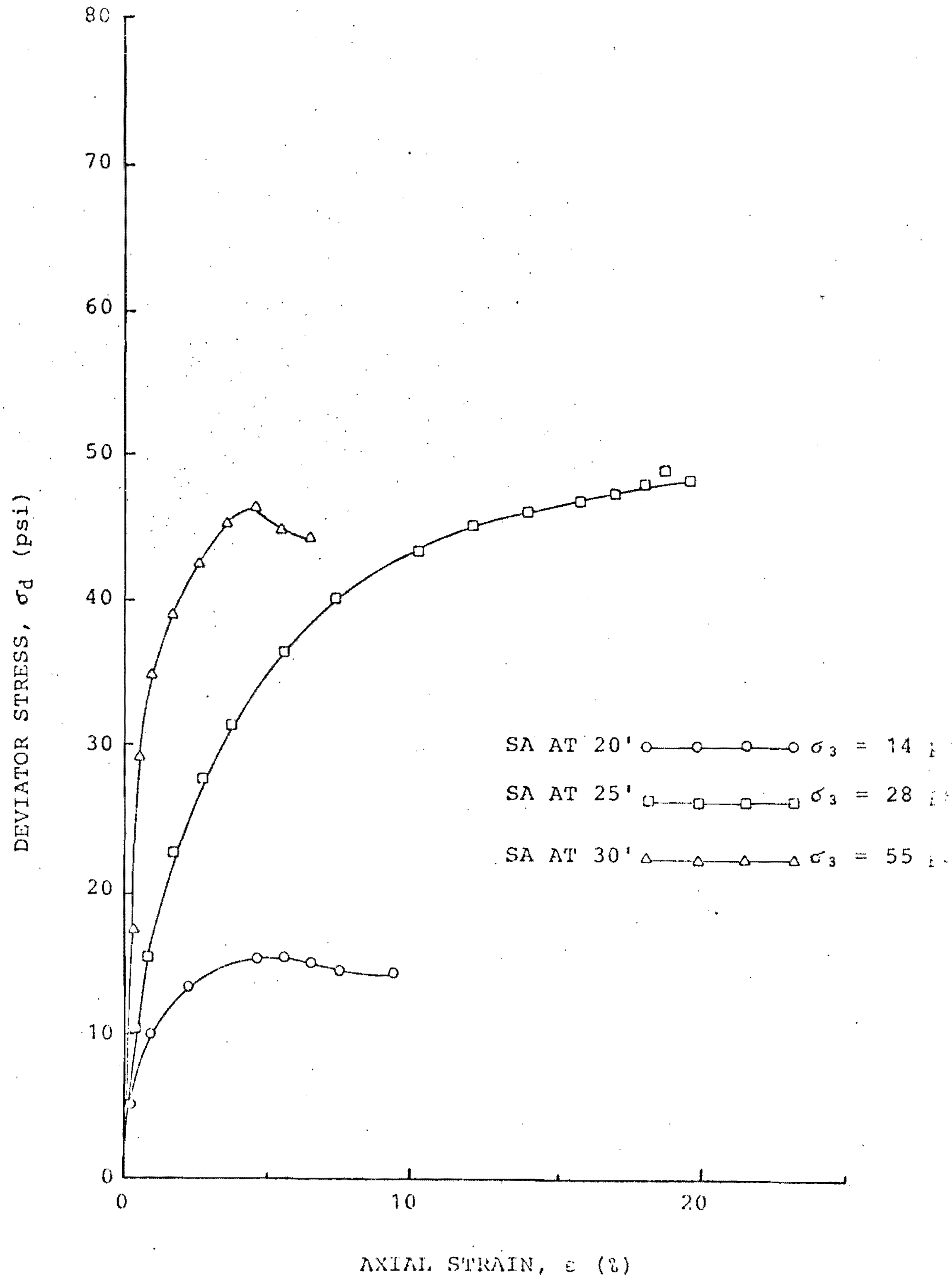
Shear failure occurred on well defined planes for samples taken at 20 and 30 feet, but the one from 25 feet failed by bulging at the center.

TRIAXIAL TEST SUMMARY

Depth (feet)	Before Consolidation (γ_w) (pcf)	Before Consolidation (γ_d) (pcf)	Confining Pressure (σ_3) (psi)	Deviator Stress (Max) (psi)	Strain to σ Max. (%)	Deviator Stress 1%	Deviator Stress 5%	Deviator Stress 10%
20-30	116	90.1	14.0	15.3	5.6	10.4	15.3	
25-28	116	85.5	28.0	49.1	18.7	16.4	35.3	46.6
30-33	121	84.1	55.5	46.9	4.6	35.7		



τ
SHEAR
STRESS
(PSI)
20
40
60
20
40
60
80
100
120
σ
NORMAL STRESS
(PSI)
θ₂=27°
θ₃=17°
Sa @ 20'
Sa @ 25'
Sa @ 30'



STRESS/STRAIN CURVES (SEWARD SILT)

CONSOLIDATION TESTS

Three compression tests yielded compression indices in the range of .3 or higher. These values are typical of marine sediments found along the south coast of Alaska.

The Casagrande method of determining previous overburden pressure was used. This is essentially a graphical method with little theoritical justification. It does indicate that these deposits are moderately overconsolidated. We have noticed that many recent marine deposits have been overconsolidated due to dissication.

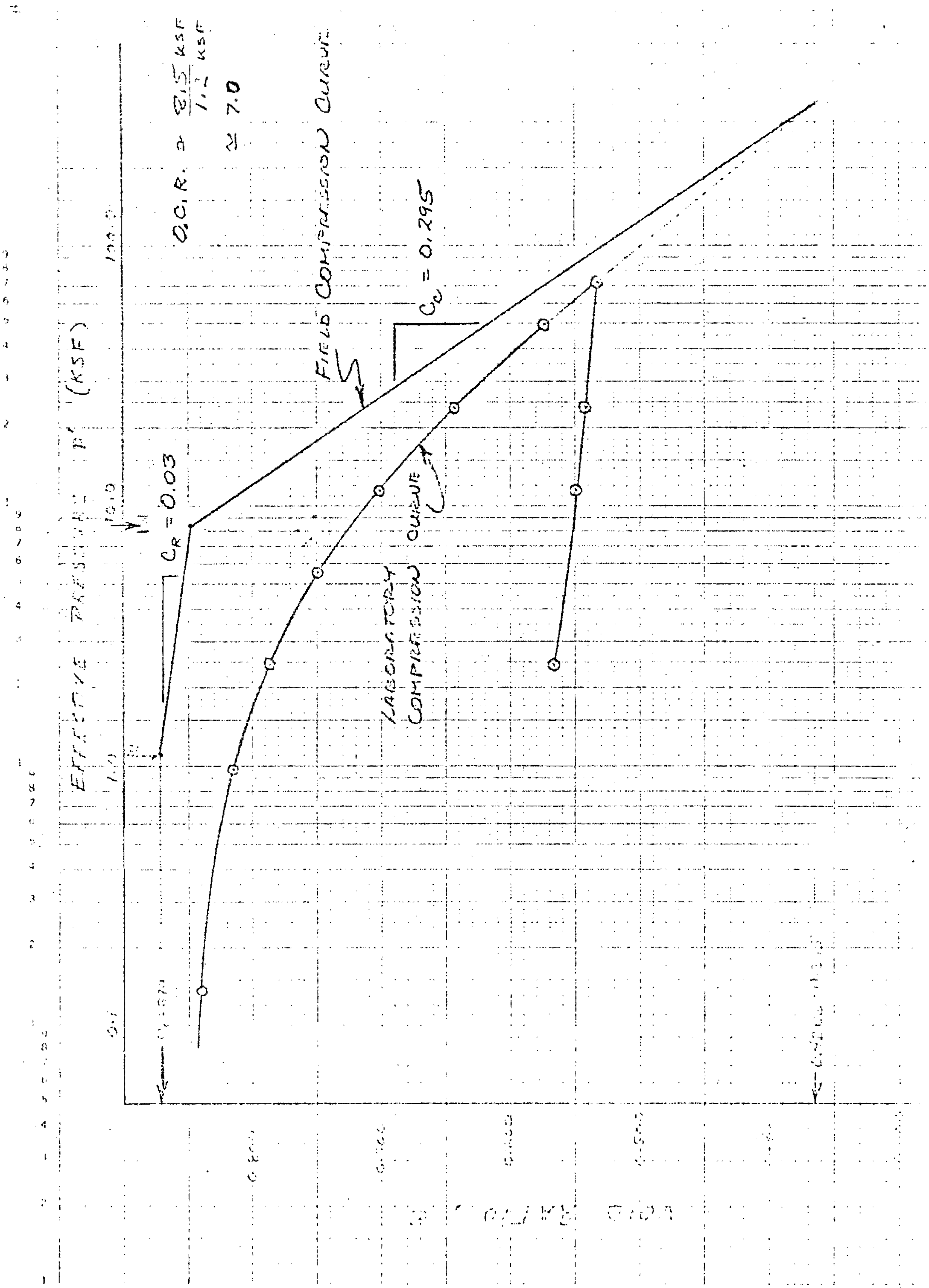
A conservative approach to construction on soil which relies on Casagrande's method of determining past pressure is to assume no overconsolidation when calculating settlement. Hence, settlement is given by:

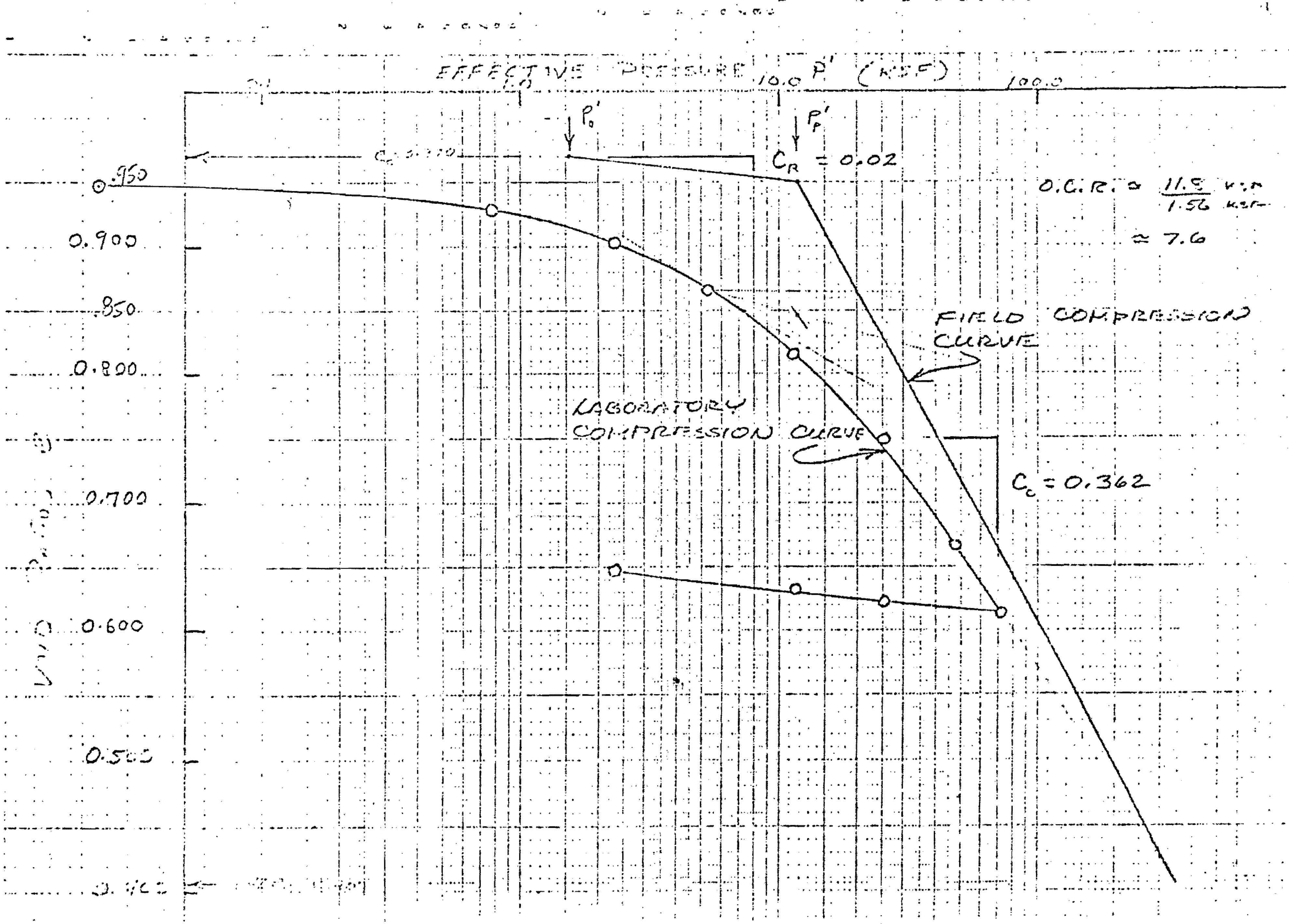
$$s = \frac{H\ C_c}{1+e_0} \log_{10} \frac{\Delta p' + P_0}{P_0}$$

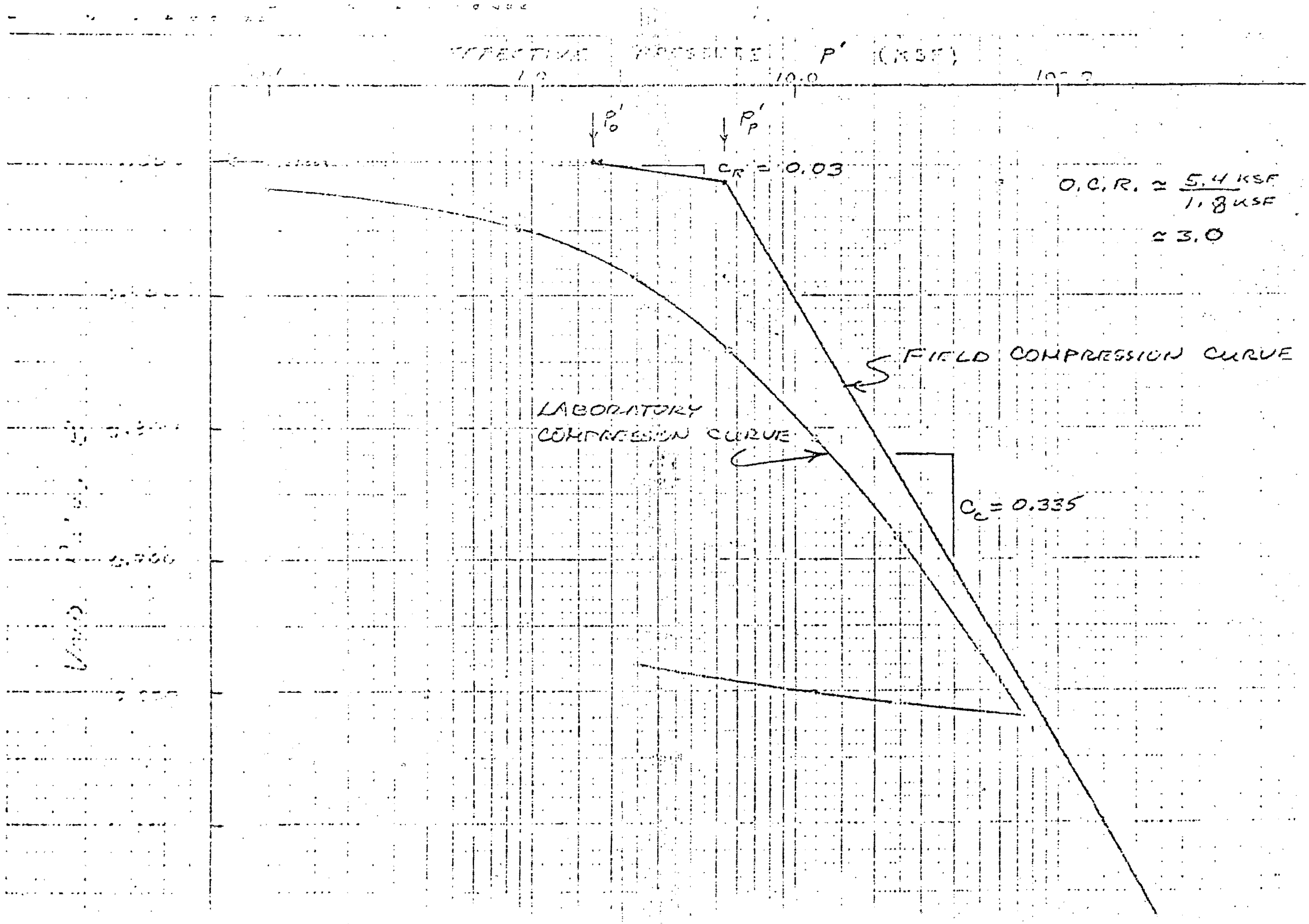
TABLE I

CONSOLIDATION TEST SUMMARY

Depth (ft)	Saturated Unit Wt. γd (pcf)	Moisture Content ω (%)	Dry Unit Wt. γd (pcf)	Field Compression Index C_c	Field Recom-pression Index C_R	Present Effective Overburden Pressure P'_o (ksf)	Past Effective Overburden Pressure $P'\rho$ (ksf)	Over Consolidated Ratio O.C.R.	t_{100} (Min)
20 - 23	119.8	32.9	90.1	0.295	0.03	1.2	8.4	7.0	2.3
25 - 28	116.7	36.5	85.5	0.362	0.02	1.6	11.8	7.6	1.8
30 - 33	115.9	37.9	84.1	0.335	0.03	1.8	5.4	3.0	5.0


EFFECTIVE PRESSURE p' (KSF)
0.1
1.0
10.0
100.0
$C_R = 0.03$
O.C.R. ≈ 8.5 KSF / 1.2 KSF
≃ 7.0
FIELD COMPRESSION CURVE
LABORATORY COMPRESSION CURVE
$C_c = 0.295$


EFFECTIVE PRESSURE P' (KSF)
1.0
10.0
100.0
P'o
P'p
CR = 0.02
O.C.R. ≈ 11.5 ksf / 1.56 ksf
≈ 7.6
FIELD COMPRESSION CURVE
LABORATORY COMPRESSION CURVE
Cc = 0.362
.950
0.900
.850
0.800
0.700
0.600

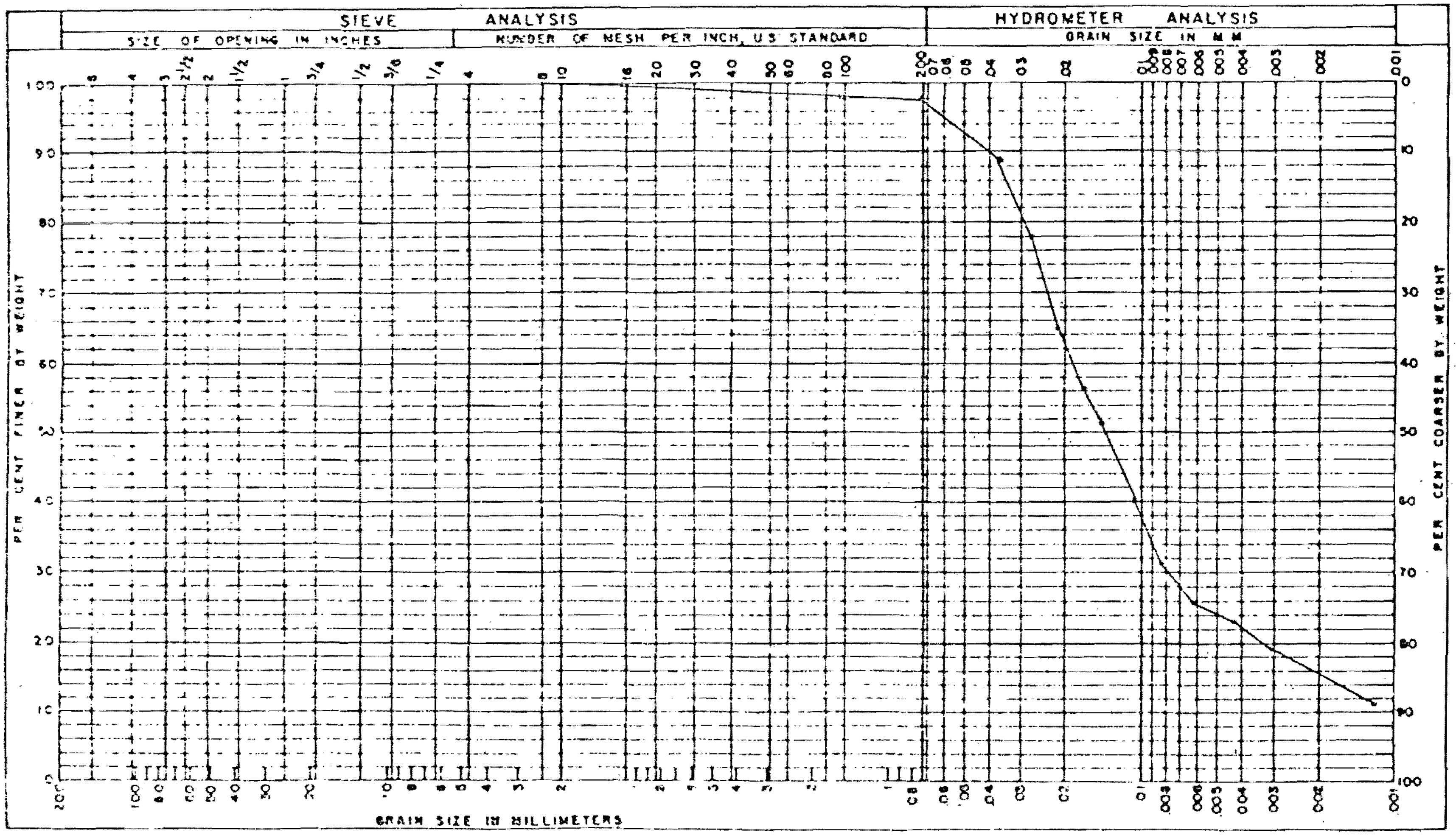

EFFECTIVE PRESSURE P' (KSF)
1.0
10.0
100.0
P_o'
P_p'
$C_R = 0.03$
O.C.R. ≃ 5.4 KSF / 1.8 KSF
≃ 3.0
FIELD COMPRESSION CURVE
LABORATORY COMPRESSION CURVE
$C_c = 0.335$

Alaska Testlab 4040 "B" Street Anchorage, Alaska 99503 Phone (907) 278-1551

Sheet 1 of 3
W. O. No. A 19755
Date 5-16-81
Technician SCM

Textural Class Silt
Frost Class F3 or F4 Unified Class ML
Plastic Properties
Date Received

Client Corp of Engineers
Project shelby tubes
Sample Number 2159
Location Sa 5 Spec 1 @ 20'-23'
Sample Taken By



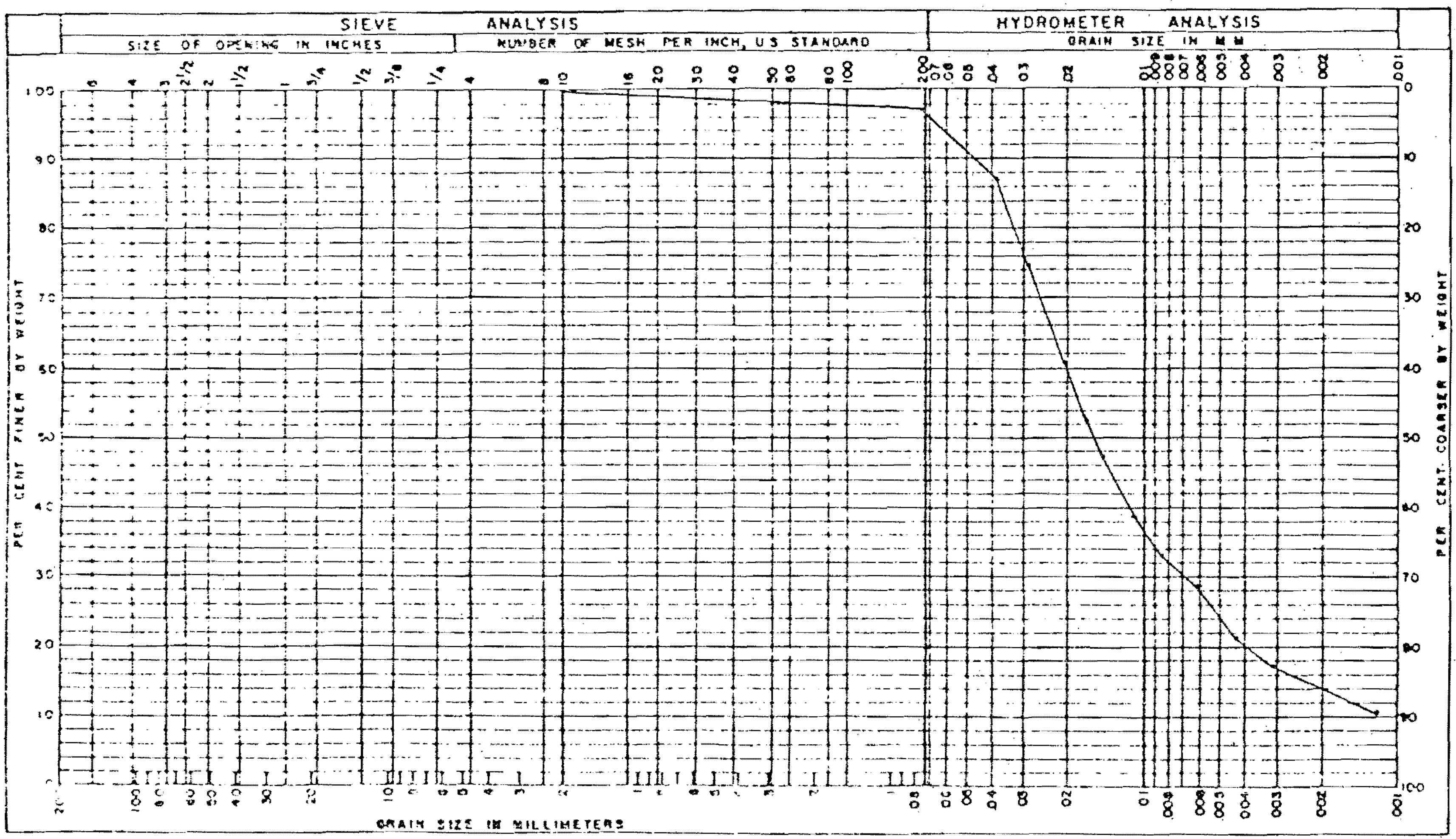
US STD SIEVE	CUM % PASS
3	
2	
1 1/2	
1	
3/4	
1/2	
3/8	
4	
10	100%
20	
40	
100	
200	98%
0.02 MM	63%

Alaska Testlab 4040 "B" Street Anchorage, Alaska 99503 Phone (907) 278-1551

Sheet 2 of 3
W. O. No. A19755
Date 5-16-81
Technician SCM

Textural Class Silt
Frost Class F3 or F4 Unified Class ML
Plastic Properties
Date Received

Client Corp of Engineers
Project Shelby Tubes
Sample Number 2160
Location TH-5 spec-3 @ 25'-28'
Sample Taken By



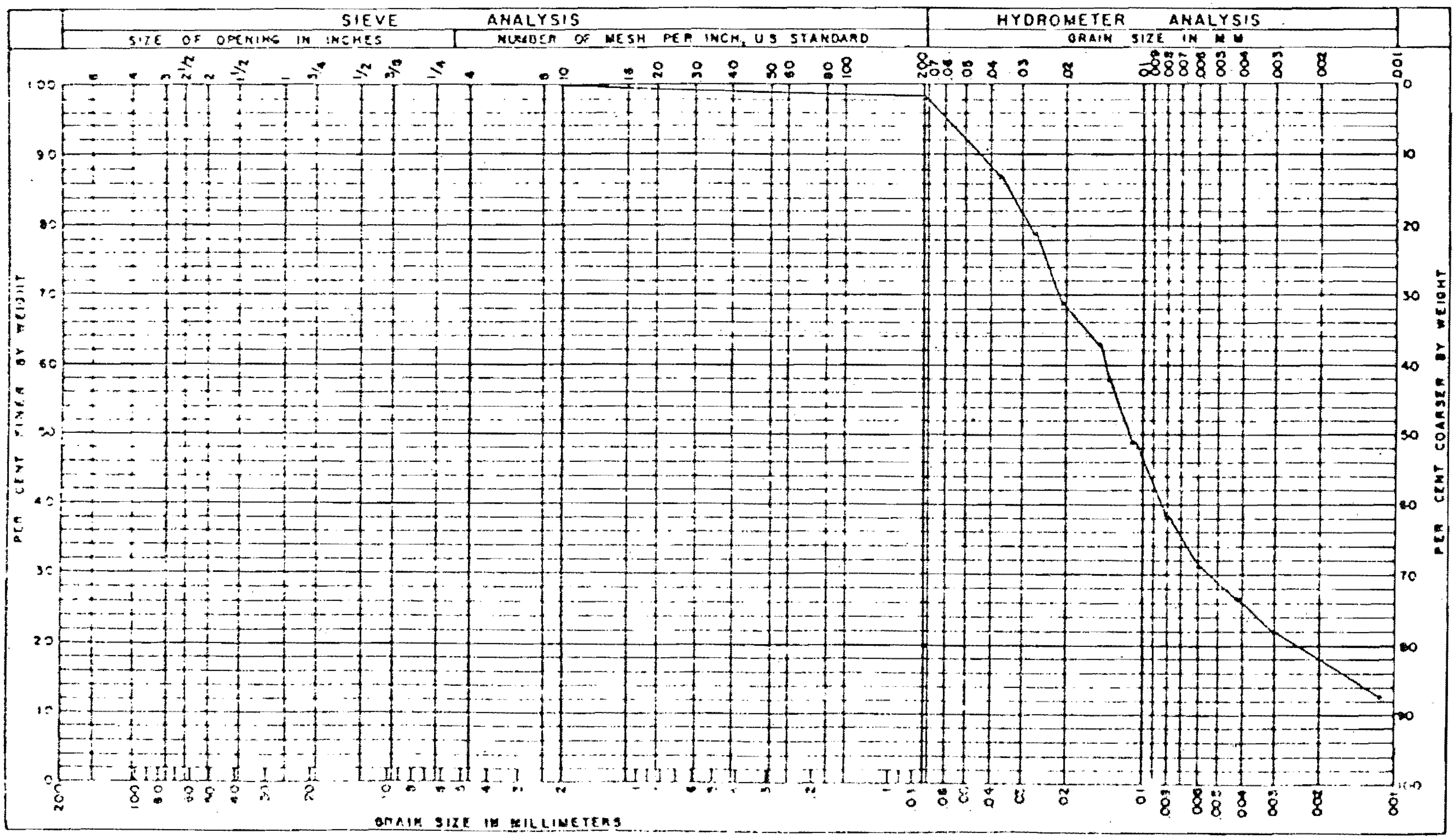
US STD SIEVE	CUM % PASS
3	
2	
1 1/2	
1	
3/4	
1/2	
3/8	
4	
10	100%
20	
40	
100	
200	97.8%
0 02 MM	60%

Alaska Testlab 4040 "B" Street Anchorage, Alaska 99503 Phone (907) 278-1551

Sheet 3 of 3
W. O. No. A 19755
Date 5-16-81
Technician SCM

Textural Class Silt
Frost Class F3 or F4 Unified Class ML
Plastic Properties
Date Received

Client Corp of Engineers
Project Shelby Tubes
Sample Number 2161
Location TH-5 spec 3 @ 30'-33'
Sample Taken By



US STD SIEVE	CUM % PASS
3	
2	
1 1/2	
1	
3/4	
1/2	
3/8	
4	
10	100%
20	
40	
100	
200	98.4%
0.02 MM	68.5%

SHELBY LOG

Client USA C of E
Project [illegible]
Date 4-15-81 Technician J [illegible]

W.O. # A19755
T.H. # 5
Sa. # [illegible]
Depth: From 20 to 23

Sample Condition: Good ☐ Sat. ☒ Poor ☐

(Inches)	Specimen No.	Test	Moisture %	L.L.	PL/PI	Density (PCF)	Vane Shear (TSF)	Pocket Pen (TSF)	Consistency	Dilatency	Remarks	Description	Pictorial Description
0											Shell fragments		
52.58 / 39.50		M-1	33.1				0.37	0.15	Soft		Thin seams gray silt		
5											Black to Gray Black Organic Marine Silt		
	1	T											
10									Soft				
41.62 / 31.84		M-2	30.6				0.40 / 0.10	1.1					
15	2	C								moderate	Shells		
20	3	T							Soft	Slow to moderate	Shear beds		
41.10 / 30.62		M-3	34.1				0.20 / 0.07	0.52					
25											Sample Condition Generally Good		
											Bedding planes in the last 3" appear to be deformed from sampling		
30													
35													

Test Codes:
A = Atterberg Limits
C = Consolidation
D = Density

Consistency:
S = Soft
M = Medium
F = Firm

Dilatancy:
N = Non-Dila[illegible]
L = Low
M = Medium

Date 9/18/81 Technician [illegible] Sa. # [illegible]

Depth: From 25 to 28'

Sample Condition: Good ☐ Sat. ☒ Poor ☐

(Inches)	Specimen No.	Test	Moisture %	L.L.	PL/PI	Density (PCF)	Vane Shear (TSF)	Pocket Pen (TSF)	Consistency	Dilatancy	Remarks	Description	Pictorial Description
0													
							0.23 / 0.15	0.80			Thin gray silt bands		
5											Shell fragments		
	1												
10	2												
15	3								Firm to Soft	Slow			
											No visible layering		
UF 9.20 / 35.07 20		M-2	39.2				0.25 / 0.15	0.75					
25	4												
											Thin seams (5mm) gray silt		
53.41 / 38.15 30		M-3	40.0				0.17 / 0.09	0.35					
35											Sample 30" before extrusion Sample 30" after extrusion		

Description (0–30 in.): Black to Gray Black Organic Marine Silt

Test Codes:

A = Atterberg Limits
C = Consolidation
D = Density
H = Hydrometer
M.A. = Mechanical Analysis
T = Triaxial Compression

Consistency:

S = Soft
M = Medium
F = Firm
H = Hard

Dilatancy:

N = Non-Dilatant
L = Low
M = Medium
H = High

SHELBY LOG

Client USA COE
Project [illegible]
Date 6-18-77 Technician [illegible]
W.O. # [illegible]
T.H. # [illegible]
Sa. # [illegible]
Depth: From 30 to 33

Sample Condition: Good ☐ Sat. ☑ Poor ☑

(Inches)	Specimen No.	Test	Moisture %	L.L.	PL/PI	Density (PCF)	Vane Shear (TSF)	Pocket Pen (TSF)	Consistency	Dilatency	Remarks	Description	Pictorial Description
0													
60.97 / 42.82		m-1	42.1				0.10 / 0.05	0.30			Wet Looking		
5											Trace Shells		
10	1	T							Soft				
64.38 / 45.69		m-2	40.9				0.11 / 0.06	0.25	Very		Sample bulged in Catcher during Extraction area very soft at wet		
15													
65.42 / 47.96	2	m-3 C	36.4			0.34 / 0.13	0.60				No visible Layering Seen in Sample	Gray Black Organic Marine Silt	
20										Slow			
25	3	T							Soft to Firm				
64.85 / 46.930		m-4	35.0				0.22 / 0.10	0.4					
30													
35													

Test Codes:
A = Atterberg Limits
C = Consolidation
D = Density

Consistency:
S = Soft
M = Medium
F = Firm

Dilatancy:
N = Non-Dilatant
L = Low
M = Medium

APPENDIX E

COORDINATION WITH OTHER AGENCIES

APPENDIX E

COORDINATION WITH OTHER AGENCIES

1. Fish and Wildlife Coordination Act Report and Corps of Engineer Review Comments
2. Fish and Wildlife and Endangered Species Coordination Letters
3. Coordination Letters for the Archeological and Historical Preservation Laws
4. Comment - Response display

1. Fish and Wildlife Coordination Act Report and Corps of Engineers Review Comments

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
1011 E. TUDOR RD.
ANCHORAGE, ALASKA 99503
(907) 276-3800

IN REPLY REFER TO:

19 JUL 1979

Colonel Lee R. Nunn
District Engineer
Alaska District
Corps of Engineers
P.O. Box 7002
Anchorage, Alaska 99510

Re: Seward Small Boat Harbor
Coordination Act Report

Dear Colonel Nunn:

This letter constitutes our Final Coordination Act Report on the unauthorized Seward Small Boat Harbor expansion project in Seward, Alaska. The report addresses the expansion's projected impacts on fish and wildlife resources. It has been prepared under the authority of and in accordance with the provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et. seq.). This report is for inclusion in your study report being prepared persuant to a Committee on Public Works of the United States Senate resolution of September 9, 1970. Our evaluations are based on your Stage II Report (March 1978), project engineering data provided by your staff, and biological data gathered by Fish and Wildlife Service staff. This report supersedes our draft Coordination Act Report dated December 21, 1978, and includes evaluation of the Nash Road alternative site. This report has received the concurrence of the Alaska Department of Fish and Game and the National Marine Fisheries Service as indicated by the attached letters dated July 2, 1979.

Introduction

The project area is located in the northwest corner of Resurrection Bay at Seward, approximately 120 miles south of Anchorage, Alaska. The bay is a glacial fjord with steep slopes that drop to depths of 300 to 700 feet. It is surrounded by the Kenai Mountains which rise abruptly to elevations of 2,000 to 5,000 feet except where incised by river valleys. Winds are influenced by the north-south orientation of Resurrection Bay. During April through September, winds are predominately from the south, whereas northerly winds occur during the rest of the year.

Due to its protected waters and strategic location, a marine based economy has developed in Seward. It is a center of commercial fishing and is well known for sports fishing and its famous silver salmon derby. Seward is also the marine terminus for the Alaska Railroad and provides facilities for petroleum exploration vessels, timber shipments, the Alaska Marine Ferry System, and the University of Alaska Marine Institute.

The town of Seward is sited on a narrow alluvial fan of Lowell Creek. Marine clays, silt, and sand underlie much of the city. In areas where these deposits were thickest, massive submarine slides occurred during the 1964 earthquake. The earthquake destroyed the city's harbor which was located just south of the present facility.

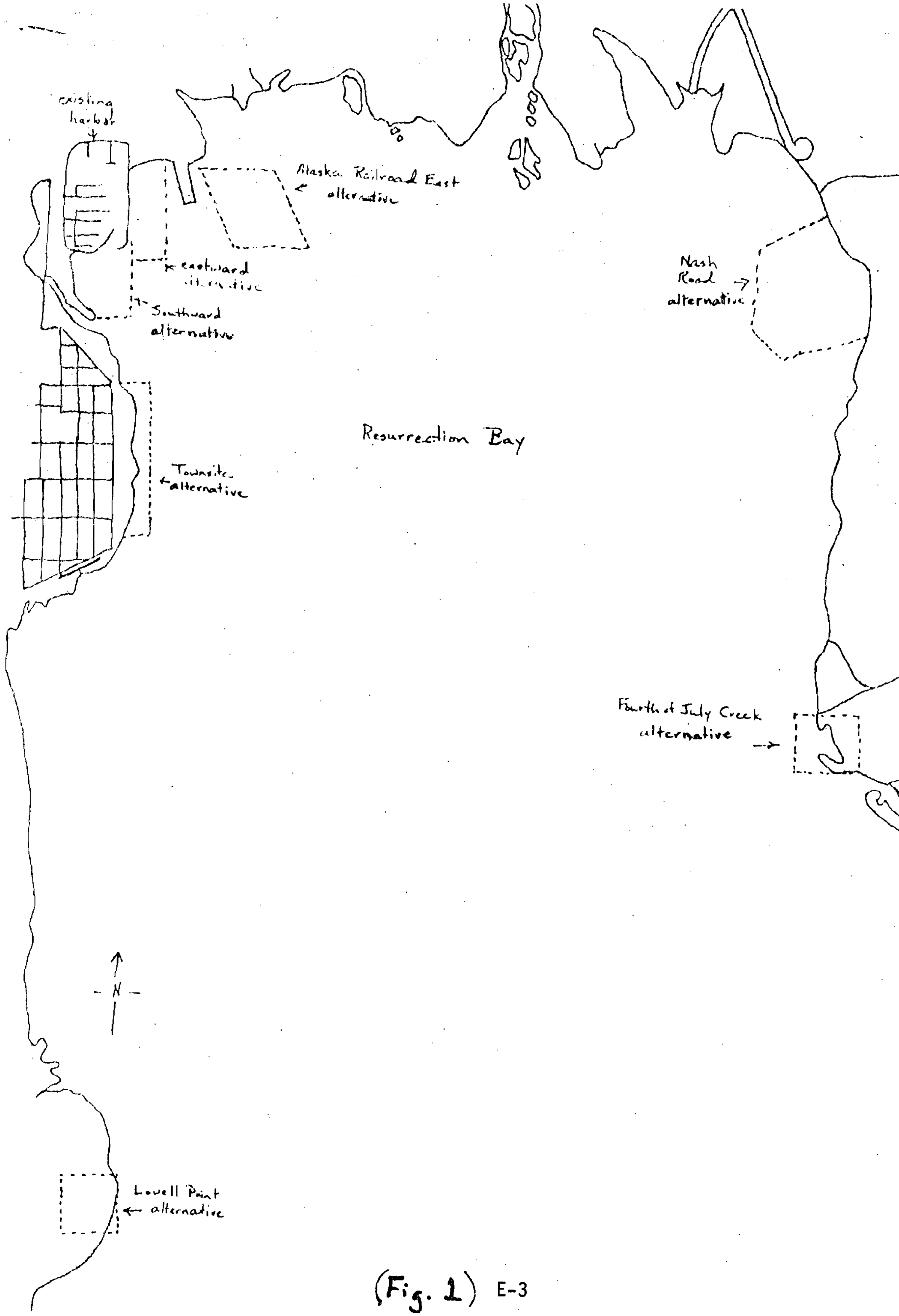
The existing harbor was constructed in 1964-65 with funds from the Office of Emergency Planning. In moving the harbor north of the high risk earthquake area, nearly 50% of a nearby brackish water lagoon was filled to provide fastland for shoreside facilities. It provided habitat for more than 600 migrating coho salmon (Oncorhynchus kisutch), and several hundred pink (O. gorbuscha) and sockeye salmon (O. nerka) (Rietze, 1964). The lagoon is still utilized to some extent by salmon, but its size has been reduced until only that portion lying west of the Seward Highway remains. Since freshwater from the lagoon would have created icing problems in the harbor, its outlet was diverted through a ditch which enters the bay south of the harbor.

The present harbor has approximately 465 berths for vessels of various sizes, an open faced city dock, a dry dock grid, a boat lift, and a four-lane loading ramp for small boats. The harbor is utilized primarily by commercial vessels which have preference for mooring. Recreational boats are generally trailer mounted and are launched daily. There are, however, facilities for up to 68 recreational boats in shallow water.

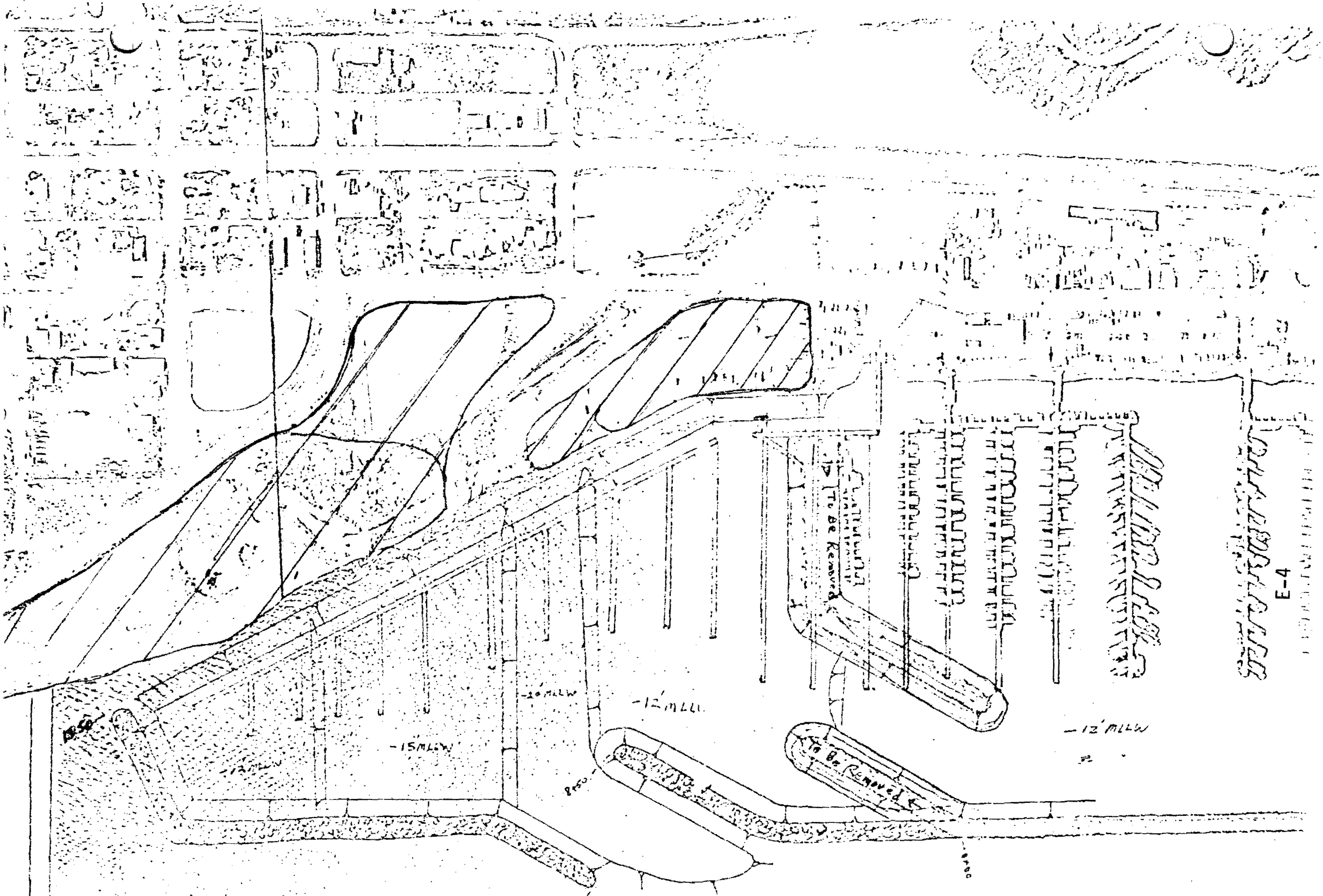
Large vessels utilize the Alaska Railroad dock east of the boat harbor or the Fourth Avenue dock south of town. Local sponsors have expressed interest in facilities for deep, medium, and shallow draft vessels. A Section 107 Reconnaissance Report prepared in 1976 concluded that medium and deep draft navigation improvements are not feasible for Federal participation; however, such improvements may be economical for state, local, or private interests.

Project Description

There have been seven alternative project sites considered for the expansion of the Seward Small Boat Harbor; these include the Lowell Point site, the Townsite location, the Southward extension, the Eastward extension, the Alaska Railroad East site, the Nash Road site, and the Fourth of July Creek site (Figure 1). Of these sites, all but the Southward and Nash Road alternatives have been determined by the Corps to be infeasible for a variety of reasons, such as cost or engineering problems. This report describes resources and impacts involving the Southward and Nash Road sites only.


existing harbor
Alaska Railroad East alternative
eastward alternative
Southward alternative
Nash Road alternative
Resurrection Bay
Townsite alternative
Fourth of July Creek alternative
N
Lowell Point alternative

(Fig. 1)



(Fig. 2)

Southward Expansion Alternative
30 Acre Plan

(based on economic
optimization)

The Southward expansion would consist of a 1,350-foot main breakwater and a 850-foot breakwater extension with a crest elevation of 18 feet mean lower low water (MLLW). The existing stub breakwater would be removed and the hooked end of the existing breakwater would be extended 850 feet to provide a new entrance channel (Fig. 2). The profile of the Lagoon outlet channel at the Fourth Avenue culvert would be modified. It would provide an invert depth of 1.4 feet at the harbor, then rise to +7.0 feet, the level of the existing channel, approximately 80 feet downstream of Fourth Avenue. A tide gate would be installed at the Fourth Avenue culvert to maintain existing salinity levels in the lagoon and yet accommodate the passage of fish (Dunn, 1978).

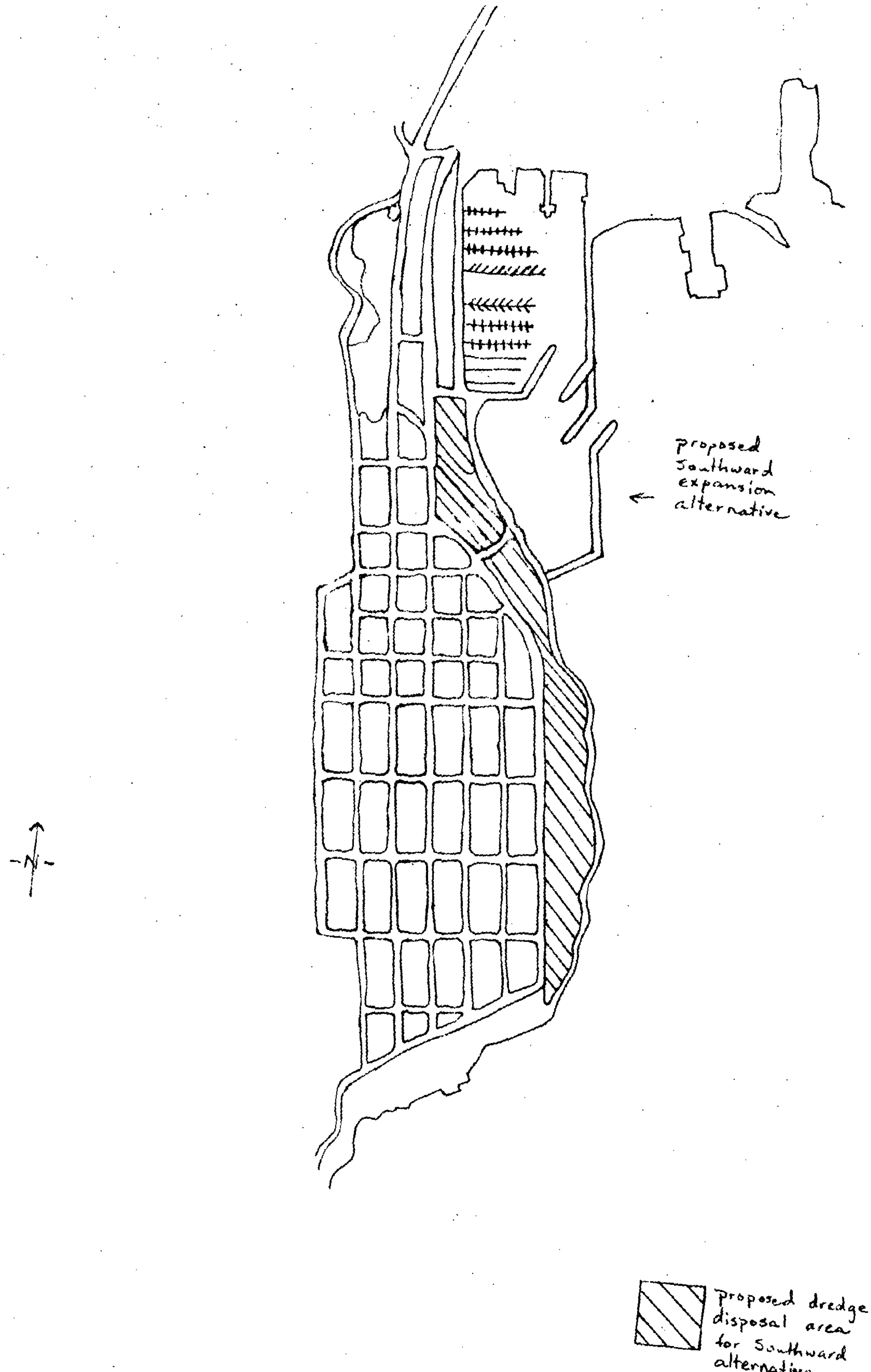
Approximately 11,000 cubic yards of material would be removed to create a 200-foot wide and 15-foot deep entrance and access channel. Development of mooring facilities by local sponsors would require removal of an estimated 411,000 cubic yards of dredged material within the 30 acres immediately adjacent to the expansion and south along the townsite shore buffer area (Fig. 3). The City currently is developing plans for a greenbelt system along this high risk corridor which settled during the 1964 earthquake (Johnson, 1979).

The Nash Road site is located 2 miles northeast of Seward, at the head of Resurrection Bay. Nash Road, a secondary State highway lined with private dwellings, ends approximately 2,000 feet northwest of the proposed site. (The site has been relocated 1,200 feet south of the area designated in the original plans.) Installing a harbor at this location could be accomplished with 2,000 feet of breakwater along the west side, 1,000 feet on the south side, and 1,500 feet of silt-barrier on the north side. The area enclosed would be approximately 30 acres. A 200-foot wide entrance channel at -20 MLLW would provide access to a maneuvering channel and mooring area which would be dredged at varying depths from -20 feet (for bottom fishing trawlers) to -15 feet and -10 feet (for recreation boats) (Fig. 4).

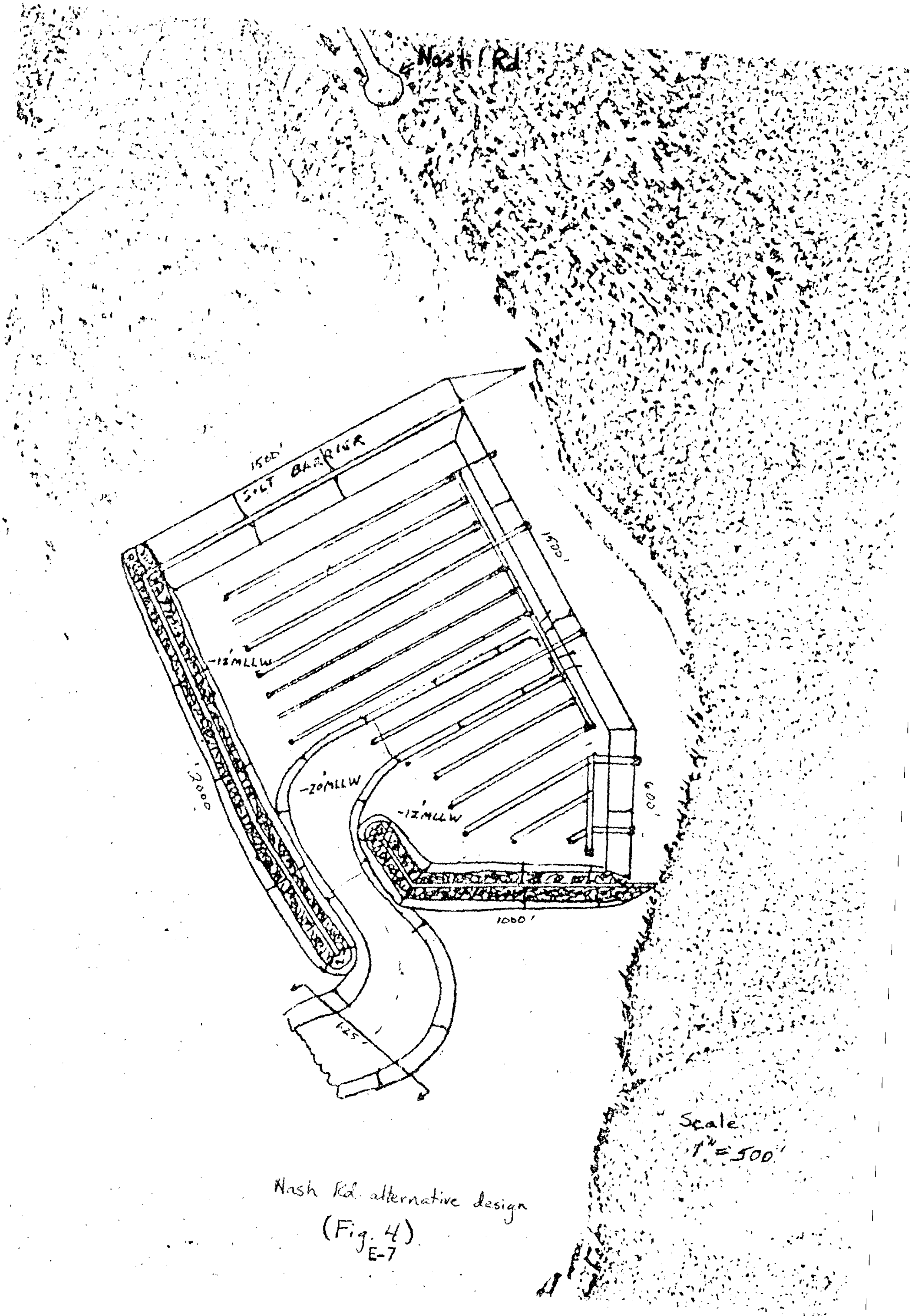
Dredged material (approximately 1.2 million cubic yards) would be used to construct 14 acres of fastland for a staging and parking area on the intertidal land owned by the City, and to construct the north silt-barrier as well as the core of the rock barrier.

The breakwater enclosure would serve several purposes: (1) to protect the mooring basin from waves; (2) to cut off freshwater flows and silt deposition from the north; and (3) to divert migrating fish around the harbor. To help maintain water quality and allow passage of any stray fish within the harbor, a culvert (or culverts) would be installed at a chosen location toward the north end of the west breakwater. This would allow free exchange of harbor water with Resurrection Bay at mean higher high water (MHHW).

Local interests would dredge a mooring basin within the enclosed area. Rock for the breakwaters is readily available from massive graywacke cliffs overhanging the site to the east. Power is available and water and sewer services would be developed.


proposed
Southward
expansion
alternative
N
proposed dredge
disposal area
for Southward
alternative

(Fig. 3)



Nash Rd. alternative design
(Fig. 4)

Fisheries Resources

Resurrection Bay supports the largest marine sport fishery for coho salmon in Alaska (Table 1). Incidental catches of pink and chinook salmon (O. tshawytscha) also occur in this fishery. Sockeye and chum salmon (O. keta) occur in the study area, but do not contribute to the fishery. Other sports fish include rockfish (Sebastes spp.), lingcod (Ophiodon elongatus), and to a lesser extent, Pacific halibut (Hippoglossus stenolepis).

The small boat harbor and adjacent intertidal and subtidal waters are utilized as spawning substrate for Pacific herring (Clupea harengus pallasi) in the spring. Other inhabitants include: Pacific staghorn sculpin (Leptocottus armatus), starry flounder (Platichthys stellatus), Pacific cod (Gadus macrocephalus), Pacific tomcod (Microgadus proximus), and greenling (Hexagrammos spp.).

Since 1960, funds appropriated under the Federal Aid in Fish Restoration Act have been utilized to enhance coho rearing habitat at Bear Lake and Seward Lagoon. Management at Bear Lake involves supplemental plants of coho fingerling, monitoring of smolt and adult migrations, and periodic rehabilitation including threespine stickleback (Gasterosteus aculeatus) control.

Seward Lagoon occupies approximately a 10-acre area directly west of the existing small boat harbor. It has a freshwater lens of about 1 foot, but salinity levels of 30 parts per thousand occur through much of the lagoon. These waters are utilized by Dolly Varden (Salvelinus malma) and about 100 coho and 50 sockeye salmon prior to ascending to spawning grounds in the Dairy Creek system (Ted McHenry, 1978a). The resultant fry rear in the lagoon or creek until smoltification. In May the lagoon is planted with approximately 100,000 coho smolts which mill around the small boat harbor and adjacent areas before moving into Resurrection Bay. Each plant contributes approximately 2,000 to 8,000 adult coho and 1,000 to 4,000 jacks to the sport catch (McHenry, 1978b). The lagoon waters are discharged through an open ditch that is interrupted by culverts at the Seward Highway, Fourth Avenue, and at its outlet. The outlet has been placed at an elevation of +6.0 feet. Since mean high water is +9.7 feet and mean low is +1.4 feet, access to the lagoon is not continuous. Returning adults consequently concentrate in very shallow waters and become susceptible to snagging. Smolts must also negotiate intertidal waters and are susceptible to predation by gulls (Larus spp.) and other fish-eating birds.

Within the intertidal areas of the Southward harbor expansion, a benthic survey revealed no species of significant recreational or commercial importance. The infauna was dominated by the following families of polychaetes: Cirratulidae, Capitellidae, and Spionidae. The clam Macoma balthica was also common. Other groups occurring in the area included

Copepoda, Amphipoda, and Cumacea (Gardner, 1978). In the upper intertidal zone, the seaweed Fucus distichus dominated. Epifauna and infauna among the rocks and in the seaweed include: blue mussel (Mytilus edulis), barnacle (Balanus glandula), limpet (Collisella pelta), crescent gunnel (Pholis laeta), the isopod Idotea (Idotea) ochotensis and the polychaete Nereis (Neanthes) virens.

Benthic surveys in the Nash Road site intertidal area showed only marginal productivity. Epifauna and epiflora included blue mussel, acorn barnacles, limpets, isopods, rockweed (Fucus distichus), and green algae (Ulva spp.) (Nation, 1979).

Subtidal investigation of the Nash Road site revealed that the area has low primary productivity; species observed included starry flounder (Platichthus spp.), seapen (Ptilosarcus spp.), cockles (Clinocardium nuttalli), and moon snails (Polinices draconis) (McGillivary, 1979). The project area was found to be relatively flat (sloping to the southwest) and covered with sandy silt. Depths of -4.0 to -40.0 feet were encountered at MLLW.

Wildlife Resources

Wetlands located at the head of Resurrection Bay are the most significant waterfowl habitat in the project area. Due to limited breeding habitat, birds generally do not remain here, but move on to more suitable nesting sites. Waterfowl found in the bay or adjacent wetlands include: double-crested cormorant (Phalacrocorax auritus), black brant (Branta nigricans), mallard (Anas platyrhynchos), pintail (A. acuta), American wigeon (A. americana), shoveler (A. clypeata), green-winged teal (A. crecca carolinensis), lesser scaup (Aytha affinis), Barrow's goldeneye (Bucephala islandica), bufflehead (B. albeola), harlequin duck (Histrionicus histrionicus), surf scoter (Melanitta perspicillata), white-winged scoter (M. deglandi), and common merganser (Mergus merganser) (Brooks, 1976). Seabirds in the area include: glaucous-winged gull (Larus glaucescens), mew gull (L. canus), common murre (Uria aalge), horned puffin (Fratercula conrniculata), black-legged kittiwake (Rissa tridactyla), and arctic tern (Sterna paradisaea) (LeResche and Hinman, 1973). The intertidal zone and nearshore waters are often utilized by some sea or bay ducks, gulls, double-crested cormorants, and shorebirds, including semipalmated plover (Charadrius semipalmatus), dowitchers (Limnodromus spp.), dunlin (Calidris alpina), and sandpipers (Calidris spp.).

During subtidal investigation, harbor seals (Phoca vitulina) were observed outside the subtidal area of the Nash Road site. Cetaceans such as harbor porpoise (Phocoena phocoena) and dall porpoise (Phocoena dalli) may occasionally visit Resurrection Bay (Gusey, 1978).

No threatened or endangered species as classified under the Endangered Species Act of 1973 are known to occur in the Seward area.

Major Project Impacts

Dredging and building breakwaters to create the Southward expansion alternative would effectively destroy approximately 30.0 acres of intertidal and nearshore marine habitat. Infauna and other sessile marine invertebrates will be removed until recolonization occurs. Benthic sampling has indicated that productivity of this area is low and that no important shellfish habitat would be affected. Most species of fish would avoid the area until construction disturbances have ceased. Inwater work conducted from April through October would disturb several species of finfish (i.e. herring and salmon) which either spawn in the intertidal zone or migrate through the area. The Fourth Avenue culvert opening would be widened and the tidegate maintained to allow continued salmon spawning in the lagoon; however, increased human activity and decreased water quality can be expected to disturb salmon. Returning adults may fail to spawn or be forced to utilize other streams; this could affect the natural run of the Dairy Creek system. Increased suspended sediment during early spring could smother herring eggs and result in gill abrasion in salmon smolts. Degraded water quality will probably result from increased boat traffic and concurrent petrochemical discharge, onboard disposal of sanitary wastes, and surface runoff.

No major impacts are anticipated with the Lowell Point quarry site. There are no active seabird colonies nearby and the quarry site was used previously for riprap to build the existing harbor.

Approximately 422,000 cubic yards (approximately 60 acres) of dredge material would be disposed of on uplands adjacent to and south of the project area (Petro, 1979). A levee or bulkhead would contain the fill and prevent shoreline erosion. This disposal site is a gravel and alder covered high risk area with depressions and metal debris remaining from the 1964 earthquake. The City has plans for creation of a greenbelt along the shore; they look favorably upon filling and improvement of the shoreline. A greenbelt may even enhance bird usage of the area.

The Nash Road alternative would have essentially the same primary impacts as the Southward expansion. Initial dredging would eliminate approximately 30.0 acres of nearshore habitat. No major shellfish beds would be affected. Construction disturbances would be similar to those of the Southward expansion. Moving the project site 1,200 feet southward has eliminated the problem of enclosing the outlet of an unnamed anadromous fish stream (coho and pink salmon) at the end of Nash Road; however, increased human activity and boat traffic would probably disturb spawning and migrating adult salmon in the area. Localized dust, noise, and construction debris would degrade a previously undeveloped area. Breeding waterfowl utilize the wetlands surrounding the Resurrection River outlet north of the project site; increased use of Nash Road would increase dust and could impair the area for use as bird habitat.

The graywacke cliffs at the site would be used as a source of riprap; no harmful effects are anticipated from use of this site for material.

Dredge spoils would eliminate an additional 14 acres of intertidal habitat, precluding eventual recolonization by benthic organisms. Parking and staging area construction would totally preclude the limited use as feeding area for all avifauna. No marine mammal impacts would be expected.

Discussion

Two alternative project sites, the Southward expansion and the Nash Road site, are evaluated in this report. Present project information on both alternatives show few differences in primary impacts to fish and wildlife resources; either alternative will meet current and projected harbor demands. Both alternatives would replace 30.0 acres of low productivity nearshore habitat with approximately 30.0 acres of dredged -15 to -20 feet harbor. However, the Nash Road alternative involves filling of 14 acres intertidal area, increased human activity in a previously undeveloped area in close proximity to wetlands, and more frequent maintenance dredging. While both alternatives are biologically acceptable, we feel that the Southward expansion is the preferred site for the above reasons.

Development of either site would provide facilities for the 1,687 vessels currently registered with the Harbormaster; these include 87 commercial fishing vessels, 1,250 recreational boats, and a waiting list of 350 additional boats of both types. More boats are expected to be registered as facilities are made available (Singleton, 1979). This effectively triples the present harbor capacity which now provides 465 mooring spaces.

Increased traffic would contribute additional wastes, petroleum products, and pollutants from related activites into the harbor. Although culverts are planned for both alternatives, model studies have not been performed to determine flushing rates of the new facilities or estimate pollutant loads within the new facilities. Because adult salmon as well as Pacific herring would use harbor waters, there must be reasonable assurances that flushing rates will be sufficient to maintain a favorable environment for these fishes and meet Alaska water quality standards. Harbor fueling facilities can be susceptible to accidental spills. Measures to prevent or contain discharges to harbor waters must be assured through preparation and implementation of spill prevention control and countermeasure plans as provided by 40 CFR 112. Furthermore, provisions to reduce vessel sewage discharges are provided under 33 CFR 159, Marine Sanitation Devices. To allow full implementation of this regulation, a shoreside pumpout station must be provided by the local sponsors.

Plans are being made by the City for a $7 million dollar water treatment plant adjacent to the existing harbor (Johnson, 1979).

Comparative water quality data have been collected by Corps' staff at the alternative sites and existing harbor; these data will be used in the Stage III planning process and alternative selection (Vannice, 1979).

Planning of the proposed expansion requires measures to reduce dredging impacts through concurrent rather than chronologically separate local and federal excavations. To contain turbidity plumes as much as possible, dredging should follow completion of the proposed breakwaters. Disturbances to the reproductive cycle of fishes can be minimized when work is conducted between November 1 and April 1. Safeguards to fish and wildlife resources also require that spoil from initial construction and any subsequent maintenance dredging be disposed of on upland sites. These sites should be maintained with sufficient retention basins to allow only clean return flows to enter Resurrection Bay and adjacent streams. At the present accretion and erosion rates, projected maintenance dredging would be needed every 30 years at the Southward expansion and existing harbor areas. Maintenance dredging would be needed every 10 years at the Nash Road site due to the sandy silt substrate and deposition of material from the Resurrection River just north of the project area (Petro, 1979).

The Fourth Avenue culvert opening would be enclosed by the Southward expansion alternative. Design of the harbor should in some way incorporate a non-navigable corridor between the south breakwater and the opening to the culvert system. Fish passage from the harbor directly to the culvert system should be included in the breakwater design.

Recommendations

We recommend that:

1. Model studies be utilized to project flushing rates in the selected harbor and that the harbor be constructed only when conformance to Alaska water quality standards can be assured.

2. The Southward expansion be chosen as the selected plan because it will have fewer impacts on fish and wildlife resources than the Nash Road alternative.

3. All dredged spoil be disposed on uplands in such a manner as to avoid impact to wetlands, and only clean return flows from the dredged disposal site be allowed to enter the streams and waters of Resurrection Bay.

4. A semipervious bulkhead be constructed to contain spoil material and prevent excessive leaching if the Southward alternative is selected.

5. If the Southward expansion alternative is selected, the Seward Lagoon outlet be located adjacent to a nonnavigable entrance at the south shoreline of the expanded harbor. This outlet shall have an invert elevation of -1.4 feet at the harbor then rise to +7.0 feet approximately 80 feet downstream of Fourth Avenue.

6. Spill prevention control and countermeasure plans in compliance with Coast Guard requirements be described in future planning documents for the harbor.

7. All construction activities be conducted between November 1 and April 1 to avoid disturbance of migrating and spawning herring and/or salmon.

8. The U.S. Fish and Wildlife Service be given the opportunity to assess the overall project, including plans of local sponsors, when such additional data become available.

We appreciate the cooperation shown by your staff during preparation of this report. Please notify us of your proposed actions regarding our recommendations. We would appreciate notification of any changes in project plans so that we can revise or supplement this report as necessary.

Sincerely yours,

Gary L Hickman

Area Director

cc: AOES, WAES
ADF&G, NFMS, ADEC, EPA, Anchorage
EPA, Seattle

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January 11, 1979

Mr. Gary L. Hickman
Assistant Area Director
U.S. Department of the Interior
Fish and Wildlife Service
1011 East Tudor Road
Anchorage, Alaska 99503

Re: Seward Small Boat Harbor Draft Coordination Act Report

Dear Mr. Hickman:

This office has received additional comments to the abovementioned draft Coordination Act report and ask that they be incorporated with our initial response.

page 5, para. 2

"...before moving into Prince William Sound." should read, "...before moving into Resurrection Bay." Or "...before moving into the Gulf of Alaska."

"Each plant contributes approximately 2,000 to 4,000 adult coho..." should read, "Each plant contributes approximately 2,000 to 8,000 adult coho..."

page 11, para. 2 and page 14, recommendation 9

Rather than the stated inwater construction period between September and March we feel it should occupy the period between November 1 and April 1.

Table 1

Estimated Effort (man-days) for 1970, should read 27,125 rather than 26,485. For 1971, should read 26,485 rather than 30,125.

Again, thank you for the opportunity to comment.

Sincerely,

Thomas W. Trent
Regional Supervisor
Habitat Protection Section

NPAEN-PL-EN

Mr. Keith Schreiner
Area Director
U.S. Fish and Wildlife Service
1011 E Tudor Road
Anchorage, Alaska 99503

Dear Mr. Schreiner:

The Corps of Engineers review comments on the revised coordination act report for the proposed Seward small boat harbor are given below. These comments have already been discussed with Ms. Nation of your staff so that the 15 July schedule for submission of the final coordination act report can be met.

1. Page 6, paragraph 3: cliffs are massive graywackie.

2. Page 13, paragraph 2: see comment 1.

3. Page 13, paragraph 1, last sentence: It is conceivable that Nash Road would be paved in the future if this small boat harbor proposal was selected, thus eliminating impact from dust. It would be better stated; " . . . increased use of Nash Road may increase dust and impair the area for use as bird habitat."

4. Page 15, paragraph 3: Dredging cannot be delayed until after the breakwaters are completed because dredge materials are needed for construction of the breakwaters.

5. Page 17, Recommendation 1: A model circulation study was done for the Homer Small Boat Harbor expansion. It was found that the overall circulation and mixing characteristics are good and that expansion of the Homer Spit Harbor does not present any conditions that would result in any regions of poor circulation or flushing. The harbor configuration and tidal range and fluctuation for both of the Seward harbor alternatives are basically the same as the Homer harbor proposal. The data used for a circulation model study on Seward would not be significantly different than that used for Homer, therefore the results would be basically the same. For this reason a circulation study will not be done for Seward.

Water quality tests taken in May 1979 in the existing harbor and in the proposed south expansion area indicate that there are no water quality problems at this time.

6. Page 17, Recommendation 3: Dredge spoil may be used for tideland fills for water dependent and water oriented uses. This will apply to the Nash Road proposal for dredge material disposal. Suitable upland sites are not available and the impacts associated with upland disposal are far greater than those associated with disposal in the tidal area. The south expansion alternative plans call for upland disposal of dredge material.

7. Page 18, Recommendation 5: Each individual fuel station operator is required by the Coast Guard to have a spill prevention control and countermeasure plan before they can operate within a small boat harbor. These plans will not be developed by the operator until after the small boat harbor is built and therefore cannot be described in the Corps future planning document.

8. Page 18, Recommendation 6: This time frame is very restrictive for completing construction activities. More specific information is needed on why construction activities are restricted to November 1 through April 1. What type of environmental impacts could be expected if construction were to occur outside of the time frames given? Are there time periods that are more critical for salmon spawning or other environmental concerns between April 1 and October 31? Possibly certain types of construction activities could occur outside of the time frame given during a less critical period. More information is needed before a decision can be made on construction time.

If you have any questions please contact Sandra Vannice of my staff at 752-3861.

Sincerely,

JAY K. SOPER
Chief, Engineering Division

3 July 1979

2. Fish and Wildlife and Endangered Species Coordination Letters

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Western Alaska Ecological Services
733 W. 4th Avenue, Suite 101
Anchorage, Alaska 99501
(907) 271-4575

IN REPLY REFER TO:

WAES

Colonel Lee R. Nunn
District Engineer
Alaska District
Corps of Engineers
P.O. Box 7002
Anchorage, Alaska 99510

1? SEP 1981

Re: Seward Small Boat Harbor
Design Revisions

Dear Colonel Nunn:

The U.S. Fish and Wildlife Service (FWS) has reviewed the design revisions for the Seward Small Boat Harbor project, Nash Road site. This letter is in accord with the provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.) and refers to our 19 July 1979 Final Coordination Act (CA) Report.

The original design (Figure 1) entailed construction of 2,000 feet of breakwater on the west side, 1,000 feet on the south side, and 1,500 feet of silt-barrier on the north side. The enclosed area would be approximately 30 acres. A 200-foot-wide entrance channel at -20 mean lower low water (MLLW) would have provided access to a mooring area dredged to varying depths ranging from -20 feet to -10 feet.

Dredged material (approximately 1.2 million cubic yards) was to be used to construct 14 acres of staging and parking areas on the intertidal land owned by the city of Seward.

The Corps of Engineers (CE) has revised the breakwater designs to provide better flushing and higher water quality within the enclosure. The newest design (Figure 2) entails 2,600 feet of breakwater on the west, 1,800 feet on the north, and 1,400 feet on the south. The south breakwater has been realigned and moved north approximately 400 feet. The enclosed area would still be approximately 30 acres and the 200-foot entrance channel would be dredged to -18 feet.

Dredged material amounts have been recalculated and now amount to 1.3 million cubic yards. Also, the staging area has been expanded to 48 acres, with the assumption that the dredged material, which is largely compacted silt, will expand after removal from the breakwater areas.

Although the above design plans will be in essentially the same site as the plans assessed in our CA Report, the FWS did an additional subtidal investigation of the area to determine any changes in biological communities since the CA Report was issued (see attached dive report); also, the Corps' Environmental Section collected samples of intertidal benthic organisms (see attached list).

Additional data collected shows no significant changes in the productivity of the harbor site intertidal area. Therefore, the impacts and recommendations discussed in our Final CA Report have adequately addressed our concerns for this project. Unless further design changes are made, we believe that no additional studies will be warranted, and no supplements to the Final CA Report will need to be made.

Should you have additional questions or information concerning this project, please call Mary Lynn Nation at our Western Alaska Ecological Services office.

Sincerely,

Robert Bowker

Field Supervisor

Attachments

cc: FWS-ROES
ADF&G, NMFS, ADEC, OCM, Juneau
ADF&G, NMFS, ADEC, EPA, Anchorage

UNITED STATES GOVERNMENT

memorandum

U.S. FISH AND WILDLIFE SERVICE
WESTERN ALASKA ECOLOGICAL SERVICES
733 W. 4th Avenue, Suite 101
Anchorage, Alaska 99501
(907) 271-4575

TO: Bob Bowker, Field Supervisor

FROM: Dave Ferrell, F&W Biologist DKF.

DATE: 9-14-81

SUBJECT: Seward Small Boat Harbor (Nash Road Site) Subtidal Investigation

Introduction

On September 10, 1981, a subtidal investigation was conducted at the site of the Corps of Engineers' proposed Seward Small Boat Harbor. The boat harbor site has been relocated northward approximately 400 feet. The south breakwater is now located approximately 100 feet north of the abandoned Army Dock.

Objectives

Investigate subtidal habitat at boat harbor site in order to assess project impacts associated with harbor construction.

Methods

SCUBA was utilized for underwater investigation. Dive was made from Zodiak situated approximately 100 meters off-shore, 100 meters north of Army Dock on the east shore of Resurrection Bay. Depth, substrate, and flora and fauna were recorded.

Results

Date:	September 10, 1981
Tide:	8' at 11:00 a.m.
Dive Time:	12:45 to 1:30
Bearing:	20°
Visibility:	5' - 10'

Depth

10' Benthos was flat and consisted of silt/mud becoming quite turbid when disturbed. Occasional stands of eel grass (Zostera) present. Epibenthos: cockles (Clinocardium nuttali), Macoma, Mytilus, unidentified worms.

15' Silt/mud substrate, occasional tree stump and other debris (Beer cans). School of Pacific herring encountered. Numerous small and occasional large (12') soles (yellowfin sole?). One unidentified blenny.

35' Silt/mud substrate. Slope of approximately 30°. No *Zostera*. Visibility less than 5 feet. One large sun star (*Pycnopodia helianthoides*).

Up Approximately 400 meters off-shore.

General assessment indicates that this subtidal area is impoverished due to the silt/mud substrate and lack of rocky habitat for kelp and other invertebrate attachment. Increased turbidity due to dredging may impact adjacent areas. Placement of rock jetties will provide some compensating habitat. Intertidal fill will not be particularly disruptive. Some salmon jumpers seen in the area (pinks?) and bait fish moving through. Placement of harbor at this location should not significantly affect salmon migrations. It is recommended that, if possible, jetties are constructed prior to dredging basin to minimize turbidity problems. Maintenance dredging at this site may be long-term in nature.

SEWARD, ALASKA - 6 June 1981

INTERTIDAL SAMPLING

Phylum Annelida
Class Polychaeta

Family Spionidae

Family Nereidae
Nereis

Family Nephtyidae
Nephtys

Class Oligochaeta

Family Tubificidae

Phylum Mollusca
Class Bivalvia

Family Tellinidae
Macoma balthica
Macoma nusuta
Clinocardium nuttallii

Phylum Arthropoda
Subphylum Crustacea
Class Malacostraca

Cancer magister (Dungeness Crab)

Order Isopoda
Family Sphaeromatidae

Order Amphipoda
Family Gammaridae

Miscellaneous

Phaeophyta (Brown Algae)

Fucus

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
P.O. Box 1668
Juneau, Alaska 99802

January 18, 1980

Mr. Jay K. Soper
Chief, Engineering Division
Department of the Army
Alaska District Corps of Engineers
P.O. Box 7002
Anchorage, Alaska 99510

Dear Mr. Soper:

This is in response to your letter requesting our analysis of the potential fishery resources that will be processed through major ports on the Gulf of Alaska within the next ten years.

The 1979-80 Optimum Yield (OY) set by the North Pacific Fisheries Management Council (NPFMC) for the Gulf of Alaska fishery resources is 376,000 mt. (approximately 827,200,000 pounds). The Gulf of Alaska encompasses the area between 170°West longitude and 132°40'W longitude as defined by the NPFMC. The Gulf of Alaska is divided into three regulatory areas as shown on the attached chart which also notes the approximate location of the major ports.

We believe we can make a fairly safe assumption that within ten years virtually all of the current OY in the Gulf of Alaska will be harvested by U.S. fisheries. We project that 60-65 per cent of that amount will be processed in shorebased facilities. The remainder will be received by floating processors whose fishing fleet and processing vessel(s) will either use the port facilities as a base or for supply, maintenance and shelter.

The current OY designated for the three Gulf of Alaska areas are:

Eastern -	75,000 mt	(165,000,000 pounds)
Central -	198,000 mt	(435,600,000 pounds)
Western -	103,000 mt	(226,600,000 pounds)
TOTAL	376,000 mt	(827,200,000 pounds)

It should be noted, however, that the areas have limited relationship to the source of fish which will be received by a particular processing facility or port. The areas were set up by the NPFMC for management reasons with OY's and other quota figures assigned to an area. In actuality with the current technology and that which is expected to be developed for freezing and holding fresh fish, fish will be delivered from any area to any port.

There will likely be one or more seafood processing facilities in the communities listed below capable of processing between 5 and 150 million pounds of bottomfish either exclusively or in conjunction with the more traditional species.

We have projected the following essentially judgment estimates of the total quantity of bottomfish which will be delivered to the respective ports listed.

Port	Millions of Pounds
Ketchikan	10-15
Petersburg	10-20
Kake	5-10
Sitka	10-20
Yakutat	10-30
Cordova	10-25
Valdez	5-10
Seward	10-20
Homer	20-30
Kenai	10-15
Kodiak	100-150
Sand Point	10-15
Chignik	10-15
King Cove	20-30
Cold Bay	20-30
Dutch Harbor	50-100
TOTAL	315-520

Dutch Harbor, Cold Bay and King Cove will also receive deliveries of fish from the Bering Sea. It is likely that ports as far eastward as Kodiak will receive some deliveries from the Bering Sea and Western Aleutians.

There are other ports in Southeast Alaska which are expected to have some processing of bottomfish primarily from inshore waters. These include Craig/Klawak, Hydaburg, Juneau, Angoon, Haines and Pelican. Quantities of bottomfish processed will likely range from 2.0 to 5.0 million pounds in each community.

We hope this information will help you in your projections. Let us know if other data is needed.

Sincerely,

Walter G. Jones
By RH/cK

Walter G. Jones
Chief, Fisheries Development

Attachment

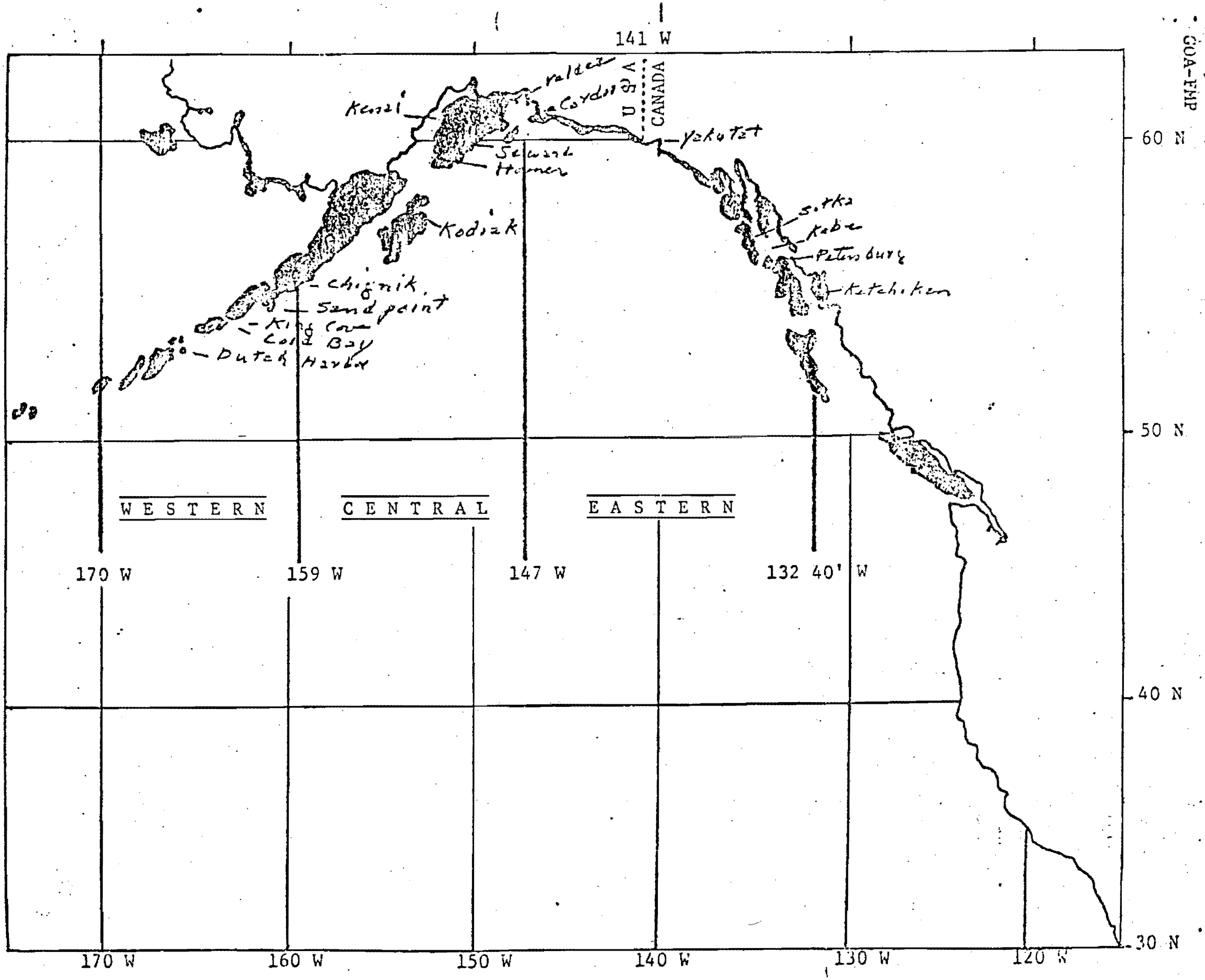


Figure 1 -- Regulatory Areas of the Gulf of Alaska (FMP)

ORIGINAL

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
P.O. Box 1668
Juneau, Alaska 99802

December 27, 1979

Colonel Lee R. Nunn
District Engineer
Alaska District, Corps of Engineers
P.O. Box 7002
Anchorage, Alaska 99510

Dear Colonel Nunn:

This responds to your letters of November 16, 1979, and November 21, 1979, in which you requested information on endangered and threatened species which might occur in the vicinity of proposed boat harbors at Seward, Cordova, and Homer (November 16 letter) and that at Kake (November 21 letter). We have no knowledge of threatened species that may be present in these areas but a number of endangered great whales are in the general areas seasonally.

Seward

Gray whales migrate along the Gulf of Alaska coast and may be found in outer parts of Resurrection Bay. Sei, fin, blue, black-right, humpback, and sperm whales have been sighted in the northern Gulf of Alaska.

Homer

Endangered whales occurring seasonally south and east of the Barren Islands include gray, sei, fin, black-right, blue, humpback and sperm. Occasional sightings of fin whales have been made in Kachemak Bay.

Cordova

Gray whales occur in the northern Gulf of Alaska and are found in both Hinchinbrook and Montague entrances to Prince William Sound (PWS). Humpback whales have spring, summer, and fall residence in PWS with the majority of sightings made in the western portion (Knight Island Passage, Chenega, and Perry and Naked Islands). Fin whales enter PWS in the May-June period during their migration to the Bering Sea. Sei whales have also been sighted in PWS.

Kake

Frederick Sound in the vicinity of Kake is a major concentration area for humpback whales. They tend to concentrate in the northeastern portion near The Brothers. We have no record of sightings in the immediate Kake area.

While there is a general paucity of information concerning the distribution of endangered whales, we believe that these species are apt to occupy waters in the vicinity of the proposed boat harbors infrequently.

Sincerely,

Robert W. McVey
for Harry L. Rietze
Director, Alaska Region

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
1011 E. TUDOR RD.
ANCHORAGE, ALASKA 99503
(907) 276-3800

N REPLY REFER TO: (SE)

30 NOV 1979

Colonel Lee R. Nunn, District Engineer
Department of the Army
Alaska District, Corps of Engineers
P.O. Box 7002
Anchorage, Alaska 99510

Dear Colonel Nunn:

This responds to your November 14, 1979, request for identification of proposed or listed threatened or endangered species which may be affected by construction of small boat harbors at Seward, Cordova and Homer, Alaska. Based on the best information currently available to us, neither listed species nor species proposed for listing are known to occur in or near the proposed project areas.

You may, therefore, conclude that preparation of a biological assessment as identified in Section 7(c) of the Endangered Species Act of 1973, as amended, is unnecessary and that further consultation is not presently required. However, if new information indicates the possible presence of endangered or threatened species or if species occurring in the affected area are subsequently listed, it will be necessary to initiate Section 7 consultation.

Thank you for your timely request and for your interest in endangered species. If we can provide additional information, please contact us.

Sincerely,

Jon M. Nelson

Acting Area Director

R7-1

14 Nov 1979

NPAEN-PL-EN

Mr. Harry L. Rietze
Area Director
National Marine Fisheries Service
P.O. Box 1668
Juneau, Alaska 99802

Dear Mr. Rietze:

As required by Section 7 of the Endangered Species Act of 1973, the Corps of Engineers requests that your office provide information on any listed endangered or threatened marine species, species proposed for listing and their critical habitat thay may be present in the areas of the proposed Seward, Cordova, and Homer Small Boat Harbors. Inclosed are maps showing the location of the proposed harbor alternatives.

A similar letter is being sent to U.S. Fish and Wildlife Service requesting information on endangered or threatened terrestrial species. Both the letters and responses will be included in the DEIS's. If you have any questions please contact William Lloyd of my staff at 752-2572.

Sincerely,

3 Incls
As stated

LEE R. NUNN
Colonel, Corps of Engineers
District Engineer

DEPARTMENT OF THE ARMY
ALASKA DISTRICT, CORPS OF ENGINEERS
P.O. BOX 7002
ANCHORAGE, ALASKA 99510

REPLY TO
ATTENTION OF:

NPAEN-PL-EN

14 NOV 1979

Mr. Keith Schreiner
Area Director
U.S. Fish and Wildlife Service
1011 E Tudor Road
Anchorage, Alaska 99503

Dear Mr. Schreiner:

As required by Section 7 of the Endangered Species Act of 1973, the Corps of Engineers requests that your office provide information on any listed endangered or threatened terrestrial species, species proposed for listing and their critical habitat that may be present in the areas of the proposed Seward, Cordova, and Homer Small Boat Harbors. Inclosed are maps showing the location of the proposed harbor alternatives.

A similar letter is being sent to National Marine Fisheries Service requesting information on endangered or threatened marine species. Both the letters and responses will be included in the DEIS's. If you have any questions please contact William Lloyd of my staff at 752-2572.

Sincerely,

LEE R. NUNN
Colonel, Corps of Engineers
District Engineer

3 Incls
As stated

JAY S. HAMMOND, GOVERNOR

DEPARTMENT OF FISH AND GAME

333 RASPBERRY ROAD
ANCHORAGE 99502

October 4, 1979

Department of the Army
Alaska District, Corps of Engineers
P. O. Box 7002
Anchorage, Alaska 99510

Attention: Mr. Jay Soper, Chief of Engineering

Gentlemen:

Re: Seward Small Boat Harbor Draft Coordination Act Report

On 11 January 1979, we addressed the subject Draft Coordination Act Report to U.S. Fish and Wildlife Service (copy attached). One of the comments was that inwater construction should occur between 1 November and 1 April. We have re-evaluated our position and feel that area fisheries resources could best be protected by holding inwater work to the periods of 15 June to 10 August and 1 November to 15 April. By not working inwater between 15 April and 15 June and also, 10 August to 1 November, there should be no appreciable conflict between construction activity and anadromous fish migration and rearing and herring spawning.

Thank you for consulting us.

Sincerely,

Ronald O. Skoog, Commissioner

B. Barrett

BY: Bruce M. Barrett
Projects Review Coordinator
Habitat Protection Section

cc: R. Bowker, USFWS
T. McHenry, ADF&G

3. Coordination Letters for the Archeological and Historical Preservation Act of 1974

June 5, 1981

Re: 1130-2-1

Mr. H. E. Moore
Chief, Engineering Division
Alaska District, Corps of Engineers
P. O. Box 7002
Anchorage, Alaska 99510

Subject: Seward Small Boat Harbor Navigation Improvement Project

Dear Mr. Moore:

We have reviewed the subject proposals and would like to offer the following comments:

STATE HISTORIC PRESERVATION OFFICER

No probable impacts. Should cultural resources be found during the construction, we request that the project engineer halt all work which may disturb such resources & contact us immediately. If there are any questions, please call or write Ty Dilliplane of this office.

The proposed action is consistent with the Alaska Coastal Management Program's historic, prehistoric and archaeological resources standard.

Robert D. Shaw
State Historic Preservation Officer

STATE PARK PLANNING

The proposed action is consistent with the Alaska Coastal Management Program's recreation standard.

LAND AND WATER CONSERVATION FUND GRANT PROGRAM

No comment.

Sincerely,

Chip Dennerlein
Director

CD:mlb

18 MAY 1981

NPAEN-PL-EN

Mr. Robert Shaw
State Historic Preservation Officer
619 Warehouse Dr., Suite 210
Anchorage, Alaska 99501

Dear Mr. Shaw:

The inclosed map indicates the location of a quarry site we propose to use during the construction phase of the Seward Small Boat Harbor Navigation Improvement Project.

Dr. John E. Lobdell of Anchorage Community College has examined the Fourth of July Creek area in conjunction with studies conducted for the City of Seward Marine Industrial Park development, and did not locate any significant cultural resources. Our quarry site is within the project area of the Marine Industrial Park and will, in fact, be used by the city as quarry before the Corps of Engineer uses it.

In light of Dr. Lobdell's survey we feel it will be unnecessary for us to test further for cultural resources before using this quarry. Does your office concur in this matter?

Should there be any questions please contact Ms. Julia Steele at 752-2572.

Sincerely,

s/D[illegible] G. H[illegible]ton

1 Incl
As stated

HARLAN E. MOORE
Chief, Engineering Division

Reference: Lobdell, John E.
1980 Archaeological and Historic Resources in the vicinity of the Proposed Land Use Area of Fourth of July Creek, Seward, Alaska (Final Draft). A report in Environmental Assessment, City of Seward, Marine Industrial Park. Prepared by OTT Water Engineers as a subconsultant to Century/Quadra Joint Venture.

MFR: Self -explanatory.

CONCUR
Lloyd
Pinard
OPP

STATE OF ALASKA

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF PARKS

JAY S. HAMMOND, GOVERNOR

619 Warehouse Dr., Suite 210
Anchorage, Alaska 99501

June 14, 1979

File No.: 1130-2-1

Subject: Nash Rd. Alternative: Seward, Small Boat Harbor Expansion

G. R. Robertson
COL, Corps of Engineers
P. O. Box 7002
Anchorage AK 99510

Dear Sir/Madam:

We have reviewed the above proposal and would like to offer the following comments:

STATE HISTORIC PRESERVATION OFFICER

No probable impacts. Should cultural resources be found during the construction, we request that the project engineer halt all work which may disturb such resources and contact us immediately.

William S. Hanable
William S. Hanable
State Historic Preservation Officer

STATE PARK PLANNING

No objection. Every effort should be made to insure that adequate use support facilities such as toilets, parking, trails, etc. are incorporated into the design of the harbor as significant public use can be expected. We would be happy to review and comment on future comprehensive design plans.

STATEWIDE RECREATION SERVICES

Concur

LWCF

No comment

Sincerely,

William S. Hanable
for Terry A. McWilliams
Director, Parks

NPAEN-PL-EN

Mr. William S. Hanabal
State Historical Preservation Officer
Alaska Department of Natural Resources
619 Warehouse Drive, Suite 210
Anchorage, Alaska 99501

Dear Mr. Hanabal:

Your office provided the Corps of Engineers with historical, cultural and archeological information on the proposed expansion of Seward Small Boat Harbor, in a letter dated 15 December 1978. Since that time, an additional alternative, Nash Road, has been added as a result of public request at a 25 October 1978 public workshop.

We would like to request that your office provide the Corps of Engineers with existing archeological and historical information on the Nash Road site and with any recommendations you feel are necessary. We would appreciate receiving this information as soon as possible to aid us in our planning for this field season. A description of the Nash Road site is given below.

Nash Road alternative is located two miles northeast of Seward, at the head of Resurrection Bay. Nash Road, a secondary State highway, ends approximately 2,000 feet northwest of the proposed site. Dredged materials would be disposed of on nearby uplands to the east where this material will be used to construct a staging and parking area on the tidelands owned by the city. Rock for breakwater construction will be taken from cliffs adjacent to the project site. A print has been inclosed showing the location of the proposed site and quarry location. If you have any questions please contact Sandra Vannice, 752-3861, of my staff.

Sincerely,

11 May 1979

1 Incl
As stated

GEORGE R. ROBERTSON
Colonel, Corps of Engineers
District Engineer

STATE OF ALASKA

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF PARKS

JAY S. HAMMOND, GOVERNOR

Terry A. McWilliams, Director

619 Warehouse Dr., Suite 210
Anchorage, Alaska 99501

January 11, 1979

Re: 1130-2-1

Mr. Jay K. Soper
Chief, Engineering Division
Alaska District, Corps of Engineers
P.O. Box 7002
Anchorage, Alaska 99510

Dear Mr. Soper:

Reference your letter of 4 January 1979 clarifying the proposed locations of quarrying activities for the Seward boat harbor expansion project. A telephone conversation with Mr. Ed Curtis has resolved our concerns, with Mr. Curtis indicating that the actual construction work will not be at Lowell Point, but at locations further north along Lowell Point Road. We therefore withdraw our recommendation for an archaeological survey with regard to the Seward boat harbor expansion project.

Should we be able to be of any further assistance, please do not hesitate to contact us.

Sincerely,

William S. Hanable

William S. Hanable
State Historic Preservation Officer

TLD:clk

Corps of Engineers

NPAEN-PL-R

Mr. William S. Hanable, SHPO
State of Alaska Division of Parks
619 Warehouse Ave. Suite 210
Anchorage, Alaska 99501

Dear Mr. Hanable:

This is in response to your letter of 15 December 1978 (Rep: 1130-2-1) with your comments on boat harbor expansion at Homer, Port Lions and Seward, Alaska. We wish to clarify the location of proposed quarry sites for Seward.

Quarrying will take place ~~in~~ at the base of cliffs along the Lowell Point Road, in existing disturbed areas which have previously been quarried. It therefore seems improbable that cultural resources could be endangered. Do you concur?

In the event that alternative quarry sites should be proposed. We will contact you for an evaluation.

Meanwhile should you have questions please contact Mr. Ed Curtis of my staff (752-3461).

Sincerely yours,

s/Jay K. Soper

JAY K. SOPER
Chief, Engineering Division

3 Jan 79

STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF PARKS

JAY S. HAMMOND, GOVERNOR
Terry A. McWilliams, Director
619 Warehouse Dr., Suite 210
Anchorage, Alaska 99501

December 15, 1978

Re: 1130-2-1

Jay K. Soper
Chief, Engineering Division
Alaska District, Corps of Engineers
Box 7002
Anchorage, Alaska 99510

Dear Mr. Soper:

This office has reviewed the proposals to expand the small boat harbors at Homer, Port Lions, and Seward, Alaska. Our comments are as follows:

(1) For the Homer project, our review indicates that the proposed expansion may directly impact Alaska Heritage Resource Survey (AHRS) site no. SEL-077. This is an aboriginal site, at which no archaeological testing has taken place. Because of the potential significance of SEL-077, a pre-construction archaeological survey is recommended under provisions of Title 36, Code of Federal Regulations, part 800. Enclosed please find a copy of your project location map showing where the site is situated. Moreover, the proposed quarry site at Gray Cliff may also be the location of currently unknown and significant aboriginal subsistance sites. Therefore, a pre-construction survey is also recommended for that location. The other two possible quarry sites, Sadie Cove and Watch Point, are archaeologically cleared. We note that a specific site for the disposal of dredged material has not yet been selected, and we shall look forward to reviewing that area prior to such activities taking place there.

(2) Our study of the Port Lions proposal indicates no conflict, or likely conflict, with cultural resources.

(3) The Seward Harbor expansion proposal, also does not appear to be in conflict with cultural resources of significant value. However, we are concerned with your proposal to initiate quarrying operations at Lowell Point. According to local traditions, Lowell Point may be the site of the Russian Post Voskressenski where the ship Phoenix was constructed. Therefore, prior to any work at Lowell Point, we recommend an archaeological survey under provision of 36 CFR 800.

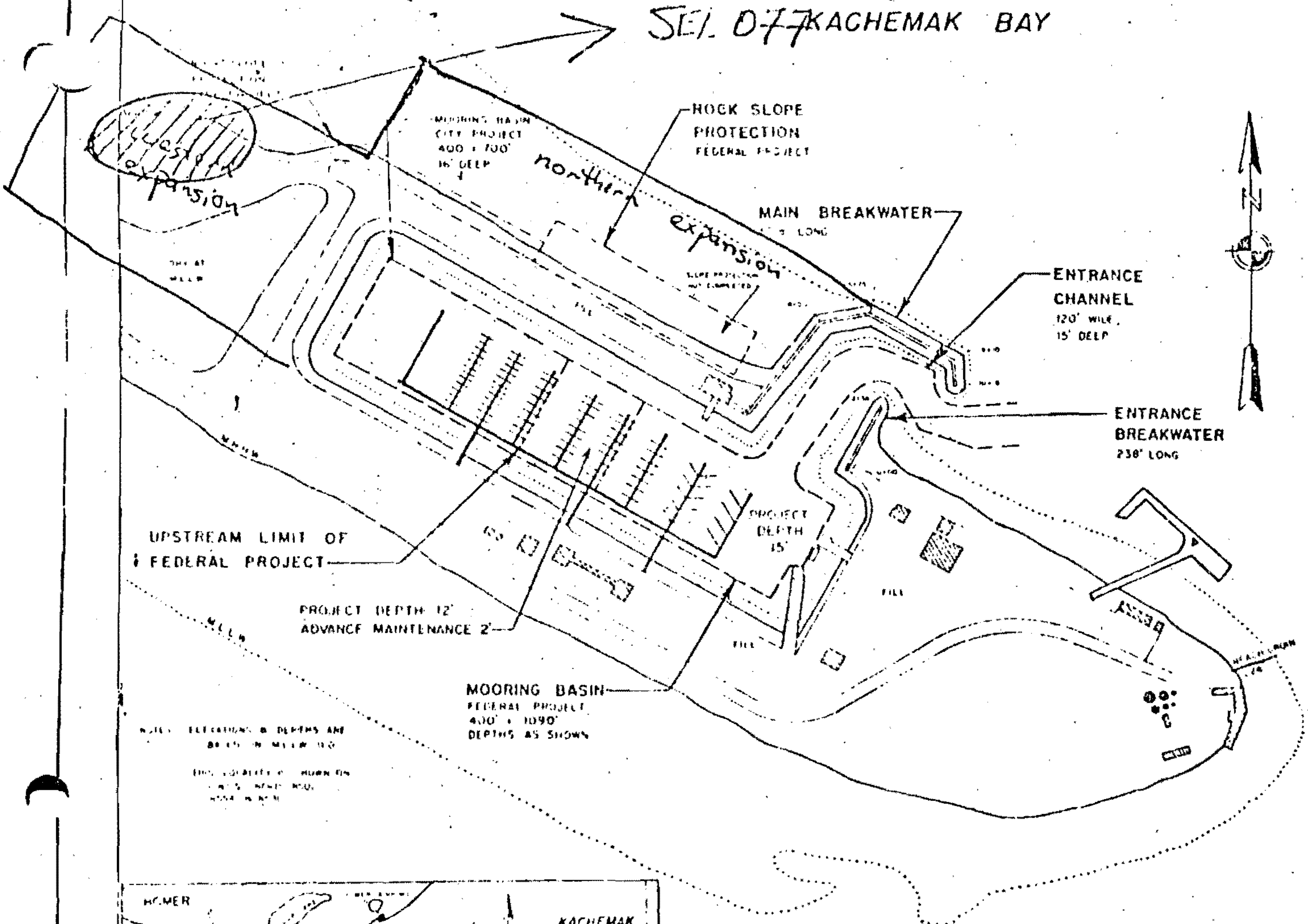
Should you have any questions concerning the above please do not hesitate to contact us.

Sincerely,

William S. Hanable
State Historic Preservation Officer

enclosure

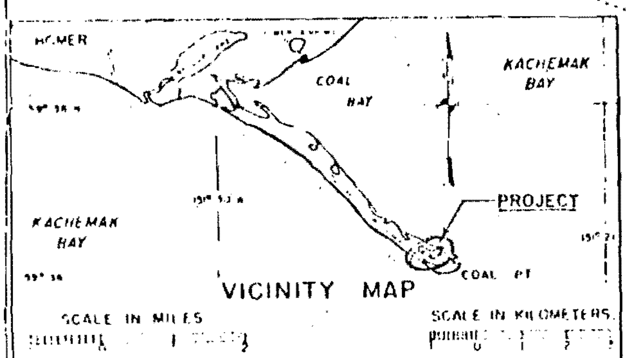
WSH/ml

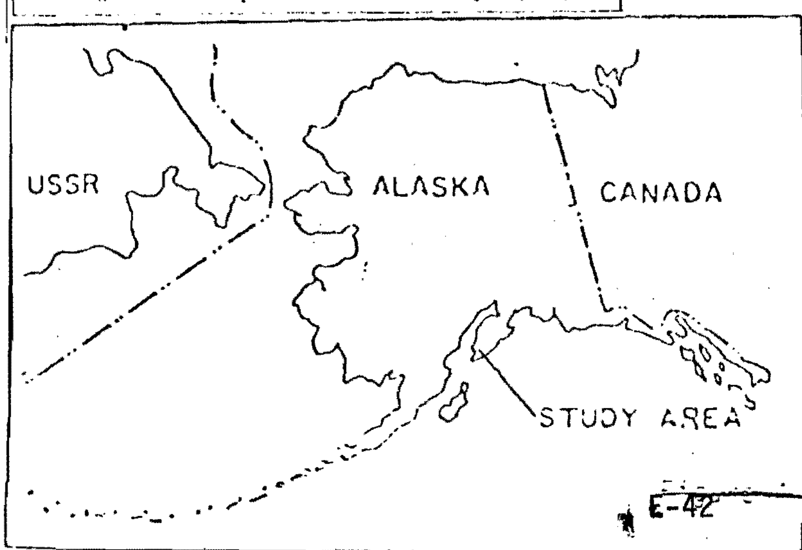


HOMER HARBOR
ALASKA
1977

SCALE IN FEET

SCALE IN METERS





CORPS OF ENGINEERS

E-42 Location and Vicinity Maps.

Inclosure 1

UNITED STATES
DEPARTMENT OF THE INTERIOR

HERITAGE CONSERVATION AND RECREATION SERVICE
Interagency Archeological Services
Box 36065
450 GOLDEN GATE AVENUE
SAN FRANCISCO, CALIFORNIA 94102

IN REPLY REFER TO:
H2219 IAS (HCRS)

October 25, 1978

Project Manager
Seward Small Boat Harbor Expansion Study
Alaska District, U.S. Army Corps of Engineers
P.O. Box 7002
Anchorage, Alaska 99510

Dear Sir:

We appreciate receiving your notice yesterday of plans for expanding existing boat facilities in Seward Harbor, Alaska and your invitation to attend the October 25 workshop. Because of the great distance involved, we will not be able to attend the workshop, but we would like to take this opportunity to recommend that you consider possible effects of each alternative on any cultural resources that may occur along the harbor edge. We suggest that you consult William Hanable, State Historic Preservation Officer (Division of Parks, 610 Warehouse Drive, Suite 210, Anchorage 99501) to determine the likelihood of such effects and to weigh the need for archeological surveys in advance of construction. If we can be of any assistance to you in terms of mitigating impacts to significant cultural resources under P.L. 93-291 (the Archeological and Historic Preservation Act of 1974), please call us anytime (FTS 556-7741),

Sincerely yours,

Garland J. Gordon

Garland J. Gordon, Chief
Interagency Archeological Services
San Francisco

cc:

State Historic Preservation Officer, Alaska
HCRS Regional Office, Seattle

4. Comment - Response display

U.S. ENVIRONMENTAL PROTECTION AGENCY

REGION X

1200 SIXTH AVENUE

SEATTLE, WASHINGTON 98101

REPLY TO ATTN OF: M/S 443

13 NOV 1981

Ms. Lizette Boyer
Department of the Army
Alaska District, Corps of Engineers
P. O. Box 7002
Anchorage, Alaska 99510

Dear Ms. Boyer:

As you requested, we examined the proposed "responses to comments" section of your Preliminary Final EIS (PFEIS) on the planned Seward, Alaska Small Boat Basin. Based on this review and our review of the revised design for the boat basin, we believe that the circulation of either a revised draft EIS or a supplemental draft EIS that focused on the revised design would not necessarily improve the public's knowledge of the project or the results of the decisions which the Corps will make on the proposal.

We believe that an adequately effective approach, and one that would be less costly, would be for the Corps to issue the Final EIS and the Final Project Feasibility Report for public and agency review and allow these reviewers 45 days to submit their comments. This would give them ample time to review the revised analyses in the FEIS and Final Project Feasibility Report on the revised proposal. The Corps could then give appropriate recognition to any comments that it receives in its final decisions on the project and in the Record of Decision that is issued at the conclusion of the NEPA review process.

Sincerely yours,

Roger K. Mochnick for

Elizabeth Corbyn, Chief
Environmental Evaluation Branch

cc: Alaska Operations Office

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION X
1200 SIXTH AVENUE
SEATTLE, WASHINGTON 98101

REPLY TO ATTN OF: M/S 443

MAY 19 1980

Colonel Lee R. Nunn
Alaska District, Corps of Engineers
Department of the Army
P. O. Box 7002
Anchorage, Alaska 99510

Dear Colonel Nunn:

We have completed our review of the Draft Feasibility Report (DFR) and Draft Environmental Impact Statement (DEIS) recently issued by your office on the proposed Seward Alaska Small boat harbor. Based upon this review we have a few suggestions to offer regarding the scope and content of the Final EIS which are oriented towards insuring that it (the FEIS) fully meets the objectives and requirements of the Council on Environmental Quality Regulations (40 CFR 1500 et. seq.) governing the implementation of the National Environmental Policy Act of 1969.

We understand that the proposed small boat harbor is designed to alleviate a severe shortage of boat moorage space for recreational boats and to solve a severe congestion problem at the dock(s) of shore based seafood processors in Seward. Additionally it is apparently intended to provide the space necessary to support the commercial boat fleet which would be associated with a groundfish fishery when one develops in South Central Alaska.

1. With this purpose as background a few omissions and analytical problems in the DFR/DEIS merit attention in the Final Feasibility Report/EIS.

First, the DFR/DEIS never discusses or evaluates how any of the alternative boat harbors under consideration would deal with the congestion problem associated with the offloading of existing fishing vessels. This is a particular problem with sites remote from the fish processing plant(s) such as the Nash Road site in that their remote location could involve significant increases in transportation

1. The city of Seward feels that the Nash Road site would be used mainly by the recreational boat fleet while the present harbor would be for the commercial fleet. Relieving the over crowded condition in the existing harbor will relieve the congestion problem associated with the off loading of the fishing vessels.

and handling costs for the commercial fish harvest. Similarly, the

2. DFR/DEIS does not indicate how the groundfish fishing fleet could be accommodated by the new boat harbor or what feasible sites would be possible for shore based groundfish processing plants in Seward. Thus it is not clear that the current and expected future needs of the commercial vessel fleet would be met by the alternative harbors under consideration.

3. Second, the South Expansion plan alternative appears to be framed improperly within the context of Alaska's Coastal Zone Management Program. The program's guidelines and standards require, at 6 AAC 80.050, that developments in identified geophysical hazard areas may not be approved until siting, design, and construction measures for minimizing property damage and loss of life have been provided.

Thus the South Expansion plan alternative should be reevaluated based on an engineering design which has the potential to survive the design basis earthquake for the site. The analysis of its benefits and costs and its environmental consequences should be based on such an engineering design. Such a design could also solve the Federal funding constraints mentioned in the DFR/DEIS.

4. Third, given the space constraints in the vicinity of Seward, it may be appropriate for the feasibility report and EIS to evaluate split site alternatives. Such alternatives would concentrate recreational boat moorage in a separate area, which need not be close to commercial facilities, and would modify the existing harbor to deal with the commercial vessel congestion problems and provide for the expected groundfish fishery fleet (and perhaps additional shore based seafood processors). We believe that it would be possible to develop such an alternative plan in a fashion which avoided potential conflicts with the proposed Dresser Industries dock.

Proposed Plan (DEIS)

EPA has strong reservations on the environmental acceptability of Plan B as the tentatively proposed plan.

5. There is a considerable amount of dredging proposed at the Nash Road site with subsequent disposal in the existing tideland. On page 73, the DEIS states "there are no practical alternatives to intertidal disposal" and "the impacts associated with dredged material disposal on parking and staging areas on the upland area would be far greater than those associated with tideland disposal." This requires further explanation, especially if slope and forested land are the sole justification for the above statements. In the DFR and DEIS, the

6. Nash Road environs are projected as being developed in the near future. (Both water related and non-water related development). To further clarify this situation the final EIS should include a discussion about the existing land use at and around the Nash Road site, i.e. population, businesses, occupations, vegetation coverage, slope incidence, etc.

2. The commercial fishing fleet is expected to increase only by 15 boats over the first 10 years of the project. The anticipated increase in the fleet can be handled by the exiting processing plants without any major delays. Refer to response # 1.

3. The South Expansion alternative is within a "high-risk" area. This means that the land is considered unstable, particularly in the event of future earthquakes, and no economically feasible means of stabilization is known. It has been recommended that no repairs, rehabilitation, or new construction involving use of Federal funds except for grading and light fill be done in this area.

4. The Federal government - Corps of Engineers - has no authority to tell the city of Seward how to run their harbor beyond those items specified in the local cooperation agreement which includes limiting occupance on the fill area to development activities that are dependent upon water transpor- tation. It has been suggested that the Nash Road site be used primarily for recreational boats and the present harbor be used for the commercial fleet.

5. Upland dredge disposal is not considered in the FEIS for the Nash Road Alternative. Disposal in the tideland is a necessary and integral part of the harbor design. Without creating fast land by placing dredge material in the intertidal area, adequate land would not be available for necessary harbor facilities, or for a staging area for construction of the harbor. Refer to the Section 404 (b)(1) Evaluation for Compliance with the Clean Water Act. This information has been brought out in the final report.

6. The draft Environmental Impact Statement (DEIS) and Draft Feasibility Report (DFR) gave information on future development in the Nash Road area to give the readers an understanding of how harbor construction would fit into future land use. As stated in the DEIS, development of this area will more than likely occur before a small boat harbor is built. A more detailed discussion of the existing conditions at Nash Road would be helpful to the reader in evaluating potential indirect impacts of the harbor on this area and has been included in the FEIS.

7. Several factors concerning the Resurrection River wetland and the wetland (tideland) at the Nash Road site should be clarified in the final EIS. For instance, what will be the indirect effects of the small boat harbor on the Resurrection River delta wetland? The importance of Resurrection River, Salmon Creek, and the streams in the northeast corner of Resurrection Bay to the salmonid fisheries needs to be discussed. If these areas are of prime importance to the salmonid resources, the impacts resulting from Plan B and future impacts associated with harbor construction need to be detailed in the final EIS. (Also mitigation measures to provide the best protection need to be outlined). The importance of the Resurrection River wetlands to downstream migrants also merits further discussion in the final EIS. (Mitigation measures for protection should be included). The direct and indirect impacts to the spawning salmon and water quality should be listed and mitigation measures included.

8. If data are available regarding the aquatic productivity of the Nash Road site, it should be included in the final EIS. Especially since the Corps concludes that the loss of habitat at the Nash Road site would be insignificant. If data are not available to support this conclusion, it should be deleted from the final EIS.

9. There should be more information in the final EIS concerning the indirect impacts that would be expected with the construction of a small boat harbor at the Nash Road Site. What are the expected impacts to the tidelands, water quality, fisheries, and to the adjacent Forest Service land? Also, what impacts will be associated with the ten year maintenance schedule?

Environmental Analysis

We feel that the DEIS underestimates the potential impacts of the expansion plans. We hope that the comments in attachment A will help evaluate the proposed harbor expansion at Seward and allow for a more acceptable alternative that provides the best overall response to the study objectives outlined in the DFR and DEIS.

404 (B) (1) Evaluation

(Our 404 (B) (1) evaluation has not yet been completed. We anticipate that our review will be completed by May 30, 1980 and it will be forwarded to you as soon as possible).

Finally, we would like to suggest that the FEIS should include specific consideration of water quality protection measures which could be incorporated into the boat harbor facilities. Specifically, it is our view that an expanded boat harbor of the size envisioned by the

7. The indirect effect of the small boat harbor on Ressurection River Wetlands was discussed on Page 71 of the DEIS. This discussion included Fish and Wildlife Service's concerns outlined in their Coodination Act (CA) report to the Corps of Engineers, Page E-10, Para 4. Ressurection River, Salmon Creek, and streams in the northeast corner of Ressurection Bay and their fisheries would not be affected by the Nash Road alternative. The one exception is the unnamed anadromous fish stream at the end of Nash Road. Mitigation measures to protect this spawning area are given on Page 63 of the DEIS. The importance of the wetland to down-stream migrants was not discussed because this function of the wetland would not be affected by the project. The project would not have a direct effect on the water quality of the wetland; however, increase development could indirectly affect the water quality. This effect and measures that would minimize it, are included in the FEIS under water quality. The direct or indirect impact that the project would have on spawning salmon is given on Pages 73-75 of the DEIS. The final report includes a detailed location map so that reviewers will have a clear understanding of where Salmon Creek and Ressurection River are in relationship to the Nash Road alternative.

8. Available data on productivity was included in the DEIS and in the U.S. Fish and Wildlife Service Coordinative Act Report (Appendix E). No additional data on productivity is available. However, we feel this is sufficient to draw the conclusions made. The term productivity is used in the DEIS to describe the abundance of important or significant species in the affected intertidal or subtidal areas in Alaska waters. The U.S. Fish and Wildlife Service identified both areas as having low or marginal productivity. The conclusions regarding productivity are based on the Fish and Wildlife Service's knowledge of productive intertidal areas in Alaska waters.

9. The indirect impacts that are mentioned in this paragraph have already been covered in the DEIS. The expected impacts to tide lands are covered on Page 73, Par. 3. As stated, adjacent tide lands could be impacted due to a decrease in water quality. This impact is expected to be minimal because the strong tides that occur in the area will rapidly disperse the pollutants rather than concentrate them. The above sentence is included in the final EIS. Impacts on water quality are adequately covered on Page 75, in Paragraphs 2 and 3, and under Item 6, Water Quality, Pages 75-76 in the DEIS. After the DEIS was filed, a circulation study was completed for the Nash Road alternative which will result in a minor change in the harbor design and would improve water quality. The water quality section has been revised to include this new information. The circulation study is included in the Final report. Both the direct and indirect impacts to fisheries and marine resources are covered on Page 74 under B. Nash Road Alternatives, and on Page 75, Paragraphs 2 and 3 in the DEIS. The last paragraph on Page 74 has been improved by specifically stating what the impact to fish would be rather than referencing back to the impacts described for the south harbor expansion. One possible indirect impact which has been added to the FEIS, would be induced development near an anadromous fish stream. A harbor in this location may increase recreation use of Forest Service lands. Impacts from maintenance dredging on the marine environment are given on Page 74, Para 4 of the DEIS. Maintenance dredge material will be disposed of in the upland dredge disposal area identified in Plan A. Additional details on maintenance dredging are included in the FEIS.

10. DEIS would require and could economically support facilities for (1) pumping out vessel bilges and treating oily bilge water prior to discharge, and (2) pumping out sanitary waste holding tanks which U.S. Coast Guard regulations, issued under the Clean Water Act, require in a significant proportion of the vessels that would use the planned boat harbor. Given the proximity of the boat harbor to Seward it seems reasonable to expect that this pumped out sanitary waste could be easily transported to the Seward wastewater treatment plant. These two measures could, prevent the significant water quality degradation which can be associated with vessel waste discharges in confined harbors.

The Environmental Protection Agency has rated the Draft Feasibility Report and the Draft Environmental Impact Statement for the proposed small boat harbor navigation improvement as a Category 3 (Inadequate EIS) for the following reasons:

First, we feel the alternatives are not focused on the problems they are theoretically supposed to resolve.

Second, the analysis of the environmental consequences contains omissions which we consider significant.

Finally, due to the above reasons, we feel the reader cannot determine which of the alternatives is the most acceptable from a public health standpoint or from an environmental perspective.

This rating will be published in the Federal Register in accordance with EPA's responsibility to inform the public of our views on proposed Federal actions under Section 309 of the Clean Air act, as amended.

If you have any questions or wish to discuss our comments please feel free to contact either Dan Steinborn (our EIS Review Team Leader) or LeRoy Loiselle of my staff at (206) 442-1285 or (FTS) 399-1285.

Sincerely,

Daniel Steinborn, for

Roger K. Mochnick, Acting Chief
Environmental Evaluation Branch

Attachment

10. Considerations of water quality protection measures were included in the DFR and DEIS to the fullest extent of the Corps of Engineers' authority. specifically, two of the Local Cooperative Requirements given on Page 50 of the DFR deal with discharge of idustrial waste, untreated sewage, and provision for suitable sanitary facilities. Item C requires that the local sponsor provide for suitable sanitary facilities. Item F. requires that the local sponsor establish regulations prohibiting discharge of untreated sewage, garbage, industrial waste, and other pollutants into water of the harbor in accordance with applicable laws or regulations of Federal, State, and local authorities responsible for pollution prevention and control. The above issues are also covered in the DEIS under Water Quality, Page 75, Para 5. The authority to implement and enforce the provisions of the Clean Water Act that deal with these water quality protection measures is outside of the jurisdiction of the Corps of Engineers.

Attachment A

EPA's Comments on: Seward Small Boat Harbor Expansion - DFR & DEIS

Alternatives

There are several issues concerning the alternatives that are either contradictory or need further attention for a better understanding of why they were rejected.

1. Existing Harbor Extension East

11. Since the Harbor Extension East proposal is described as being favorable and comparable to Harbor Extension South (Plan A), we feel this alternative merits a detailed discussion akin to the discussion given the Plan A and Plan B.

The final EIS should consider whether the Dresser Industries site would, in fact, be available for use as a boat harbor site. The draft EIS assumes that it would not be available. However, two similar proposed offshore facility construction yards in Washington State have been cancelled due to the absence of a market in Alaska. Thus, Dresser might be more than happy to be released from its lease if the market continues to be stagnant.

Rejecting this alternative on the grounds of the Alaska Railroad's opposition seems rather dubious for two reasons: 1) the small boat harbor would be surrounded by a breakwater and limit interference with the railroad's dock, 2) navigational hazards associated with the proposed development of Dresser Industries' medium draft dock appear to us to be a far greater threat than with a bounded small boat harbor. Rejection on the grounds that shore parking would be inconsistent use of prime industrial shoreland also merits explanation. What is the shoreland currently being used for? Are mitigation measures available that would allow for the shoreland to be used for a staging area to support a small boat harbor? Since the Nash Road environs has been designated for some industrial development, could this area absorb the industry that may develop in the Harbor Extension East area?

A favorable condition of the Harbor Extension East site is that it is outside of the presumed high seismic risk zone.

2. Lowell Point

12. The amount of land at Lowell Point that is privately owned should be shown on an appropriate map. If land is available, the possibilities of using Lowell Point as a site for recreational boating facilities should be discussed further, i.e. use as a launch site or recreational boat harbor only. If a suitable road exists for transporting quarry material from Lowell Point, it should be serviceable for trailered recreational boats.

11. The Harbor Extension East was dropped from further discussion because that land is leased to Dresser Industries. The Corps of Engineers has no authority to contact Dresser regarding their lease with the city of Seward. Also, the city has stated they would not try to cancel the lease because that would give them a bad reputation with other industry.

12. Lowell Point is outside the cooperate limits of the city of Seward. Therefore it is not covered by the local cooperation resolution between the Corps of Engineers and the city of Seward.

3. Fourth of July Creek

13. We generally agree with the conclusion as to why Fourth of July Creek is excluded as an alternate harbor site. Although not detailed in the DFR and the DEIS, adverse environmental impacts should also be considered as to why this site should be eliminated from the alternatives.

4. Townsite Location

14. There should be further analysis to see if the subsurface conditions along the waterfront have stabilized since 1964. Also, since this area is convenient to parking and access areas, the possibility of a launch ramp and support dock to handle weekend transients may be useful.

5. Alaska Railroad East

15. We agree with the reasons stated for rejecting this plan as a viable alternative.

<u>Split Sites</u>

16. Since overcrowding at the existing harbor facility launch ramp is a key factor influencing a need for harbor expansion, it may be useful to evaluate the feasibility of building a launch ramp and support dock away from the existing boat harbor or away from the proposed new harbor. This may alleviate the pressure from daily and weekend transient boats.

<u>Other Concerns</u>

17. 1. If more information is available on the proposals for construction by Nikiski Marine Corporation, this should be included in the final EIS. Since this proposed development overlaps the Nash Road Proposal (Plan B), the combined impacts should be addressed. Also, the combined impacts from Plan B and the proposed development at Fourth of July Creek (proposed shipyard construction) should be addressed.

2. The state water quality standards should be included in the final EIS along with a discussion of the expected construction related impacts as well as the secondary impacts after construction. Mitigation measures that are available to alleviate or attenuate these impacts should be included.

3. If excess silting and shoaling are anticipated from Plan B, the effects of this on water quality and the biota should be discussed in the final EIS.

4. A plan for disposing of the maintenance dredge spoil for Plan A and B should be included in the final EIS.

13. We now have some biological information available as a result of a consulting firm's study for the shipyard proposal at Fourth of July Creek. From this information we cannot draw a conclusion that the alternative should be eliminated for environmental reasons. The reason for eliminating the alternative at this time is that the Corps' proposal would interfer with the city's proposal to build a Marine industrial park and shipyard at Fourth of July Creek.

14. Refer to EPA comment # 3.

15. Noted.

16. Providing support facilities is the local sponsor's responsibility. This would be a useful solution to the over crowding situation but it is felt that having two sites, present harbor and Nash Road site, will alleviate the over crowding problem.

17. The Nikiski Marine Corporation proposal is no longer a viable alternative; however, if a private firm were to build a harbor at Nash Road, the Corps would not, therefore, there would be no combined impact. We understand that cumulative impacts can result from individually minor but collectively significant actions; however, we do not believe this is the case with Fourth of July Creek shipyard proposal and Plan B. The combined impact of both proposals would not result in any foreseeable significant adverse environmental impacts either short term or long term. The two projects are far enough removed from one another, so that there would not be a combined impact on water quality. The intertidal areas affected are low in productivity and even their combined loss would not affect the overall production in the Resurrection Bay area. The impacts on spawning salmon from Plan B have been mitigated by moving the harbor location, and other impacts to migrating salmon would be minimized by timing constraints. It's not clear at this time what impacts the shipyard proposal will have on spawning salmon or what mitigation measures will be required; although, it does appear that a small spawning stream would be eliminated. Both proposals will strengthen the trend towards development on the west side of the bay, but as pointed out in the DEIS development is occurring independently of the small boat harbor proposal. It is unknown whether or not the combined impact of these two proposals would significantly influence development in the area.

18. 2. The state water quality standards should be included in the final EIS along with a discussion of the expected construction related impacts as well as the secondary impacts after construction. Mitigation measures that are available to alleviate or attenuate these impacts should be included.

18. Appropriate state water quality standards were included in the DEIS, Appendix F on Page F-13 and referenced in the DEIS. Both construction related impacts and "secondary impacts" on water quality were discussed in the DEIS on Pages 75 and 76. Measures that would minimize impacts on water quality were included in the DEIS on Page 75, Par. 5 and on Page 76, Par. 3, although these were not specifically identified as mitigation measures. In addition, a mitigation measure that is included in the final is a design change in the Nash Road alternative that will improve circulation. State water quality certification is included in the FEIS.

19. 3. If excess silting and shoaling are anticipated from Plan B, the effects of this on water quality and the biota should be discussed in the final EIS.

19. Excess silting and shoaling is not expected but there may be some minor silting and shoaling. This minor problem was anticipated during the design phase, and therefore a cost for maintenance dredging was added to the cost of the project.

20. 4. A plan for disposing of the maintenance dredge spoil for Plan A and B should be included in the final EIS.

20. This information has been included in the FEIS and DPR.

21. 5. In the DFR, it is stated that the Nash Road site will only be developed as a 30 acre harbor and that provisions have been included for future expansion. This should be clarified and future expansion plans along with construction scheduling should be in the final EIS.

22. 6. We would like to see some of the Federal cost differences explained in the final EIS. For instance, in the DFR and DEIS it appears that twice as much breakwater will have to be constructed in Plan B than in Plan A. Plan A's cost is $1,274,000 more than Plan B. This should be explained. Also, a $78,000 contingency difference between the two proposals appears to us to be an oversight, please explain the reasoning in the final EIS.

23. 7. In the DEIS, the mooring capabilities for recreational and commercial craft are given as 1,674 for Plan A and 1,000 for Plan B. If the moorage acreage for both plans are the same (30 acres), why the difference in mooring capabilities.

24. 8. Since disrupting the vegetation and degrading the aesthetics at the Nash Road quarry site are expected, unavoidable and irreversible impacts should be discussed in the final EIS. Also, any mitigation that can or will be used to minimize the impacts to the quarry site should be included.

25. 9. The bottom paragraph of page 74 alludes to the fact that the South Harbor Expansion will impact the fishery in Dairy Creek The last paragraph on page 73 refutes this. This should be clarified in the final EIS.

26. 10. The expected impact to the fisheries that utilize the unnamed stream north of the Plan B site should be discussed further in the final EIS.

27. 11. From the construction description outlined in the DFR, Plan B requires approximately 4,400 feet of breakwater while Plan A requires approximately 2,100 feet of new berakwater. Therefore, we would like to know why Plan A calls for 186,000 cubic yards more than Plan B.

28. 12. If possible, more detailed maps of the area around and encompassing the alternative sites should be included in the final EIS. It would be helpful if they showed land use, industries, slope relief, fisheries use, etc.

21. Harbor expansion is designed to accommodate all future needs in Seward for the next 50 years. This projection has taken into consideration the future commercial fishing industry, projected population and future recreational activities of Alaskans. Any future expansion of the existing or proposed harbors beyond 50 years would have to be clarified at that time.

22. Cost differences such as described in your comments are not items covered in an EIS. This information is explained in the final DPR. The major cost of a breakwater is in the quantity of armor rock. Plan A requires 38,400 cubic yards and Plan B requires 22,500 cubic yards of armor rock (See Response #27). All cost figures are revised from the draft report.

23. The figure for Plan A includes the mooring capacity of the existing harbor whereas the figure for Plan B only includes the mooring capacity of the new harbor. The correct figure for expansion for both plans is 1073. This is clarified in the final report.

24. The Nash Road quarry site described in the Draft Feasibility Report has been eliminated. The new quarry site is described in both the DPR and FEIS.

25. The south harbor expansion could have an impact on the spawning runs that utilize Dairy Creek. However, the last paragraph on Page 73 does not refute this information. It states that the project would not impact Seward Lagoon or Dairy Creek but that construction could impact the spawning runs. The spawning runs that utilize Dairy Creek could be impacted without actually impacting the spawning areas. The paragraphs on Pages 73 and 74 are revised in the FEIS so that this information will be less confusing.

26. This information is included in the FEIS.

27. The difference in the amount of material required for the breakwater in Plan A over Plan B is the depth of water the breakwaters are in. Plan A breakwater is in -30 feet MLLW while Plan B is in only -5 to -6 feet MLLW.

28. More detailed maps are included in the final report.

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administrat
National Marine Fisheries Service
P. O. Box 1668, Juneau, Alaska 99802

Date : March 31, 1980

Reply to Attn. of:

To : Colonel Lee R. Nunn
District Engineer, Corps of Engineers

From : Harry L. Rietze
Director, Alaska Region

Subject: Comments on Draft Feasibility Report and Environmental Impact Statement Seward Small Boat Harbor Navigation Improvement, U.S. Army Corps of Engineers

The Draft Reports for the Seward Harbor Improvements that accompanied your letter of March 3, 1980, have been received by the National Marine Fisheries Service for review and comment.

The reports have been reviewed and the following comments are offered for your consideration.

GENERAL COMMENTS

The primary alternative sites identified as plans "A" and "B" appear to meet the needs of the Seward community in providing additional harbor space while considering environmental, economic and engineering matters. While we agree that development at either site would not necessarily create unacceptable impacts to the marine environment, we believe that expansion of the existing harbor, plan A, may be the most desirable alternative.

Adoption of this alternative would allow use of an area already developed and subjected to certain impacts associated with boat harbors. Support facilities already exist in the immediate area. This plan would entail considerably less dredging and material disposal. The DEIS does not allow for a relative comparison to be made of the productivity of the two alternative sites, therefore we recommend the plan which would impact the least amount of intertidal and subtidal habitat, plan A.

1. We recognize the seismic risks associated with such construction along the coastal regions of south central Alaska. However, we do not believe this factor alone should preclude further consideration of the alternative. Similar projects are being pursued actively by the Corps throughout this region. The matter of seismic hazard was not predominant in consideration of a federally sponsored project for harbor expansion at Homer, yet during the 1964 Earthquake the Home boat harbor received the

1. In 1965 a Congressionally - recognized commission established Seward as a "high-risk area." They recommended that "no repairs, rehabilitation, or new construction involving use of Federal funds except for grading and light fill can be done in this area." Only congress can change this designation. The proposed site at Nash Road is not within the designated "high-risk area." This same commission made recommendations at Homer. The "high-risk area" designation was made for certain areas of the Spit. This "high-risk area" is outside the recommended harbor expansion site.

Additionally, we have no reason to believe the Nash Road alternative is any less susceptible to earthquake damage than the South Harbor Expansion.

The FEIS should consider both alternatives A and B fully, and address present seismic considerations for both sites.

SPECIFIC COMMENTS

2. page i, paragraph 2. Here and throughout these reports there are minor discrepancies in the figures associated with the alternatives. The 1,674 boat mooring capability for plan B listed here conflicts with the figure of 1,000 found on page 62, paragraph 7. The benefit/cost ratio of 5.0 to 1 for plan B conflicts with that given in Appendix B.

3. page 10, paragraph 2. We do not believe the term "barren - bottomed areas" should be used to describe the Resurrection Bay vicinity. The study mentioned here, in which rubble mound breakwaters were found to be "400 times more productive" than natural bottom areas may not be applicable to this situation. We suggest this paragraph be deleted.

4. page 15, paragraph 3 - page 16, paragraph 11. We suggest this section be rewritten to identify some possible future development scenarios without expanding on proposals which have no substance at this time, and which may unreasonably affect site location.

5. page 39, paragraph 6. The first sentence states that "Besides a staging area, the newly created land...would be utilized for various marine related facilities." Figure 9 shows only the staging area; is this the only fill site or are there others? Page 62, paragraph 7 says disposal for plan B will occur "intertidally and upland." These discrepancies should be clarified.

6. page 42, paragraph 3 and page 75, paragraph 6. These paragraphs state that circulation studies for plans A and B are not necessary, as the results of a Homer Small Boat Harbor circulation study apply. The last sentence on page 75 says that the data necessary for such a study would not be significantly different than that used for Homer. However, the three harbors mentioned do not appear similar, having different depths, configurations, locations, sizes, entrance channels and volumes. The tidal range at Homer is nearly twice that of Seward, not "basically the same." Additionally the site of the Homer boat harbor (Homer Spit) rests in the middle of Kachemak Bay, and the currents at that site may not be the same as those found at the head of Resurrection Bay. We believe the FEIS should contain an expanded discussion of the in-basin flushing characteristics associated with the two primary alternatives.

2. The 1,674 boat figure in the draft report was incorrect. The figure should be 1,667 total boats for the mooring capability. This includes the mooring capabilities of 594 ships in the existing harbor and 1,073 ships in the recommended harbor at Nash Road. The benefit/cost ratio for Plan B is 2.6 to 1. Discrepancies in the figures have been corrected in the final report.

3. This paragraph will be deleted.

4. This section has been rewritten. We now only indentify those proposed project or studies that meet the study objectives of our study. The city has undertaken projects that do not meet our stated objectives (See page 15).

5. The land shown in Figure 9 will first be used as a staging area and then for marine support facilities. There would be only one fill site which extends from subtidal habitat to upland habitat. The report has clarified this information.

6. A circulation study has been prepared for the recommended alternative at Nash Road. The water quality section in the FEIS will include the results of the circulation study. The study will also be included in the appendix. A circulation study will not be prepared for the south harbor expansion alternative (See response 1).

7. page 69, paragraph 3. Primary productivity of the area was not investigated.

8. page 73, paragraph 2. The statement is made that the impacts associated with dredged material disposal...on the upland would be far greater than those associated with tideland disposal. We feel those impacts associated with upland disposal should be presented for comparison; also this section should identify disposal areas for future maintenance dredging and discuss associated impacts.

9. page 76, paragraph 4. This section should discuss the potential impacts due to turbidity resulting from the dredge disposal area, and review possible alternative methods of dredging (clam shell) which may have less impacts to the marine environment.

10. page 76, paragraph 3. The south breakwater of the plan A alternate has been breached "to improve circulation." However no circulation studies have been made. The plan would re-locate the outlet of the Seward Lagoon and place it next to this opening. This may create in-harbor icing conditions. Also, as considerable sport fishing occurs in this area, some provision for public access and use of this breakwater should be made. We believe this design feature should be reviewed. We encourage its inclusion if it will improve water quality within the harbor.

We appreciate this opportunity for comment.

7. Concur - this has been corrected in the FEIS.

8. Alternatives for upland disposal of dredge material were not considered in the FEIS because it was determined that disposal in the tideland is necessary to provide a staging area for construction of the harbor and for harbor facilities after the harbor is built. Disposal areas for maintenance dredging and associated impacts are discussed in the FEIS.

9. The dredged material disposal area would be surrounded by dikes designed to contain the dredged material and allow it to settle as useable fill. The dredged material would consist of silty medium to fine uniform sands and lean dark clay with scattered shell fragments and organic matter. Some of the finest material would escape the containment area during the dredging operation thus causing a short term increase in turbidity. The overall efficiency of the dredging operation, including the safe transport of the dredge material to the disposal area, would be maximized with the use of a hydraulic pipeline dredge. The means of transport of dredged material associated with a clamshell dredging operation would result in far more spillage and turbidity at the site, as well as be more expensive. Stabilization of the dredge material disposal area should occur after 1 year.

10. The opening or "breach" in the breakwater will cause mixing of the incoming fresh water which will slow down the formation of ice and reduce the potential. During extreme cold some formations may occur. Provisions for public access and use of the breakwater is the city's responsibility.

U.S. ENVIRONMENTAL PROTECTION AGENCY

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

ALASKA OPERATIONS OFFICE
Room E535, Federal Building
701 C Street
Anchorage, Alaska 99501

29 JUL 1980

REPLY TO
ATTN OF:

Colonel Lee R. Nunn
District Engineer
Alaska District
P. O. Box 7002
Anchorage, Alaska 99510

Dear Colonel Nunn:

1. Enclosed are additional EPA comments pertaining to the Alaska Operations Office's evaluation of the Draft Environmental Impact Statement for the Seward Small Boat Navigation Improvements. These comments are generally confined to the two Section 404(b)(1) evaluations contained in the DEIS. Additional comments on the Draft Feasibility Report and DEIS were previously provided by our Environmental Evaluations Branch in the EPA Regional Office.

We regret that these comments were not provided sooner; however, we believe that even at this late date our review of the 404(b)(1) evaluation will be useful to your staff in meeting the requirements of Section 404 of the Clean Water Act.

It is our judgement that both evaluation (alternatives A and B) are not adequate when the purpose of the 404(b) review process is fully considered. Specifically, in the review process the project sponsor must clearly demonstrate the need and water dependency of a proposed activity. Further, there must be an adequate demonstration that alternatives less damaging to the environment are not available.

The Section 404(b)(1) evaluations for both Seward Harbor alternatives do not fully comply with the crucial review criteria process. Both 404(b)(1) evaluations seem to justify the small boat navigation improvements on the basis of non-significant impacts instead of evaluating if the least environmentally damaging project is proposed for implementation.

For example, under wetlands on page F-1, it is stated that 5.8 acres of intertidal wetland would be lost to breakwater construction and dredged material disposal. No mention is made regarding whether or not the breakwater is the minimum adequate size for wave and wind protection, and general harbor integrity.

A similar problem exists on page F-2 and F-8 under the applicable water quality standards section. It is stated that "The proposed action when completed would meet the State of Alaska water quality standards for Class II C waters." While our Agency certainly believes, at a minimum, these

1. We have used the suggestions in your letter to improve the Section 404 (b)(1) Evaluation for the recommended Nash Road Alternative. The Final Environmental Impact Statement includes only the revised 404 (b)(1) evaluation for the recommended plan. The breakwater configuration for the Nash Road alternative was changed to improve water circulation within the harbor. The circulation study that resulted in the change is included in the report.

standards must be met, if water quality can be further upgraded by improved basin design or similar methods, then these measures must be implemented to assure compliance with Section 404. Our Agency's policy regarding State water quality standards was expressed to you by Donald P. Dubois on September 10, 1979. I have enclosed copy of that correspondence for your reference.

There are several other similar examples in each 404(b)(1) evaluation for this project; however, we believe that these problems can be readily corrected if our concerns are addressed in the FEIS.

Please contact me, or Bill Lawrence, my Section 404 project coordinator, if we can be of assistance or if there are questions concerning our review of this project.

Sincerely,

for W. James Sweeney
Director

Enclosures

Advisory Council On Historic Preservation

ADVISORY COUNCIL ON HISTORIC PRESERVATION
LAKE PLAZA SOUTH, SUITE 616
44 UNION BOULEVARD
LAKEWOOD, COLORADO 80228

1522 K Street NW.
Washington D.C.
20005

April 14, 1980

Colonel Lee R. Nunn
District Engineer
Corps of Engineers, Alaska District
Department of the Army
P. O. Box 7002
Anchorage, Alaska 99510

Dear Colonel Nunn:

1. Thank you for your request of March 24, 1980, for comments on the Draft Feasibility Report and Draft Environmental Statement (DES) for the Proposed Small Boat Harbor Navigation Improvement at Steward, Alaska by the Corps of Engineers. Pursuant to Section 102(2)(C) of the National Environmental Policy Act of 1969 and the Council's regulations, "Protection of Historic and Cultural Properties" (36 CFR Part 800), we have determined that your DES does not contain sufficient information concerning historic and cultural resources for our review purposes. In particular, the Council is concerned that the Town of Steward, established in 1903, and Lowell Point, the site of the Russian Post Voskressenski, are properties which may be eligible for inclusion in the National Register of Historic Places and may be affected by the undertaking. Therefore, please furnish the following data indicating:

<u>Compliance with Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. Sec. 470f, as amended, 90 Stat. 1320).</u>

The environmental statement must demonstrate that either of the following conditions exists:

1. No properties included in or that may be eligible for inclusion in the National Register are located within the area of environmental impact, and the undertaking will not affect any such property. In making this determination, the Council requires:

--evidence that you have consulted the latest edition of the National Register (<u>Federal Register</u>, March 18, 1980, and its monthly supplements);

1. The FEIS contains information (Page EIS-15) that demonstrates that no properties presently included in, or eligible for inclusion in the National Register are located within areas of direct or indirect impact of this project. Page E-27 of Appendix E includes coordination letters with the SHPO.

--evidence of an effort to ensure the identification of properties eligible for inclusion in the National Register, including evidence of contact with the State Historic Preservation Officer (SHPO), whose comments should be included in the final environmental statement. The SHPO for Alaska is Mr. William S. Hanable.

2. Properties included in or that may be eligible for inclusion in the National Register are located within the area of environmental impact, and the undertaking will or will not affect any such property. In cases where there will be an effect, the final environmental statement should contain evidence of compliance with Section 106 through the Council's regulations.

Should you have any questions, please call Betty LeFree at (303) 234-4946, an FTS number.

Sincerely,

Louis S. Wall
Chief, Western Division
of Project Review

United States Department of the Interior
OFFICE OF THE SECRETARY
P. O. Box 120
Anchorage, Alaska 99510

ER-80/247

May 6, 1980

Colonel Lee R. Nunn
District Engineer
Alaska District
Corps of Engineers
P. O. Box 7002
Anchorage, Alaska 99510

Dear Colonel Nunn:

1. In response to your March 3, 1980, request, we have reviewed the Draft Feasibility Report and Draft Environmental Impact Statement (DEIS) regarding the proposed expansion of the small boat harbor at Seward, Alaska. After comparison of preliminary alternatives, two plans have been found viable: Plan A would provide 30 acres of mooring basin by extending the existing harbor southward; Plan B would provide 30 acres of mooring area by developing a new harbor site at the Nash Road terminus near the head of Resurrection Bay.

The U.S. Fish and Wildlife Service (FWS) provided you with a Final Coordination Act Report concerning this project on July 19, 1979. In that report, it was pointed out that while both alternatives are biologically acceptable FWS preferred the southward expansion of the existing harbor because (1) it would be placed in a previously developed area with support facilities present, and (2) it would not involve intertidal fill for a staging area.

The selected plan, as represented in the DEIS, is the Nash Road alternative. If the Nash Road project site is approved for construction, the FWS requests the opportunity to participate in advanced project planning to insure adequate consideration of fish and wildlife resources. This will expedite their review of the Public Notice relative to Department of the Army authorization under Section 404 of the Clean Water Act and Section 10 of the River and Harbor Act.

We appreciate the opportunity to comment on these documents.

Sincerely,

Paul D. Gates
Regional Environmental Officer-Alaska

1. Your comments are noted.

Rec'd PP/EC 05 MAY 1980

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
ENVIRONMENTAL DATA AND INFORMATION SERVICE
Washington, D.C. 20235
Center for Environmental Assessment Services

April 30, 1980 OA/D23/ELR

TO: PP/EC - R. Lehman

FROM: OA/D2x1 - K. Hadeen

SUBJECT: DEIS 8003.23 - Proposed Small Boat Harbor Navigation Improvement (Feasibility Report and DEIS)

Page C-5

It is stated that the significant wave height would be used as the design wave height. The height of the significant wave is given as 6.5 feet. The next sentence redefines the design wave as the product of the significant wave height, the shoaling coefficient, and the refraction coefficient and results in a design wave of 5.0 feet. The rationale given for the selection of the design wave is that equipment and materials are available to effect repairs.

It is suggested that a logical approach would be to select a design wave which would cause damage wherein the cost for repair would be less than the cost of a structure based on a larger design wave. There is no discussion of the economics of either approach, and it appears that such was not considered.

The design wave for the breakwater at Seward is correctly stated as the product of the significant wave, refraction coefficient, and shoaling coefficient. The predicted deep water wave used in the computation was chosen as the significant wave average of the highest one-third of the waves. The 10% wave is many times used at remote sites to provide a more conservative design. The reason the significant wave was selected is because construction equipment and materials are available should repair to the breakwater be required. The design deep water wave, significant wave, must be modified by the shoaling and refraction coefficient to determine what the wave height will be at the breakwater location. Generally, structure design formulae are developed to use the significant wave. The design wave paragraph could have been more clearly written.

APPENDIX F

APPENDIX F

WATER QUALITY INFORMATION AND 404(b)(1) EVALUATION

TABLE OF CONTENTS

Item	Page
404(b)(1) Evaluation for the Selected Plan	F- 1
Water Quality Data	F- 7
Applicable State Water Quality Standards	F- 9
State of Alaska Department of Environmental Conservation-Certificate of Reasonable Assurance	F-12

APPENDIX F

WATER QUALITY INFORMATION AND 404(b)(1) EVALUATION

TABLE OF CONTENTS

Item	Page
404(b)(1) Evaluation for the Selected Plan	F- 1
Water Quality Data	F- 7
Applicable State Water Quality Standards	F- 9
State of Alaska Department of Environmental Conservation-Certificate of Reasonable Assurance	F-12

SECTION 404(b)(1) EVALUATION
PLAN B (NASH ROAD)
TENTATIVELY SELECTED PLAN

Proposed Action

The proposed action involves dredging and discharge of fill material for breakwater construction in the intertidal area and discharge of dredged material for creation of staging areas in the upper intertidal area enclosed within the harbor.

1. Project Description

Plan B, the Nash Road Alternative would involve construction of a 1,400-foot south breakwater, a 2,500-foot west breakwater, and a 1,700-foot north silt-barrier breakwater creating a harbor of 30 acres with a 150- foot wide entrance channel. Construction of the breakwaters would require 60,100 cubic yards of rock, 6,000 cubic yards of gravel, and 131,700 cubic yards of core material.

Suitable dredged material (514,700 cubic yards) excavated from the harbor area would be used for construction and would be disposed of in the upper intertidal area to provide access and parking for the harbor. Hydraulic dredge would be used for discharge of dredged material. Back-dump would be used for construction of breakwaters. The majority of rock, sand, and gravel for breakwater construction would come from a quarry sites located at Fourth of July Creek and Lowell point.

2. Physical Effects

a. Wetlands. 53.1 acres of intertidal wetland would be lost to break- water construction, dredging, and dredged material disposal. The wetlands in the intertidal zone are classified as saltwater coastal flats. Areas under this classification have vegetation covers of 25 percent or less and are occassionally or regularly flooded by saline waters. The upper intertidal area is composed primarily of graywacke and the lower area is composed primarily of sand (66 percent) and silt (34 percent) and is sparsely vegetated with rockweed (Fucus distichus) and green algae (ulva spp.), rockweed being the dominant species. The intertidal area is regularly flooded by saltwater.

The intertidal area involved has been identified as low in productivity with no benthic species of significant recreational or commercial importance and is not used significantly for spawning. The intertidal zone and near shore waters are utilized by some sea or bay ducks, gulls and shorebirds for resting and feeding. More suitable areas for resting are found in the Resurrection River wetland north of the project area. Similar intertidal areas exist around the entire perimeter of Resurrection Bay. The loss of 53.1 acres would not have a significant effect on the overall production of the marine ecosystem in the area. The characteristics of contiguous wetlands would not be changed. The affected wetland does not significantly shield other areas and is not a prime natural recharge area. Additional information on the intertidal area can be found in the FEIS under Chapter IV, Section 4 and Chapter V, Section 4 of the FEIS.

b. Water Column. Dredging and construction of the breakwater would temporarily increase the turbidity and suspended solid level during the construction period. The increased turbidity would adversely affect the nektonic and planktonic population and would reduce light penetration.

The impact to nektonic populations (salmon and herring) is discussed in Chapter V, Section 5 of the FEIS. The effects on the plankton community is expected to be minimal for the overall productivity in the Resurrection Bay area. The impacts to plant growth from light reduction would occur during winter when light availability is low and plant growth is minimal. Due to the low productivity of the area, the impact will be minimal. The esthetics of the water column will temporarily be degraded by increased turbidity.

c. Benthic. 52.3 acres of subtidal marine habitat would be lost or temporarily disrupted. The effects that the proposed project would have on the benthic community is discussed in Chapter V, Section 5 of the FEIS.

d. Other. Construction of the breakwaters and dredging would change the bottom geometry. The substrate composition is not expected to change significantly.

Changes in salinity are not expected because the circulation within the proposed harbor would cause sufficient mixing. Exchange of constituents between sediments and overlying water is not expected to cause alterations in the biological community.

3. Chemical

Both the dredged and fill material utilized in the project would meet the exclusion criteria. The materials proposed for discharge for construction of the breakwater are primarily sand, gravel and rock. The dredge material proposed for discharge is primarily sand and silt. The substrate in the proposed harbor area is sand and silt, and rock in the upper intertidal area.

The quarry site is sufficiently removed from sources of pollution to provide reasonable assurance that such material has not been contaminated by pollution. Riprap on harbor structures would provide reasonable assurance that the material would not be moved by currents.

4. Description of Site Comparison (Comparing sediment at the dredging site with sediments at the disposal site.)

Not applicable because the project meets the exclusion criteria.

5. Review Applicable Water Quality Standards

The harbor configuration given in the draft Feasibility Report has been revised in the Detailed Project Report, to improve mixing and flushing characteristics. The improved harbor design was the result of a circulation study of the draft proposed harbor design. The circulation study, included in Appendix G, provides data which substantiates that the proposed action would have good mixing characteristics. Applicable water quality standards were reviewed by the Alaska Department of Environmental Conservation in their review of the project for State water quality certification. The results of the certification are given at the end of Appendix F.

6. Selection of Site

a. Need. The proposed action is needed to relieve overcrowding in the existing harbor and provide additional harbor protection for recreational boats and commercial fishing vessels. Disposal in the tideland is a necessary and integral part of the harbor design. Without creating fast land by placing dredged material in the interharbor area, adequate land would not be available for necessary harbor facilities or for a staging area for construction of the harbor.

b. Alternative Sites Considered. Seven alternatives and "no action" were considered for expansion of small boat harbor facilities at Seward, Alaska. Five of these alternatives were eliminated from detailed study. The reasons why these alternatives are not practical are given on page 9 of the FEIS. The South Harbor Expansion (Plan A) and the Nash Road Site (Plan B) were deemed to be the most feasible for engineering, environmental, and economic reasons. Although the South Harbor Expansion is the least environmentally damaging alternative because it does not require intertidal disposal, this alternative could not be selected because it is located in a designated high risk earthquake zone. With this designation, Federal funds cannot be used to construct a small boat harbor at this site.

c. Objectives to be Considered in Discharge Determination.

(1) The discharge will not significantly disrupt the chemical, physical, or biological integrity of the aquatic ecosystem.

(2) Due to the low productivity of the disposal area, the impact to the food chain in the surrounding marine ecosystem will be minimal.

(3) The diversity of plants and animal species will not be decreased in the general area as a result of the discharge.

(4) The discharge activity would eliminate a feeding area of low productivity but would not prevent movement into or out of spawning, breeding, or nursery areas located in the unnamed anadromous fish stream to the north of the project area. The discharge activity would eliminate any spawning of herring or other fish species which may occur in the affected intertidal area. The intertidal area is known to be low in productivity so this impact is not expected to be significant.

(5) Impacts on wetlands having significant function of water quality maintenance. Not applicable.

(6) Impacts on areas that serve to retain natural high waters or floodwaters. Not applicable.

(7) Turbidity will be minimized by constructing the breakwater before the inner harbor is dredged.

(8) Degradation of esthetics will be minimized by confining the fill to the smallest practical area and allowing for only water oriented harbor facilities on the fill. Recreational boating and fishing would be improved. No degradation of economic values would occur.

(9) There are no threatened or endangered species in the study area.

(10) Investigate other measures that avoid degradation of esthetics, recreational, and economic values of navigable waters. Not applicable.

d. Impacts on Water Uses at Proposed Discharge Sites.

(1) Municipal water supply. Not applicable.

(2) Shellfish. No important shellfish habitat exist within the area of the proposed small boat harbor.

(3) Fisheries. Impacts on fisheries are covered in Chapter V, Section 5 in the DEIS.

(4) Discharge activities could temporarily disrupt wildlife in the immediate vicinity. This impact is expected to be minimal.

(5) Recreational activities. The action may temporarily impact recrea- tional activities; however, recreational use of the area would eventually be increased as a result of the proposed project.

(6) Threatened and endangered species. Not applicable.

(7) Damage to benthic life from the discharge would be minimal. The breakwaters would have a substrate that could enhance the production of benthic communities.

(8) Wetlands. Other alternative harbor sites have been identified as not practicable in the detailed project report. Plan A, which was studied in detail, was found not to be practicable because it is located in a high risk earthquake zone. The proposed fill activity for construction of breakwater must be located in the water to fulfill its basic purpose. The proposed activity associated with fill in the intertidal area, for a staging area on tidelands, must have direct access or be in proximity to the water to fulfill its basic purpose, that of providing support facilities for the small boat harbor. Only water oriented facilities necessary for the function of the boat

harbor will be allowed on the fill, i.e., boat launch, harbor-master office, fish buying or processing facilities, sewage disposal facilities, etc. Parking will occur on the upland portion of the fill. Suitable upland sites are not practical for dredged disposal. The activity would not cause a permanent unacceptable disruption to the beneficial water quality uses of the intertidal area ecosystem.

(9) Submersed vegetation of significant biological productivity will not be affected.

(10) Size of disposal. The disposal site is confined to the smallest practicable area. The breakwater is the minimum adequate size for wave and wind protection and general harbor integrity.

e. Consideration to Minimize Harmful Effects.

(1) Water quality criteria. The State of Alaska water quality standards were considered in determining the site and disposal conditions.

(2) Investigate alternatives to open water disposal. Not applicable.

(3) Upland disposal sites were not explored for disposal because disposal in the intertidal area for the selected alternative is necessary to provide adequate land for water oriented harbor facilities. The physical and environmental characteristics of the intertidal area were considered in selecting the Nash Road alternative.

(4) Ocean dumping. Not applicable.

(5) Where possible, investigate covering contaminated dredged material with cleaner material. Not applicable.

(6) Investigate methods to minimize effect of runoff from confined areas on the aquatic environment. The dredged material would be confined by a gravel containment dike. The staging and parking area would be sloped and drained to prevent runoff into waters of the harbor.

(7) Coordinate potential monitoring activities at discharge site with EPA. Not applicable.

7. Statement as to contamination of fill material if from a land source. The fill material to be used is not contaminated.

8. An ecological evaluation as required by Section 404(b)(1) of the Clean Water Act has been made following the evaluation guidance in 40 CFR 230.4, in conjunction with the evaluation considerations in 40 CFR 230.5. Appropriate measures have been identified and incorporated in the proposed plan to minimize adverse effects on the aquatic environment as a result of the discharge. Consideration has been given to the need of the proposed activity, the availability of alternative sites and methods of disposal that are less damaging to the environment, and such water quality standards as are appropriate and applicable by law. Impact on an intertidal wetland at the site would be unavoidable and approximately

53.1 acres of sparsely vegetated intertidal habitat would be eliminated, and 52.3 acres of subtidal habitat would be disturbed. Reestablishment of marine organisms would occur on the breakwaters, the inner harbor area and subtidal area. Construction activities would have an impact on herring and salmon. Construction during critical spawning periods would be avoided to minimize these impacts. Adverse impacts to the total marine ecosystem would not be significant. Activities associated with the proposed fill would be water oriented or water dependent. There is a need in Seward for the small boat harbor facilities.

The discharge site for the Seward Small Boat Harbor breakwater and dredge disposal site for Plan B has been specified through the application of the Section 404(b)(1) guidelines.

WATER QUALITY DATA
taken 5/31/79 - 6/1/79

Water Samples	Chemical Oxygen Demand mg/l	Turbidity NTU	Lead mg/l	Zinc mg/l	Mercury mg/l	Cadmium mg/l	Calcium mg/l	Iron mg/l	Oil/ Grease	Ammonia Nitrogen mg/l as N	Organic Nitrogen mg/l as N
Nash Road											
On-Shore-Surface	6.9	6.6	0.45	0.00	0.00	0.050	53.5	1.50	10.78 mg/l	0.04	0.07
Off-Shore-Surface	14.6	5.0	0.55	0.00	0.00	0.051	57.7	0.80	11.73 mg/l	0.03	0.09
Expansion South											
On-Shore-Surface	57.5	3.4	0.95	0.00	0.00	0.062	90.5	1.60	14.30 mg/l	0.03	0.55
Existing Harbor											
Sample 1 - Surface	0.86	3.1	0.45	0.00	0.00	0.070	89.0	0.95	24.57 mg/l	0.04	0.03
Sample 2 - Surface	---	4.6	---	---	---	---	---	---	---	0.02	0.46
Sample 3 - Surface	---	5.8	---	---	---	---	---	---	---	0.02	0.29
Sample 4 - Surface	---	3.2	---	---	---	---	---	---	---	0.03	0.40
Elutriate											
Nash Road											
Off-Shore (with water from Nash Road on-shore)	10.9	---	0.42	0.00	0.00	0.038	63.4	0.74	---	0.01	0.09
Expansion South											
On-shore (with water from Nash Road on-shore)	32.6	---	0.49	0.00	0.00	0.000	98.4	0.91	---	0.01	0.29

Bottom Samples	Volatile Solids (% dry weight basis)	Gravel (% dry weight basis)	Sand (% dry weight basis)	Silt (% dry weight basis)	Oil/Grease
Nash Road					
Off-Shore	1.05	0.0	66.7	33.3	233.8 mg/kg
Expansion South					
On-Shore	1.84	23.8	76.2	0.0	373.9 mg/kg

WATER QUALITY DATA
Taken 5/31/79 6/1/79

Water Samples	Temperature °C	Dissolved Oxygen PM	Conductivity	PH	Salinity PPt	Coliform col/100ml	Resistance mmhos/cm @ 25° C
Nash Road							
On-Shore-Surface	10	12	3,600	7.4	3	12	2,700
Off-Shore-Surface	10	12	23,000	8.0	20	2	4,800
Benthic	9	12	14,000	8.0	11.5		---
Expansion South							
On-Shore-Surface	10	12.5	9,000	7.2	6.8	36	6,800
Existing Harbor							
Sample 1							
Surface	10	12.5	19,000	8.1	17	1,244	9,800
Mid	10	11.5	---	-	-	---	---
Benthic	9	12	---	-	-	---	---
Sample 2							
Surface	10	12.5	---	-	-	42	9,800
Mid	10	12.5	---	-	-	---	---
Benthic	9	10	---	-	-	---	---
Sample 3							
Surface	11	12.5	---	-	-	8	9,800
Mid	10	12.5	---	-	-	---	---
Benthic	9	11.8	---	-	-	---	---
Sample 4							
Surface	10	12	---	-	-	28	9,700
Mid	10	13	---	-	-	---	---
Benthic	9	12.5	---	-	-	---	---

THE WATER QUALITY CRITERIA WHEN USED IN COMBINATION WITH THE

WATER QUALITY PARAMETERS → II MARINE WATER USES ↓	(1) FECAL COLIFORM BACTERIA (FC) (See Note 1).	(2) DISSOLVED GAS	(3) pH (Variation of pH for waters naturally outside the specified range shall be towards the range.)	(4) TURBIDITY
(A) Water Supply: (i) aquaculture	For products normally cooked the mean, based on a minimum of 5 samples taken in a period of 30 days, shall not exceed 200 FC/100 ml and not more than 10% of the samples shall exceed 400 FC/100 ml. For products not normally cooked the mean, based on a minimum of 5 samples taken in a period of 30 days shall not exceed 20 FC/100 ml, and not more than 10% of the samples shall exceed 40 FC/100 ml.	Surface dissolved oxygen (D.O.) concentrations in coastal water shall not be less than 6.0 mg/l for a depth of 1 meter except when natural conditions cause this value to be depressed. D.O. shall not be reduced below 4 mg/l at any point beneath the surface. D.O. concentrations in estuaries and tidal tributaries shall not be less than 5.0 mg/l except where natural conditions cause this value to be depressed. In no case shall D.O. levels above 17 mg/l be permitted. The concentration of total dissolved gas shall not exceed 110% of saturation at any point of sample collection.	Shall not be less than 6.5 or greater than 8.5, and shall not vary more than 0.1 pH units from natural condition.	Shall not exceed 25 NTU.
(A) Water Supply: (ii) seafood processing	Based on a minimum of 5 samples taken in a period of 30 days, mean shall not exceed 20 FC/100 ml, and not more than 10% of the samples shall exceed 40 FC/100 ml.	D.O. shall be greater than or equal to 5 mg/l.	Shall not be less than 6.0 or greater than 8.5. Shall not vary more than 0.5 pH unit from natural condition.	Shall not interfere with disinfection.
(A) Water Supply: (iii) industrial, including any water supplies used in association with a manufacturing or production enterprise (other than food processing) including mining, placer mining, energy production or development.	Where worker contact is present the mean FC bacteria concentration, based upon a minimum of 5 samples taken in a period of 30 days, shall not exceed 200 FC/100 ml, not more than 10% of the samples shall exceed 400 FC/100 ml.	Not applicable.	Shall not be less than 5.0 or greater than 9.0.	Shall not cause detrimental effects on established levels of water supply treatment.
(B) Water Recreation: (i) contact recreation	Based on a minimum of 5 samples taken in a 30 day period the mean shall not exceed 20 FC/100 ml, and not more than 10% of the samples shall exceed 40 FC/100 ml.	Same as (2)(A)(i).	Shall not be less than 6.5 or greater than 8.5. If the natural pH condition is outside this range substances shall not be added that cause a increase in buffering capacity of the water.	Shall not exceed 25 NTU.
(B) Water Recreation: (ii) secondary recreation	Based on a minimum of 5 samples taken in a 30 day period the mean shall not exceed 200 FC/100 ml, and not more than 10% of the samples shall exceed 400 FC/100 ml.	Same as (2)(A)(i).	Shall not be less than 5.0 or greater than 9.0.	Shall not exceed 25 NTU.
(C) Growth and Propagation of Fish, Shellfish Aquatic Life, and Wildlife Including Seabirds, Waterfowl and Furbearers	Not applicable.	Same as (2)(A)(i).	Shall not be less than 6.5 or greater than 8.5, and shall not vary more than 0.1 pH unit from natural condition.	Shall not reduce the depth of the compensation point for photosynthetic activity by more than 10%. In addition, shall not reduce the maximum secchi disk depth by more than 10%.
(D) Harvesting for Consumption of Raw Mollusks or Other Raw Aquatic Life	Based on a 5-tube decimal dilution test the fecal coliform median MPN shall not exceed 14 FC/100 ml, not more than 10% of the samples shall exceed a FC MPN of 43 FC/100 ml (See Note 15).	Same as (2)(A)(i).	Shall not be less than 6.0 or greater than 8.5. Shall not vary more than 0.5 pH unit from natural condition.	Same as (2)(C).

WATER QUALITY CRITERIA

WATER USE DESIGNATION CONSTITUTE THE WATER QUALITY STAND... FOR A PARTICULAR WATER BODY THE WATER QUALITY STANDARDS

(5) TEMPERATURE	(6) DISSOLVED INORGANIC SUBSTANCES	(7) SEDIMENT	(8) TOXIC AND OTHER DELETERIOUS ORGANIC AND INORGANIC SUBSTANCES	(9) COLOR (See Note 12)
Shall not cause the weekly average temperature to increase more than 1°C. The maximum rate of change shall not exceed 0.5°C per hour. Normal daily temperature cycles shall not be altered in amplitude or frequency.	No man induced alterations shall be made that would cause a change in the water's isohaline patterns of more than ± 10% of the natural variations.	No imposed loads that will interfere with established water supply treatment levels.	Substances shall not individually or in combination exceed 0.01 times the lowest measured 96 hour LC50 (See Note 9) for life stages of species identified by the department as being the most sensitive, biologically important to the situation, or exceed criteria cited in EPA, Quality Criteria for Water or Alaska Drinking Water Standards (See Note 6 and 5), whichever concentration is less. Substances shall not be present or exceed concentrations which individually or in combination impart undesirable odor or taste to fish or other aquatic organisms as determined by either bioassay or organoleptic tests (See Note 9).	Shall not exceed 50 color units.
Shall not exceed 15°C.	Not applicable.	Below normally detectable amounts.	Substances shall not exceed EPA, Quality Criteria for Water (See Note 6) as applicable to the substance.	Shall not exceed 75 color units in water supplies which will be treated. Untreated water supplies shall not exceed 5 color units.
Shall not exceed 25°C.	No amounts above natural conditions which can cause corrosion, scaling, or process problems.	No imposed loads that will interfere with established water supply treatment levels.	Substances shall not be present which pose hazards to worker contact.	Not applicable.
Not applicable.	Not applicable.	No measurable increase in concentrations above natural conditions.	Substances shall not exceed EPA, Quality Criteria for Water (See Note 6) as applicable to constituent.	Shall not exceed 15 color units.
Not applicable.	Not applicable.	Shall not pose hazards to incidental human contact or cause interference with the use.	Substances shall not be present which pose hazards to incidental human contact.	Surface waters shall be free of substances producing objectionable color.
Shall not cause the weekly average temperature to increase more than 1°C. The maximum rate of change shall not exceed 0.5°C per hour. Normal daily temperature cycles shall not be altered in amplitude or frequency.	Maximum allowable variation above natural salinity: Natural Salinity (parts per thousand) / Man-induced salinity (parts per thousand) 0 to 3.5 — 1 3.5 to 13.5 — 2 13.5 to 35 — 4	No measurable increase in concentrations above natural conditions.	Substances shall not individually or in combination exceed 0.01 times the lowest measured 96 hour LC50 (See Note 9) for life stages of species identified by the department as being the most sensitive, biologically important to the location, or exceed criteria cited in EPA, Quality Criteria for Water or Alaska Drinking Water Standards (See Note 6 and 5), whichever concentration is less. Substances shall not be present or exceed concentrations which individually or in combination impart undesirable odor or taste to fish or other aquatic organisms as determined by either bioassay or organoleptic tests (See Note 6 and 9).	Color or apparent color shall not reduce the depth of compensation point for photosynthetic activity by more than 10% from the seasonally established norm for aquatic life. For all waters not having a seasonally established norm for aquatic life color, or apparent color, shall not exceed 50 color units.
Same as (2)(C).	Same as 2(A)(i) and/or 2(C) as determined appropriate by the department.	Not applicable.	Substances shall not individually or in combination exceed 0.01 times the lowest measured 96 hour LC50 (See Note 9) for life stages of species identified by the department as being the most sensitive, biologically important to the location, or exceed criteria cited in EPA, Quality Criteria for Water (See Note 6) whichever concentration is less. Substances shall not be present or exceed concentrations which individually or in combination impart undesirable odor or taste to fish or other aquatic organisms as determined by either bioassay or organoleptic tests (See Note 6 and 9).	Same as (2)(C).

(10) PETROLEUM HYDROCARBONS, OILS AND GREASE (See Note 16)	(11) RADIOACTIVITY	(12) TOTAL RESIDUAL CHLORINE	(13) RESIDUES, FLOATING SOLIDS, DEBRIS, SLUDGE DEPOSITS, FOAM, SCUM	MARINE WATER USE
Shall not exceed 0.01 times the continuous flow 96 hour LC50 or if not available the static test 96 hour LC50 for the species involved. (See Note 9 and 10).	Shall not exceed the concentrations specified in the Alaska Drinking Water Standards (See Note 5). Concentration factors for organisms involved shall not exceed maximum permissible limits for specific radioisotopes and unidentified mixtures as established in Title 10, Code of Federal Regulations, Part 20 (See Note 13) and National Bureau of Standards, Handbook 69 (See Note 14).	Concentration shall not exceed 2.0 ug/l for salmonoid fish, or 10.0 ug/l for other organisms (See Note 6).	Shall not alone or in combination with other substances or wastes cause the water to be unfit or unsafe for the use. Shall not cause detrimental effects on established water supply treatment levels.	(A) (i)
Shall not cause a film, sheen, or discoloration on the surface or floor of the water body or adjoining shorelines. Surface waters shall be virtually free from floating oils. Shall not exceed concentrations which individually or in combination impart odor or taste as determined by organoleptic tests.	Shall not exceed the concentrations specified in the Alaska Drinking Water Standards (See Note 5) and shall not exceed limits specified in Title 10, Code of Federal Regulations, Part 20 (See Note 13) or National Bureau of Standards, Handbook 69 (See Note 14).	Not applicable.	Shall not alone of in combination with other substances make the water unfit or unsafe for use; cause a film, sheen, or discoloration on the surface of the water or adjoining shoreline; cause leaching of toxic or deleterious substances; or cause a sludge, solid, or emulsion to be deposited beneath or upon the surface of the water within the water column, on the bottom, or upon adjoining shorelines.	(A) (ii)
Shall not make the water unfit or unsafe for the use.	Same as (2)(A)(ii).	Not applicable.	Shall not alone or in combination with other substances or wastes cause the water to be unfit or unsafe for the use.	(A) (iii)
Shall not cause a film, sheen, or discoloration on the surface or floor of the water body or adjoining shorelines. Surface waters shall be virtually free from floating oils.	Same as (2)(A)(ii).	Not applicable.	Shall not alone or in combination with other substances make the water unfit or unsafe for use; cause a film, sheen, or discoloration on the surface of the water or adjoining shoreline; cause leaching of toxic or deleterious substances; or cause a sludge, solid, or emulsion to be deposited beneath or upon the surface of the water, within the water column, on the bottom, or upon adjoining shorelines.	(B) (i)
Shall not cause a film, sheen, or discoloration on the surface or floor of the water body or adjoining shorelines. Surface waters shall be virtually free from floating oils.	Same as (2)(A)(ii).	Not applicable.	Shall not alone or in combination with other substances make the water unfit or unsafe for use; cause a film, sheen, or discoloration on the surface of the water or adjoining shoreline; cause leaching of toxic or deleterious substances; or cause a sludge, solid, or emulsion to be deposited beneath or upon the surface of the water, within the water column, on the bottom, or upon adjoining shorelines.	(B) (ii)
Total hydrocarbons in the water column shall not exceed 15 ug/l or 0.01 of the lowest measured continuous flow 96 hour LC50 for life stages of species identified by the department as the most sensitive, biologically important species in a particular location, whichever concentration is less (See Note 9 and 10). Total aromatic hydrocarbons in the water column shall not exceed 10 ug/l, or 0.01 of the lowest measured continuous flow 96 hour LC50 for life stages of species identified by the department as the most sensitive, biologically important species in a particular location, whichever concentration is less (See Note 10 and 11). There shall be no concentrations of hydrocarbons, animal fats, or vegetable oils in the sediment which cause deleterious effects to aquatic life. Surface waters and adjoining shorelines shall be virtually free from floating oil, film, sheen or discoloration.	Same as (2)(A)(i).	Concentration shall not exceed 2.0 ug/l for salmonoid fish or 10.0 ug/l for other organisms (See Note 6).	Shall not alone or in combination with other substances or wastes cause the water to be unfit, unsafe or cause acute or chronic problem levels as determined by bioassay or other appropriate methods. Shall not alone or in combination with other substances cause a film, sheen, or discoloration on the surface of the water or adjoining shorelines; cause leaching of toxic or deleterious substances; or cause a sludge, solid, or emulsion to be deposited beneath or upon the surface of the water, with the water column, on the bottom, or upon adjoining shorelines.	(C)
Shall not exceed concentrations which individually or in combination impart undesirable odor or taste to organisms as determined by bioassay and/ or organoleptic tests.	Same as (2)(A)(i).	Shall not exceed 1 mg/l at any time.	Shall not make the water unfit or unsafe for use, cause a film, sheen, or discoloration on the surface of the water or adjoining shoreline, cause leaching of toxic deleterious substances, or sludge, solid, or emulsion to be deposited beneath or upon the surface of the water, within the water column, on the bottom, or upon adjoining shorelines.	(D)

STATE OF ALASKA

DEPARTMENT OF ENVIRONMENTAL CONSERVATION

CERTIFICATE OF REASONABLE ASSURANCE

A Certificate of Reasonable Assurance, as required by Section 401 of the Clean Water Act, has been requested by the Department of The Army, Alaska District, Corps of Engineers, P.O. Box 7002, Anchorage, Alaska 99510, for the construction of a 30-acre small boat harbor at Nash Road Site.

The proposed activity is located at the head of Resurrection Bay, 2 miles northeast of Seward, Alaska; Latitude 59°48'N, Longitude 149°30'W.

Public notice of the application for this certification has been made in accordance with 18 AAC 15.180.

Water Quality Certification is required for the proposed activity because the activity will be authorized by a Department of the Army Permit identified as Seward Small Boat Harbor - Nash Road Alternative, and a discharge may result from the proposed activity.

Having reviewed the application and comments received in response to the public notice, the Alaska Department of Environmental Conservation certifies that there is reasonable assurance that the proposed activity, as well as any discharge which may result, is in compliance with the requirements of Section 401 of the Clean Water Act which includes the Alaska Water Quality Standards, 18 AAC 70, and the Standards of the Alaska Coastal Management Program, 6 AAC 80, provided that:

> Water quality standards, for turbidity and sediments, shall be met outside a mixing zone extending 100 yards from the construction site.

March 17, 1981

Date

for Deena J. Henkins

C. Deming Cowles
Deputy Commissioner

APPENDIX G

CIRCULATION STUDY

CIRCULATION STUDY

SEWARD, ALASKA SMALL BOAT HARBOR

Prepared by:

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11018 27th Northeast
Seattle, Washington 98125

Prepared for:

Alaska District
Corps of Engineers

14 July 1980

PREFACE

This report on the Seward Small Boat Harbor has been prepared under Contract No. DACW85-80-C-0019 dated 80May29 authorizing E. P. Richey, Consulting Engineer, to carry out the following Scope of Work.

The hydraulic model was constructed and operated by H. N. Smith and J. P. Rhee, Graduate Students in the Department of Civil Engineering, University of Washington; the model was tested in the tidal tank at the C. W. Harris Hydraulics Laboratory.

SCOPE OF WORK

1.0 Project Title: Seward, Alaska, Small Boat Harbor Navigation Improvements - Circulation Study.

2.0 Authorization Status: General Investigation Feasibility Study, 1970 River and Harbor Act, as amended.

3.0 Purpose of Study: To analyze the effect on circulation and flushing in the harbor due to the construction of two rubble mound breakwater sections and breakwater silt barrier.

4.0 Timing of Input: Study shall begin upon receipt of notice to proceed with an interim or draft report submitted 10 days later. Review comments will be provided by the Alaska District, Corps of Engineers, and incorporated by the contractor with a finalized report provided within 2 weeks of receipt of District review comments.

5.0 Work/Report Required: A qualified professional engineer will assess the circulation and flushing characteristics of the proposed harbor shown on the attached sketch (Attachment 1). This assessment will utilize professional evaluation, leterature review, correlation with modeling studies performed in the past. The report shall include, but not be limited to:

a. Description of data review and investigation methods employed.

b. An evaluation of the circulation and flushing characteristics of the proposed harbor, to include tidal prism ratios and exchange coefficients, with appropriate diagrams and histograms.

c. Professional recommendations to mitigate or reduce any adverse effects (flushing or circulation) discovered, to include a discussion of possible design changes (i.e., breakwater alignment, etc.).

6.0 Alaska District Point of Contact: Contractor shall refer all questions concerning technical matters to Planning Branch, Alaska District. Complete and detailed background information on the Seward Harbor Study will be furnished the contractor by Planning Branch concurrently with notice to proceed.

Circulation Study

Seward, Alaska Small Boat Harbor

Introduction

The small circulation characteristics of the small boat harbor (SBH) proposed for the Nash Road site, Seward, Alaska (Figure 1) were considered in a preliminary assessment to be predictable without an individual model study, for the harbor planform and general layout appeared to be similar to other harbors for which circulation studies have been performed. However, a more detailed look disclosed some important differences nullifying the similar-shape assumption. Although the planform appears nearly square (see Figure 2), the entrance is located so that the area on the southeast corner is isolated from the main flooding current; the easterly entrance jetty forms a separation point for the flow, and a fairly deep (-18 ft MLLW) channel is located normal to the flooding current direction. Because of these distinguishing features it was decided to carry out a physical model study to support the comparative analyses based on the circulation studies of record. A physical model of the Seward SBH was not included in the circulation study proposal.

A laboratory hydraulic modeling technique for assessing tidal flushing of small boat harbors was initiated by Lewis (1972). The technique has been applied to a number of sites in the Pacific Northwest and Alaska (see List of References) in the quest for objective measures of water quality, needed by regulatory and permit-granting agencies when considering design proposals for new or modified marinas (SBHs). Overall exchange rates can be obtained and local regions of good and poor exchanges can be identified. Some field

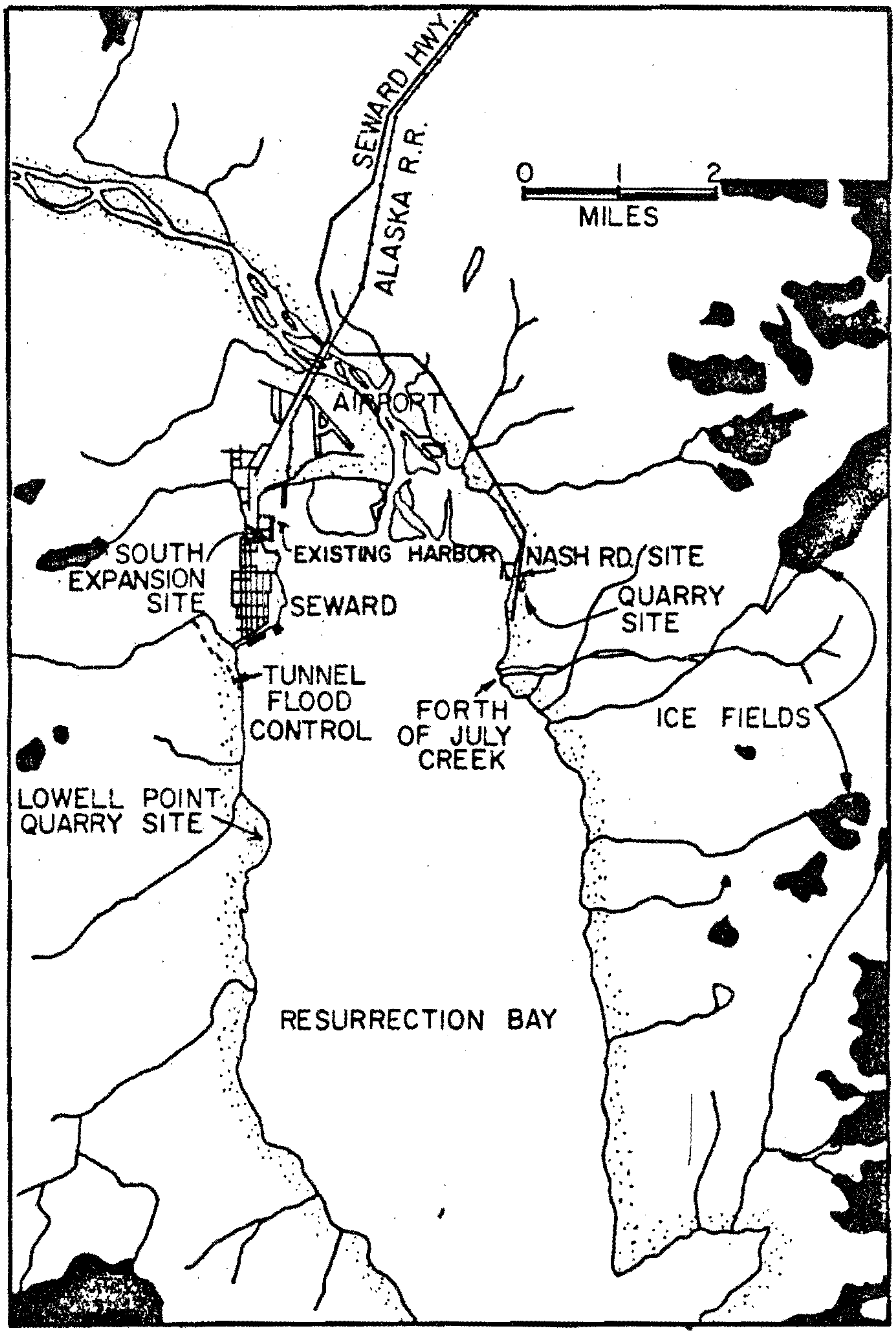


Figure 1. Seward and Vicinity

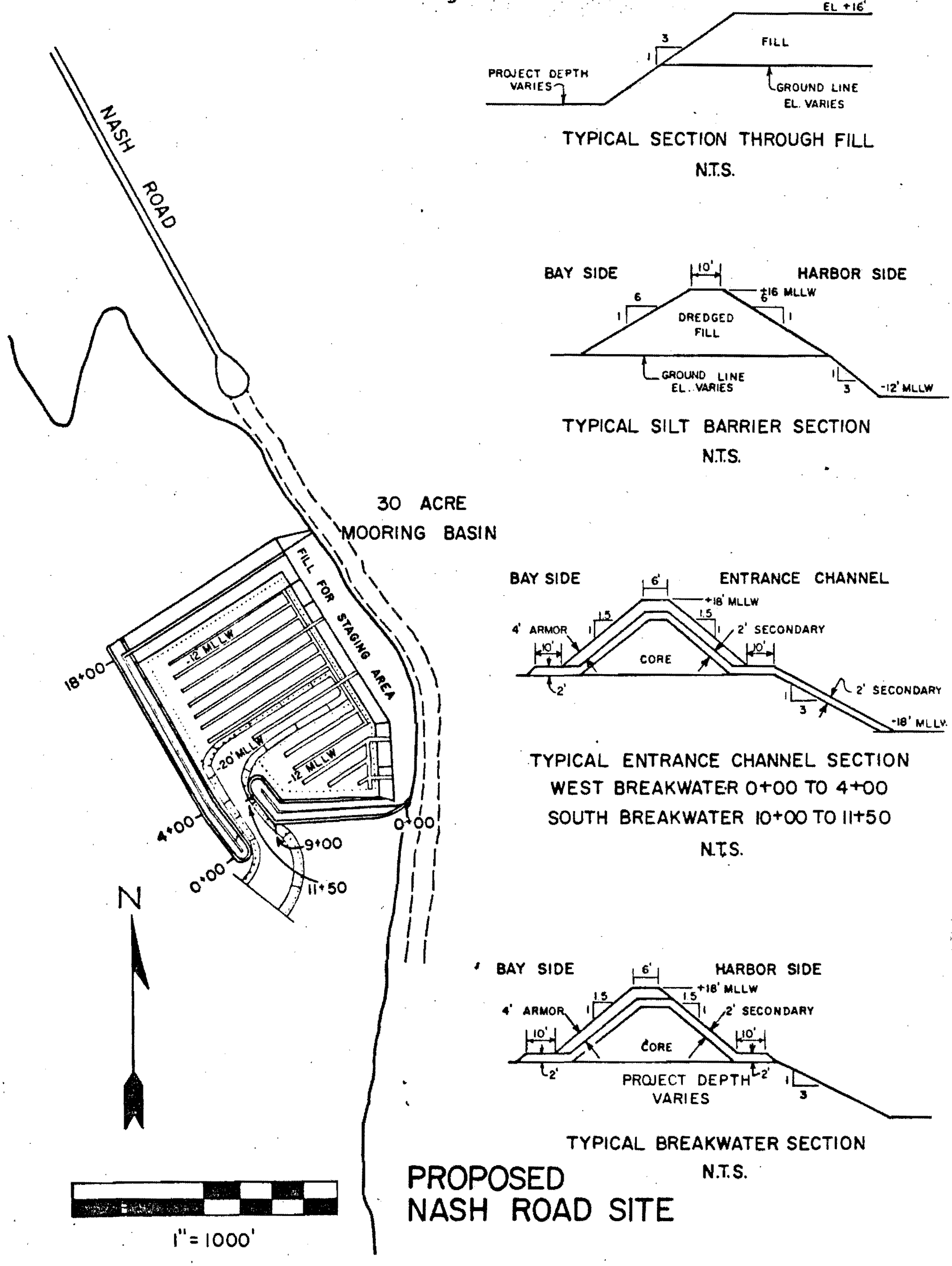

EL +16'
3
1
FILL
PROJECT DEPTH VARIES
GROUND LINE EL. VARIES
TYPICAL SECTION THROUGH FILL
N.T.S.
BAY SIDE
10'
HARBOR SIDE
+16 MLLW
6
1
DREDGED FILL
GROUND LINE EL. VARIES
3
-12' MLLW
TYPICAL SILT BARRIER SECTION
N.T.S.
NASH ROAD
30 ACRE MOORING BASIN
FILL FOR STAGING AREA
-12 MLLW
-20' MLLW
18+00
4+00
0+00
9+00
11+50
N
1" = 1000'
BAY SIDE
6'
ENTRANCE CHANNEL
+18' MLLW
1.5
4' ARMOR
2' SECONDARY
10'
CORE
2'
-18' MLLW
TYPICAL ENTRANCE CHANNEL SECTION
WEST BREAKWATER 0+00 TO 4+00
SOUTH BREAKWATER 10+00 TO 11+50
N.T.S.
BAY SIDE
HARBOR SIDE
+18' MLLW
4' ARMOR
2' SECONDARY
CORE
PROJECT DEPTH VARIES
TYPICAL BREAKWATER SECTION
N.T.S.
PROPOSED NASH ROAD SITE

Figure 2.

measurements in harbors that were also studied in laboratory scale have shown that the model has realistically reproduced general circulation patterns and that the model appears to give conservative exchange values.

Harbors typically are relatively long and wide compared to depth, so a scale distortion is usually necessary in model work. A distortion of 10 horizontal to 1 vertical has been adapted as a convenient standard. This means that the dispersion-diffusion processes are not properly scaled, so the implied assumption is that the convective transport is the dominant mode of exchange. For example, the measurements in the plume of a point source in a distorted model would not directly translate to concentration values in space and time in the prototype, but the general movements would be adequately represented. The adopted technique is very useful in the study of harbors where the mean tidal range is in the order of 5-10 feet, so the currents set up by these tides are the dominant factor in mixing and circulation processes.

The exchange and mixing or flushing in a SBH depends strongly upon the tidal range, of course, as well as specific basin geometries such as aspect ratio (length of basin to width) ratio of planform area to entrance area, location and number of entrances, length of entrance channel, points of flow separation, distance to rearmost section and others. Nece and Richey (1976, 1980), Nece, et al. (1976) and Schuchter and Slotta (1978) have investigated some of the relations between planform geometries and tidal flushing and have identified some general guidelines about favorable and unfavorable features.

Basis for Model Procedures

Numerical modeling methods of harbor phenomena have made major advances with the advent of the computer, but, as pointed out by Calloway (1980), the dimensions of the small boat harbor require such small steps to achieve a satisfactory solution by finite difference techniques that the necessary computer time becomes inordinately expensive. The physical model provides a graphic simulation of prototype features, is quite flexible so design changes can be compared readily, and can be kept simple and hence relatively inexpensive in those applications where currents and exchanges are dominated by tidal effects. Effects of density differences, wind stresses, boat wakes, mixing by propellors, etc., are excluded.

One index used in evaluating the tidal flushing of an estuary or harbor is the tidal prism ratio:

$$TPR = \frac{\text{Basin Volume at High Tide - Basin Volume at Low Tide}}{\text{Basin Volume at High Tide}}$$

which implicitly assumes a complete mixing of the new, ambient water (the numerator) with resident basin water. An experimental, laboratory technique to determine the actual exchange was used by Lewis (1972) who mixed a selected amount of fluorescent dye in basin, measuring the initial concentration, ran the model for a series of tides (4-6) and measured the final concentration. The retention between cycles is assumed constant, i.e.,

C_o = initial concentration

C_n = concentration after n cycles

R = retention coefficient between cycles

$$C_n = R^n C_o$$

$$R = (C_n/C_o)^{1/n}$$

The exchange coefficient E is expressed as

$$E = 1 - R$$

which represents the fraction of basin water replaced per tidal cycle, and depends strongly upon tidal range, of course, as well as specific basin geometries as mentioned above.

A flushing efficiency is defined as

$$\eta = E/TPR$$

which represents how effectively the basin utilizes the potential for exchange. For a completely and uniformly mixed basin, the exchange coefficient should equal the tidal prism ratio. The efficiency so defined, may exceed 100% where special features such as density flows, littoral currents, gyres, etc., are prominant.

Modeling Techniques

The Seward SBH was fitted into a laboratory tidal tank having the overal dimensions 8' x 12' and a working depth of 18", using scale ratios of 1:600 (X_r) and 1:60(Z_r) for vertical dimensions. The dikes forming the boundaries of the harbor were simplified as vertical walls in the model; Froude scaling laws then yield a time scale ratio

$$T_r = X_r/(Z_r)^{1/2} = 77.46$$

so that the 12.4-hour prototype tidal cycle becomes 9.6 minutes in the model. The model tank generated tides as cosine curves of constant amplitude, corresponding to the half-range of the tide being investigated.

The fluorescent dye technique of determining gross exchange coefficients as used in earlier studies (Lewis, 1972, e.g.) has been superceded by a photodensimetric method initiated by Richey and Smith (1977), in which a spatial distribution of exchange coefficients as well as the gross values can be obtained; local values are denoted as "E", and the gross values as "$\overline{E}$". An initial concentration needs to be set; several investigations used high water slack as a reference point, but the flooding current pattern is not as repetitive as on an ebb pattern. In this study the initial (o) condition was taken at low water slack. The specific steps in setting up and evaluating each run are:

1. With water level in the tide bank at low water slack (low tide) elevation, insert a temporary barrier dam across the entrance, separating basin and ambient waters.

2. Photograph the model when filled with clear water at low tide level to establish a background light level, at C = zero percent. Standard black and white control strips are placed in the camera field of vision for control purposes.

3. The basin is dosed with the amount of dye required to produce a concentration, $C = 25$ percent of C_o. Mix the dye thoroughly into the basin, allow the water to become quiescent, and photograph the basin; this provides the $C/C_o = 0.25$ calibration conditions.

4. Add equal increments of dye, following the above procedures, to obtain the $C/C_o = 0.50$, 0.75 and 1.00 values.

5. Raise the water level in the tide tank and in the marina basin to high tide elevation, add the calculated amount of dye (proportional to the tidal prism) to bring the concentration to C_o, mix the dye in the basin and take a photograph when the basin waters are quiescent.

6. Remove the barrier dam and simultaneously start the tide generator.

7. Take photographs at quarter-cycle points until the desired number (4) of complete cycles is completed. Conditions at the first low tide level after the generator was started give the C_o values (no ambient water has entered the basin); four cycles later, readings at low water give the C_n values $(n = 4)$.

8. At low water slack corresponding to $n = 4$, stop the tide generator and simultaneously replace the barrier dam. Thoroughly mix the waters in the basin, allow to become quiescent, and take a final photograph which indicates the spatially averaged dye concentration in the basin.

Dye density values were measured directly from 35-mm black-and-white negatives, using a Tobias Associates Model TBX photodensitometer. This device is a portable, manually-operated unit with a digital readout of opacity (or optical density). Aperture selections (1, 2 and 3 mm) allow variations in spatial resolution. The densitometer was operated in this study by placing the 35-mm negative over the aperture; correct placement of the negative was obtained through alignment with a corresponding x-y grid. The sensor probe was then placed in contact with the negative and a density reading taken; the operation was repeated for the number of points desired from the negative.

Photos were taken by a camera mounted approximately 7 feet above the center of the marina basin. Lighting was provided by four photoflood lamps (General Electric EBW No. 82) mounted about the same distance above the basin and located to minimize shadows and give uniform lighting of the water surface in the marina. The film used was Kodak Plus-X pan (ASA 125); the camera setting was f 2 at an exposure time of 1/15 second. A red filter was used.

Film negatives were processed so that the density range corresponded, as closely as possible to the linear portion of the film characteristic curve. The film (negative) density at any point is inversely proportional to the average concentration of dye within the water column at that point. Mrs. Stewart's bluing was the dye used in all tests.

The choice of four tidal cycles was based largely on experience with prior tests using fluorescent dye methods. The 4-cycle procedure has also been verified (Nece et al., 1979), for local as well as for basin-averaged exchange.

Prints from the set of 35-mm black and white negatives are presented to convey a visual record of flow conditions in the basin at each quarter cycle of the 4-cycle test for the mean tide range of 8.3 feet. A similar set of color slides is submitted with the report; these two sets of photos serve as a substitute for watching the model in operation and in interpreting the exchange coefficient values.

Model Test Results

A set of prints from the 35-mm negatives for the 8.3-foot tide range is presented in Figures 3a-q. Figure 3a is the first photo taken in the series, as described in Step 7 under Modeling Techniques; the tide generator was started at the previous high-water slack position. The 3 vertical strips appearing in the upper left corner of Figure 3b are turbulence generators. The flooding current has crossed the central channel and has started a gyre in the southeast quadrant. At the high water slack, the flooding jet has reached the distal side of the basin; the gyre has moved the waters from the southeast corner across the entrance; a slug of "new" water is pinched off as shown by the less dense water in the northern section of the basin. Some of this trapped water moves out on the subsequent ebb, as shown in Figures 3d and 3e, and the "new" water has moved back over the center channel. These basic movements are repeated through the subsequent cycles (Figures 3f-q) where 3q is the end of the 4-cycle series. As shown in Figure 3q, the basin is quite uniformly mixed, with patches of contrasting density. A plot of local exchange coefficients after 4 cycles (corresponding to Figure 3q) is given as Figure 5. Higher values generally occur over the central channel with lower ones in the northern corners and in the southeast sector. The values of 0.26 in the entrance tag the last patch of basin water leaving on the ebb.

Three photos from the 5-foot tide range are given as Figures 4a-c to be contrasted with comparable photos from the 8.3-foot range, Figures 3g, 3i and 3q. The basic currents and gyres on the flood and ebb are similar to those for the higher tide range, but are much less intense. Figure 4c, after the 4 cycles, shows the basin to be non-uniformly mixed. The local values of E for the 5-foot range are plotted as Figure 6, which shows values in the central channel to be about the same (0.25 $\mp$) as for the 8.3-foot range, but with depressed values in the northern corner and low values in the southeast sector. Values in the entrance (0.18) show, again, the trace of the water exiting the basin, with higher E values behind it. Figures 7 and 8 show the histograms for the E values for the two ranges; basin averaged values (E) have been given in Table 1. The histograms show the marked change in uniformity of mixing between the two tide ranges. Ranges equal to or less than 5 feet occur only about 5 times a month, i.e., on the low part of the neap ranges.

The point values of exchange coefficient E for the mean range of 8.3 feet and for a 5-foot range are shown on Figures 5 and 6. The standard deviation S is a measure of how thoroughly the basin is mixed. Values of E, S, TPR and Efficiency are summarized in the following table.

Table 1. Summary Data for Seward Small Boat Basin

Tide Range	Gross (E) Exchange	Standard (S) Deviation	TPR	Efficiency, %
MHHW-MLLW			0.45	
MHW-MLW			0.37	
Mean Range, 8.3'	0.24	1.73	0.37	65
5.0 ft.	0.21	5.57	0.24	88

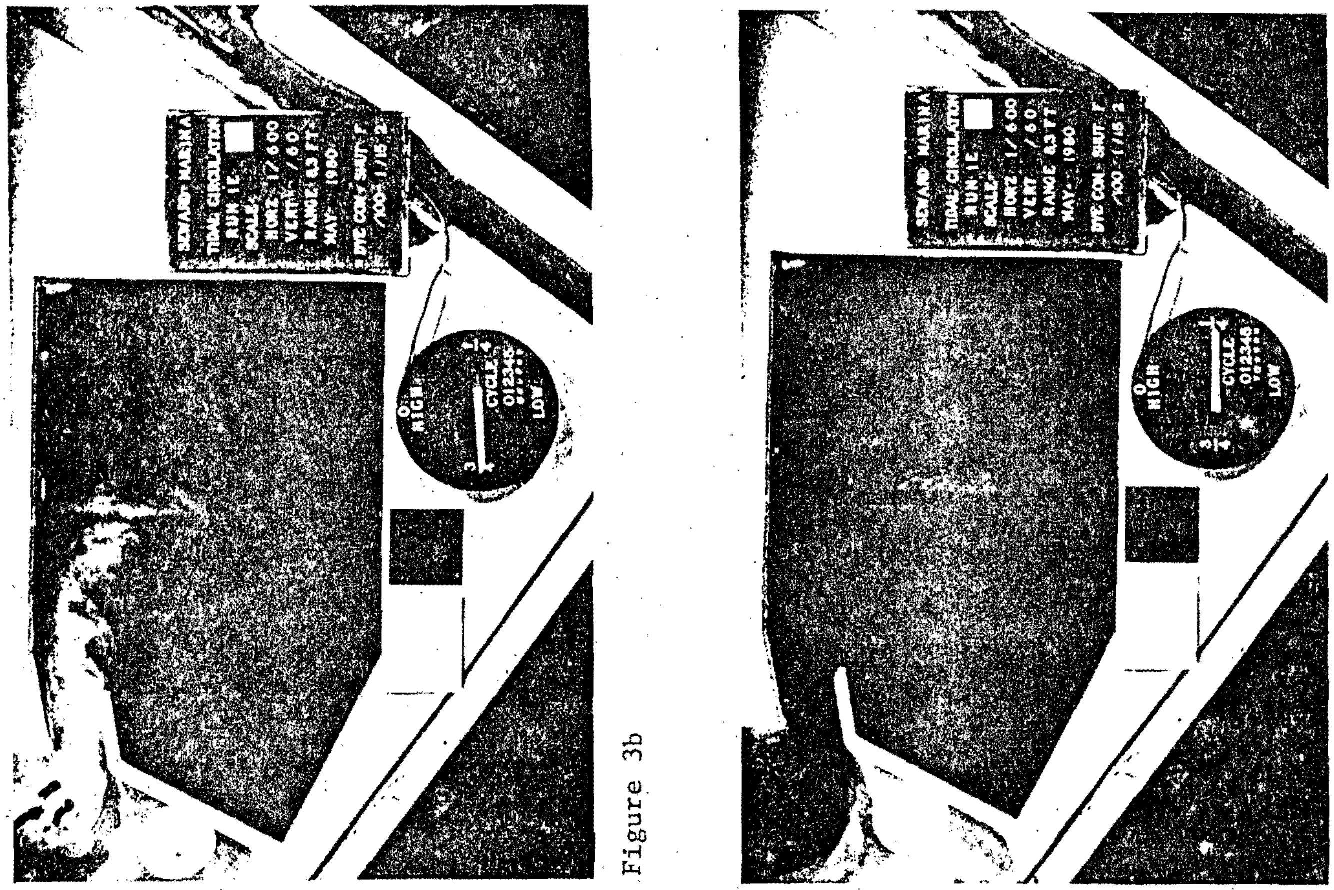


Figure 3b

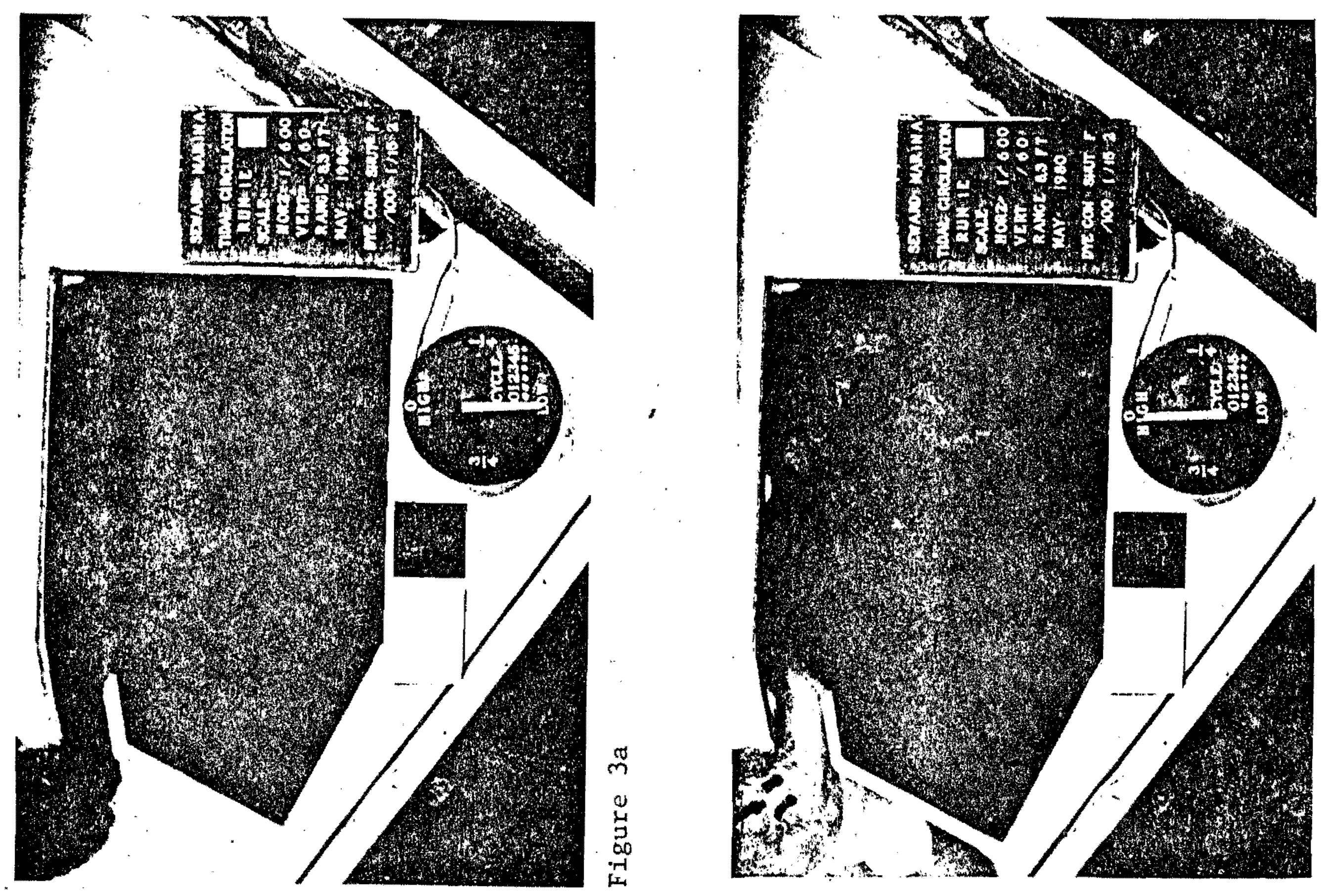


Figure 3a

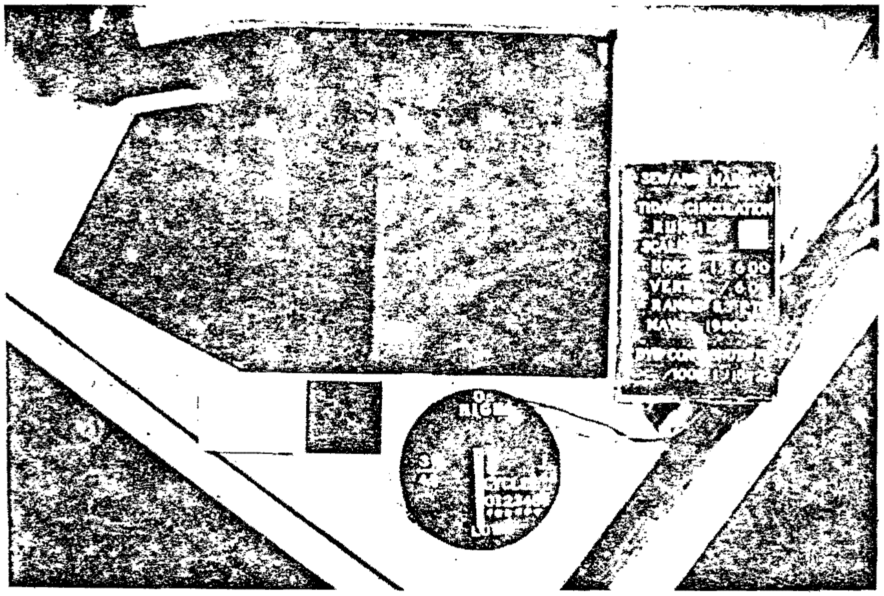


Figure 3e

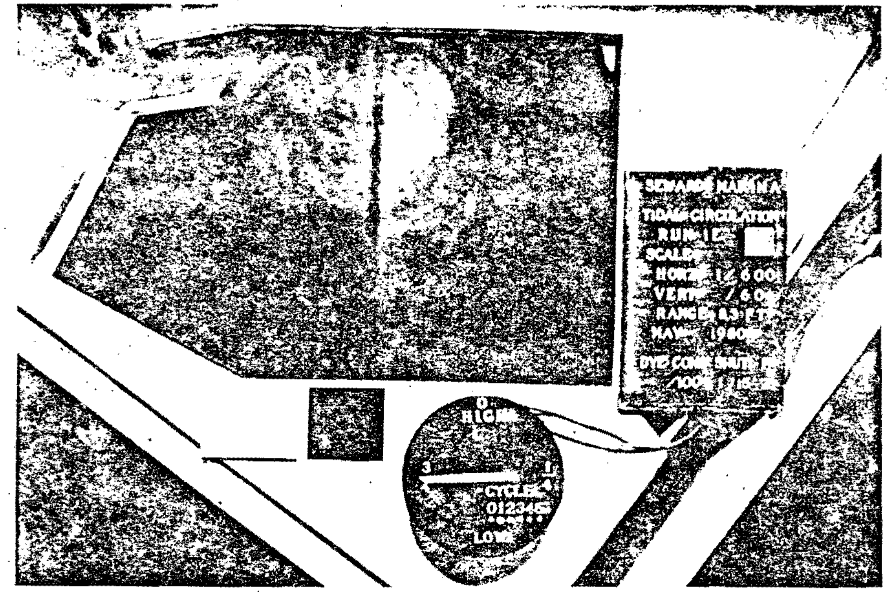
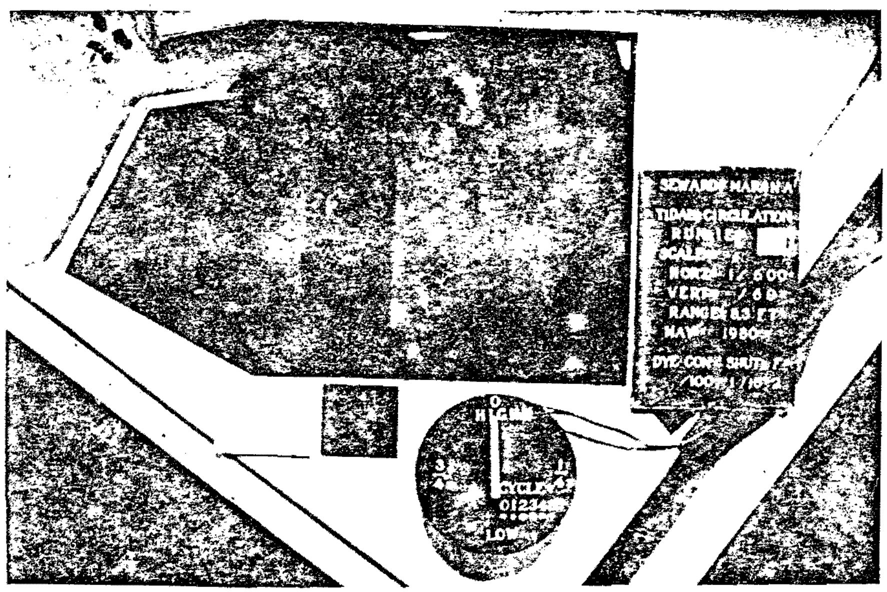


Figure 3f



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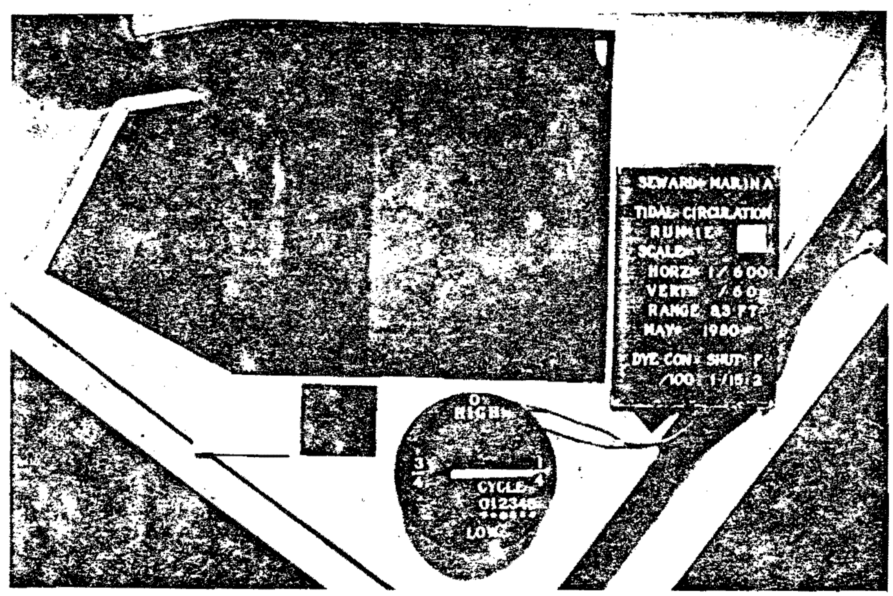


Figure 3[illegible]

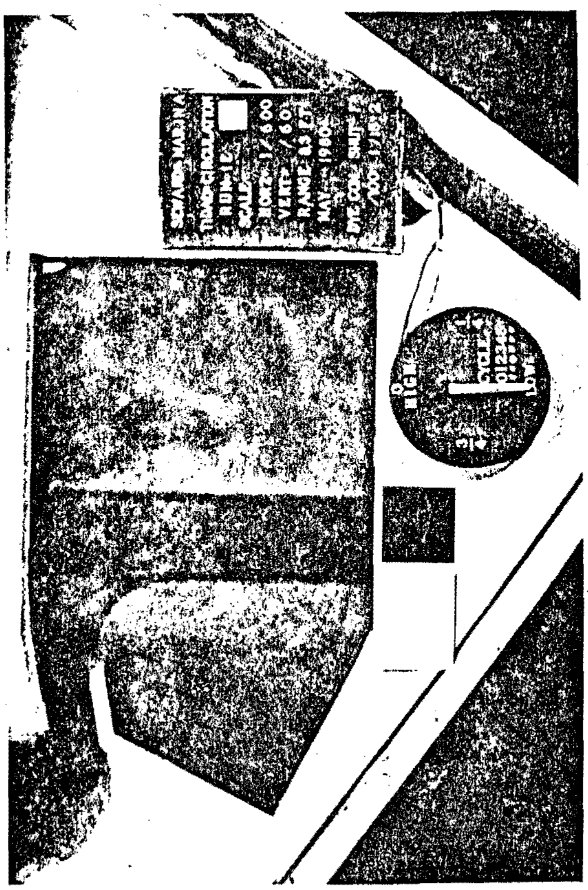


Figure 3i

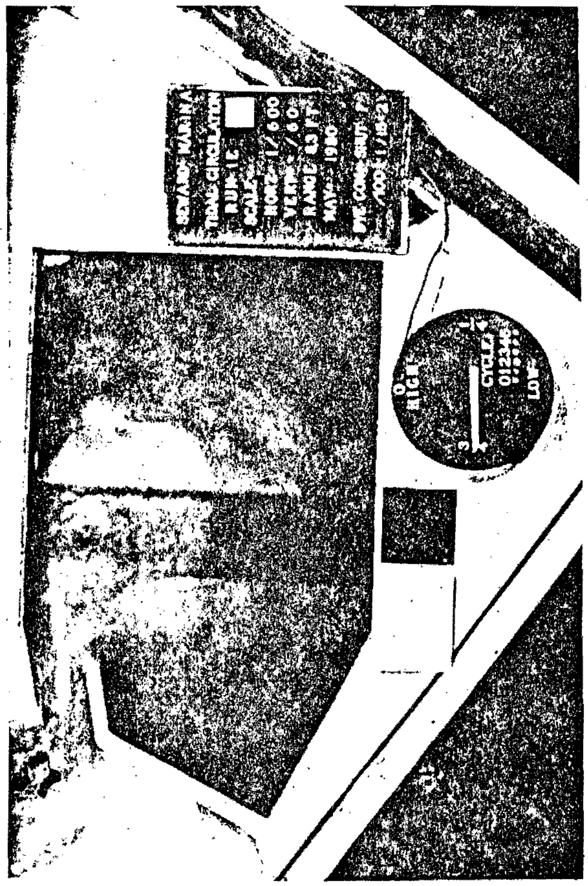


Figure 3j

Figure 3k

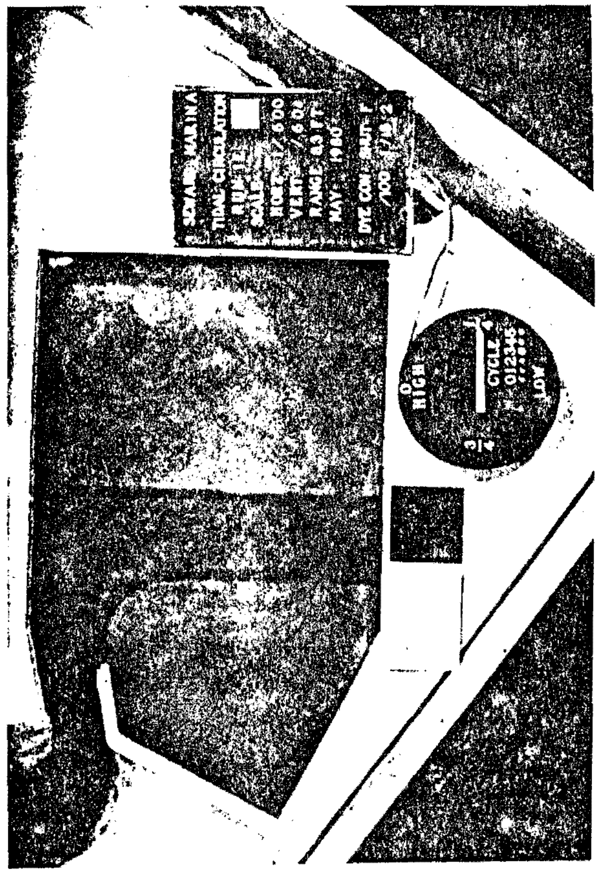


Figure 3l

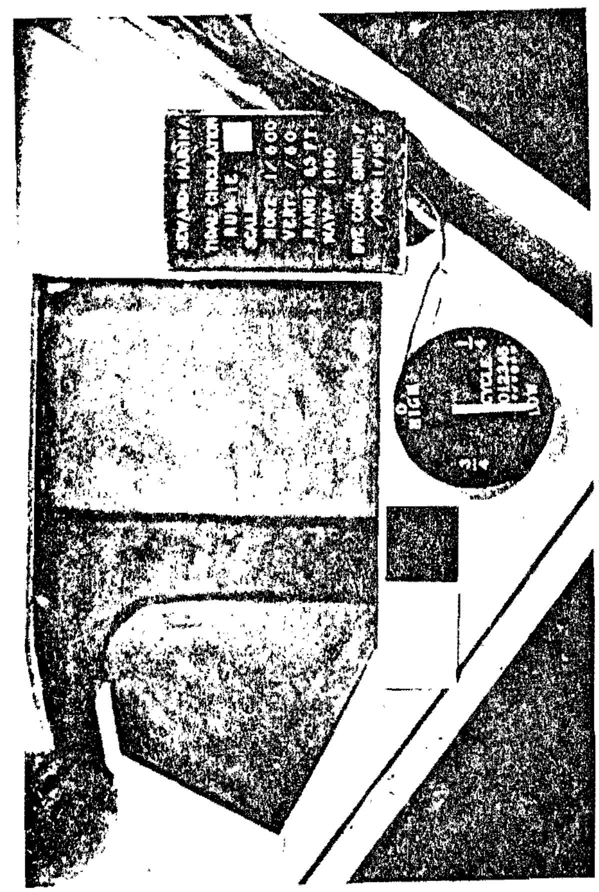


Figure 3m

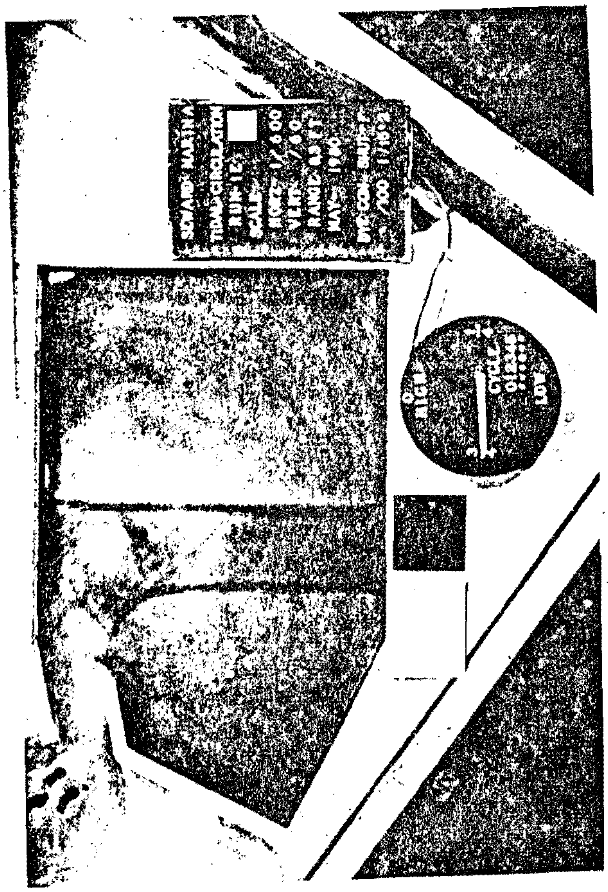


Figure 3n

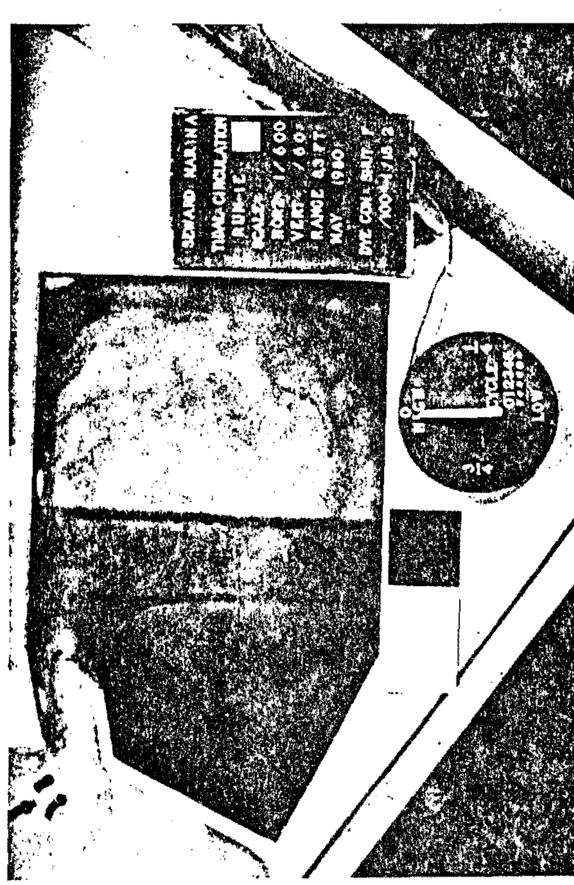


Figure 3o

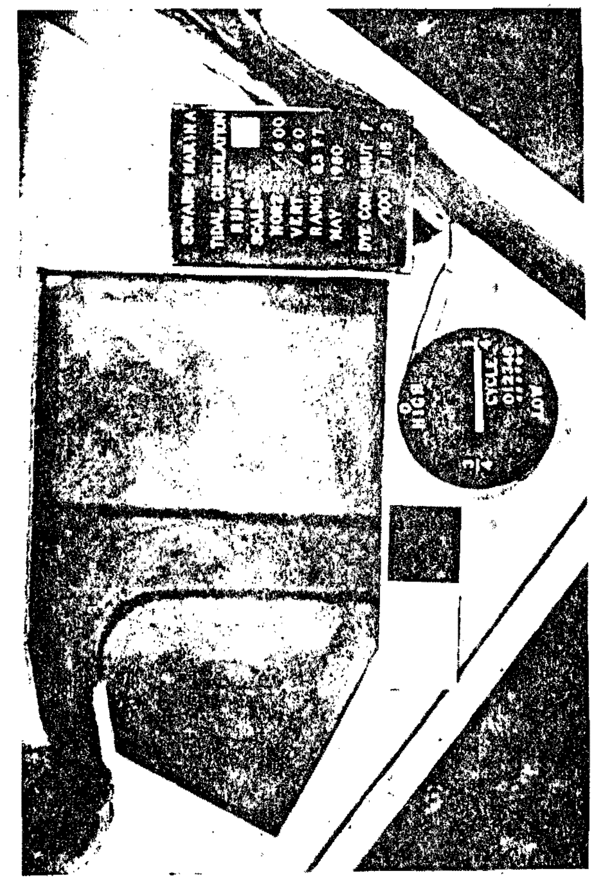


Figure 3p

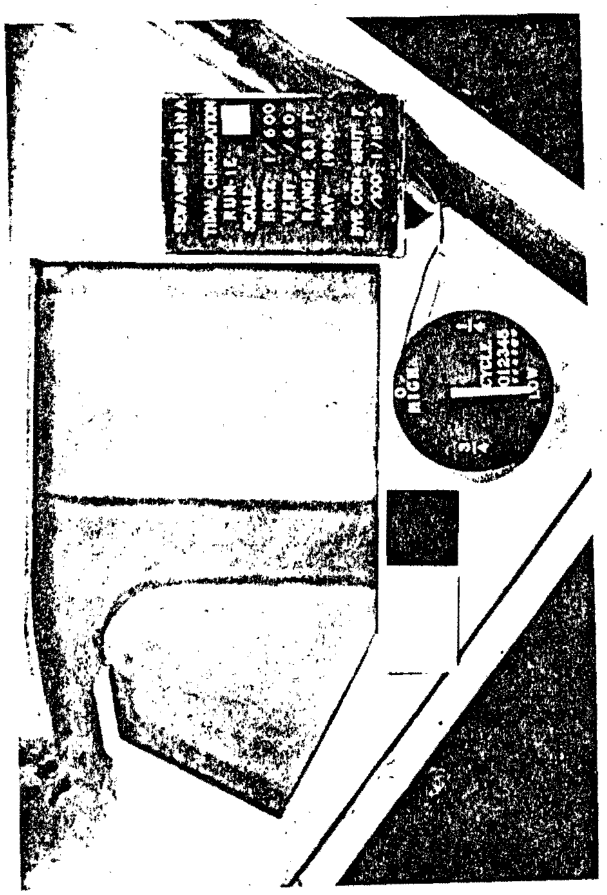


Figure 3q

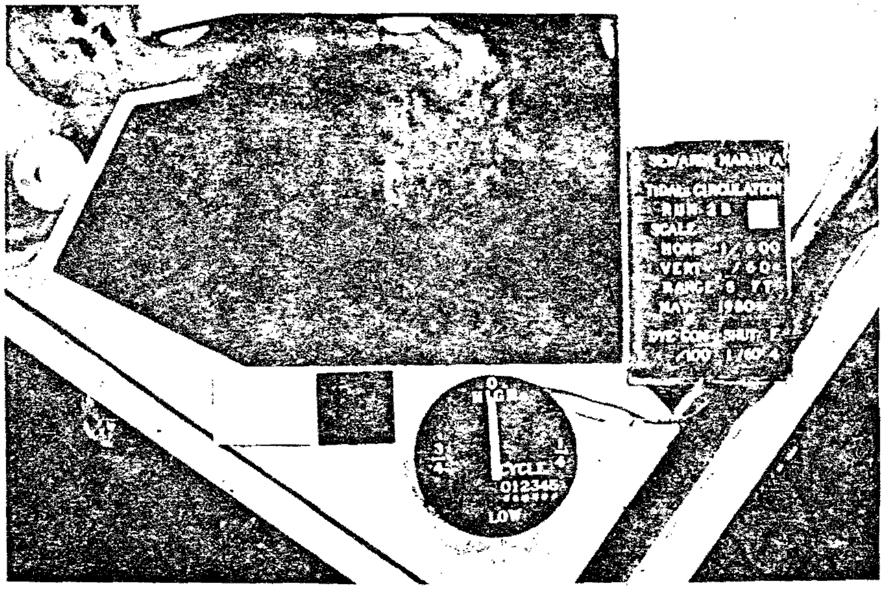


Figure 4a

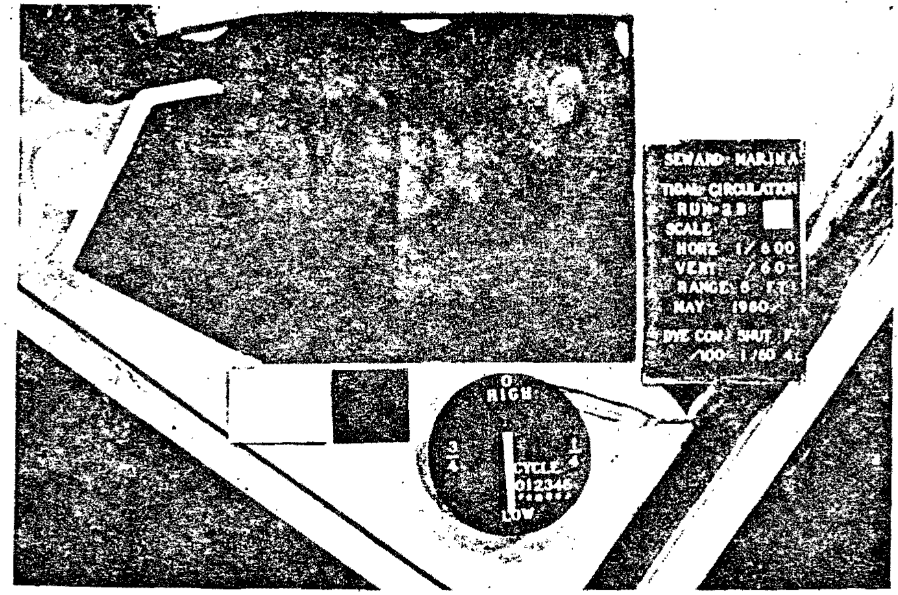
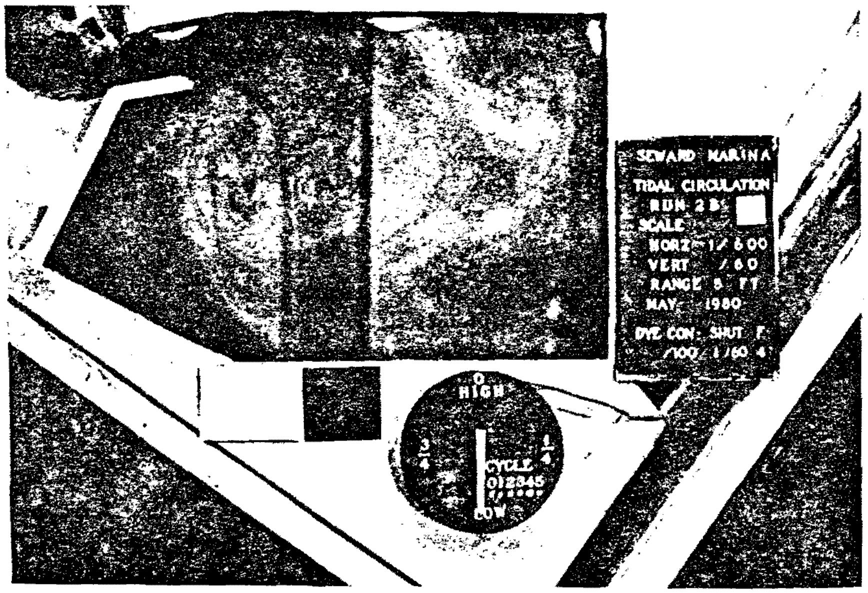


Figure 4b



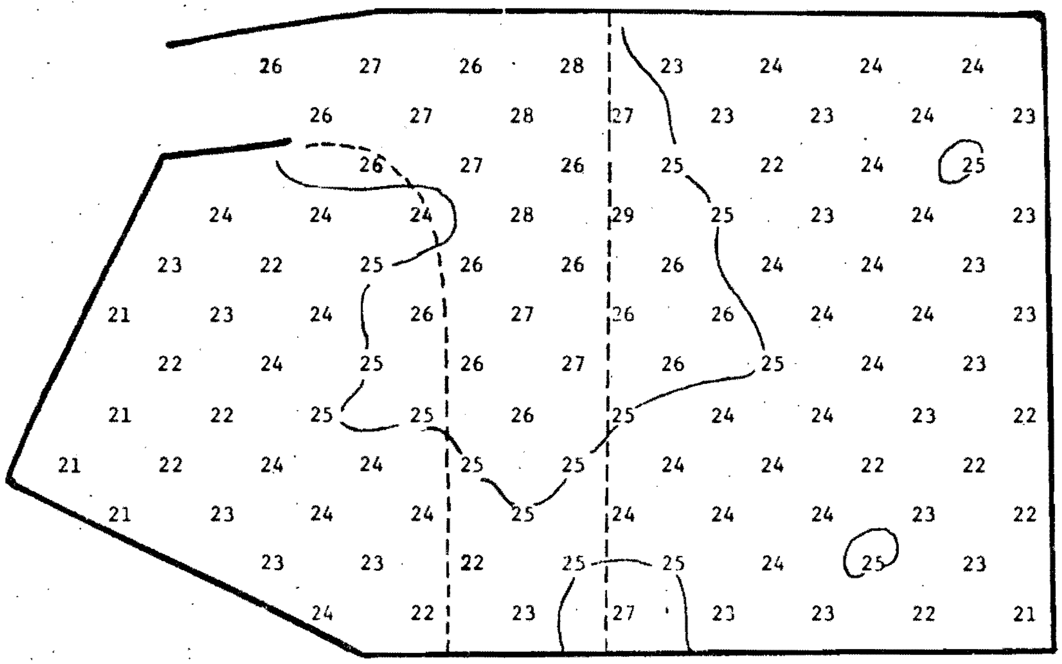


Figure 5. Local Exchange Coefficients, Tide Range 8.3 feet

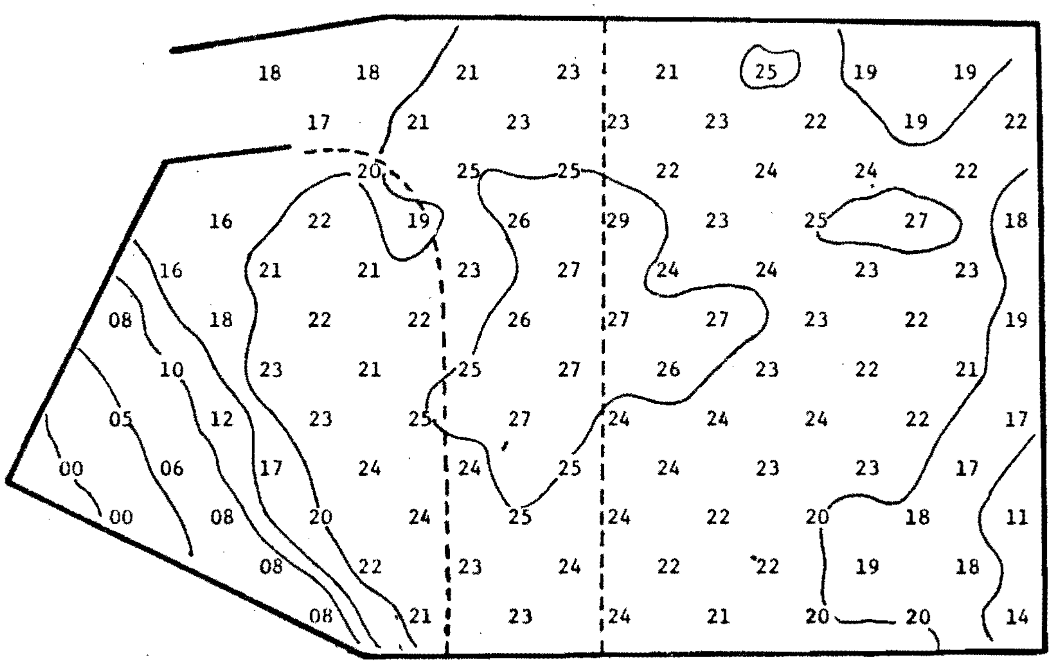


Figure 6. Local Exchange Coefficients, Tide Range 5.0 feet

Seward

R = 5.0 ft.
Avg. = 20.6 ft.
S.D. = 5.57 ft.

Figure 7. Histograms for Local Exchange Coefficients

7a. 8.3-foot range

7b. 5.0-foot range

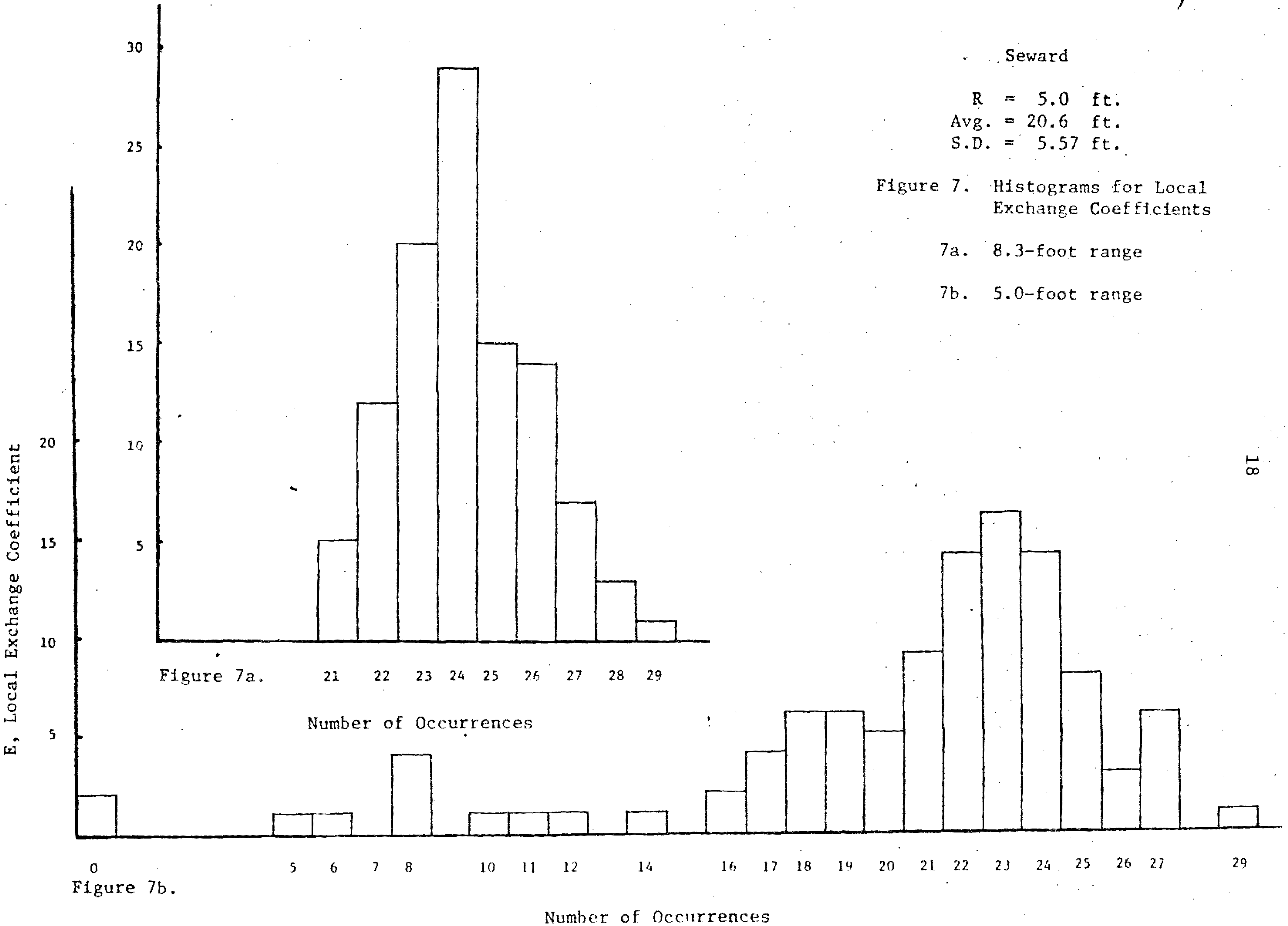


Figure 7a.

Figure 7b.

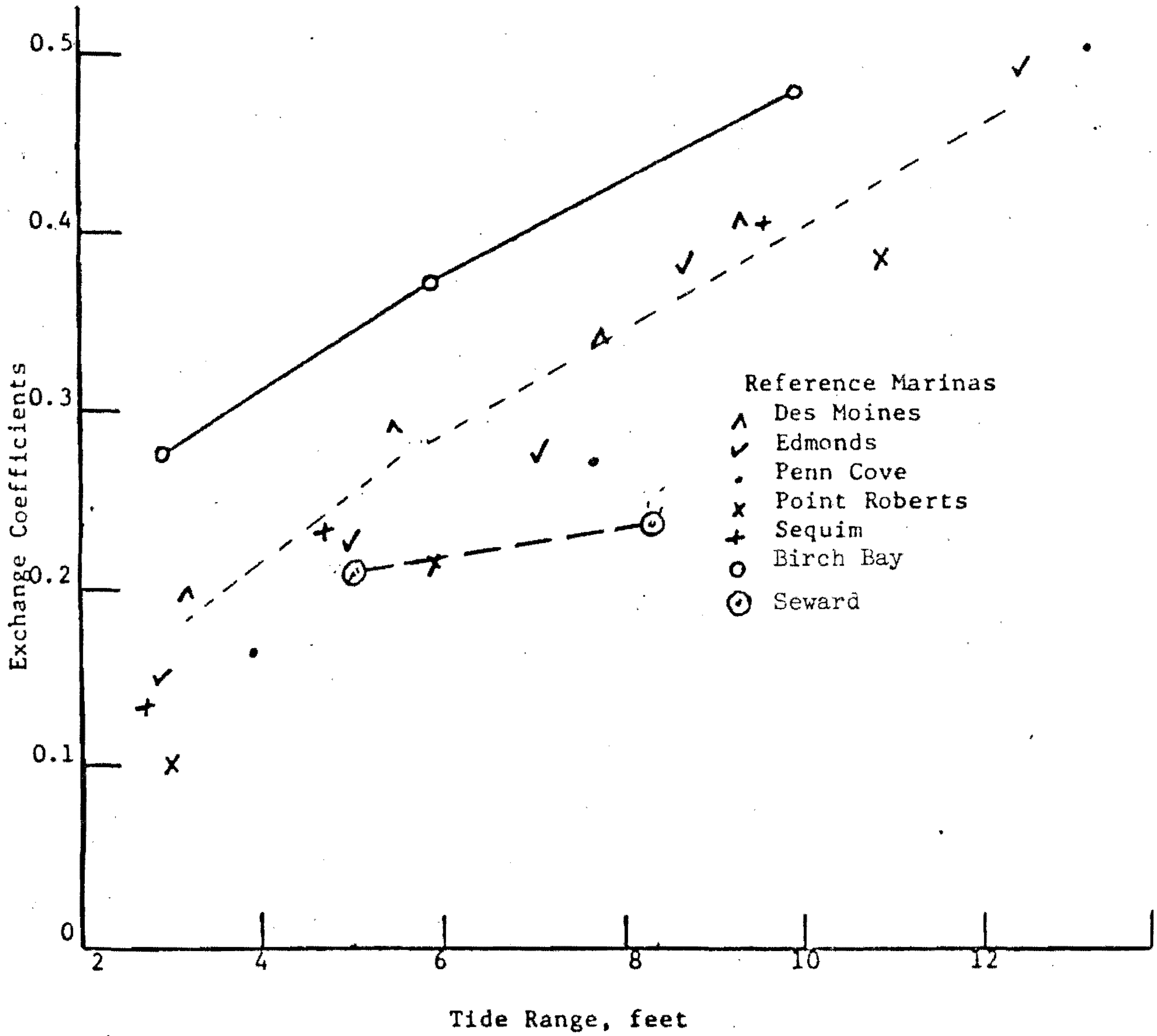


Figure 8. Exchange Coefficient vs. Tide Range for Reference Marinas

Comparisons With Other Marinas

None of the small boat harbors in the Pacific Northwest for which circulation studies have been done formed a close analogy with the one proposed at Seward because of the unusual features of the re-entrant segment on the southeast side of the entrance, and the dominant central cross channel. Exchange coefficients for the mean range at the Seward site is listed with those from other Puget Sound marinas in Table 2, and compared with other ranges on Figure 8. The Seward values are lower than others at comparable ranges. The increase in exchange with range is also lower (flatter slope) than that for the reference marinas.

Table 2. Comparison of Seward Small Boat Harbor with Puget Sound Marinas

	Mean Range (feet)	Exchange Coefficient
Birch Bay*	5.2	0.37
Des Moines*	8.0	0.34
Edmonds*	7.2	0.27
Penn Cove	7.8	0.27
Pt. Roberts*	5.9	0.21
Sequim	4.8	0.23
Seward	8.3	0.24

*in operation

Although no close match with a specific basin was found, one of the generalized shapes investigated in a report by Nece, et al. (1979) covered a single-entrance basin with a length to width ratio of 0.83, which is close to that of the Seward harbor. Figures 7 and 17 from that report show the change in E with aspect ratio L/B and the distribution of E in the harbor for the range of 6 feet and are reproduced herein as Figures 9 and 10. The

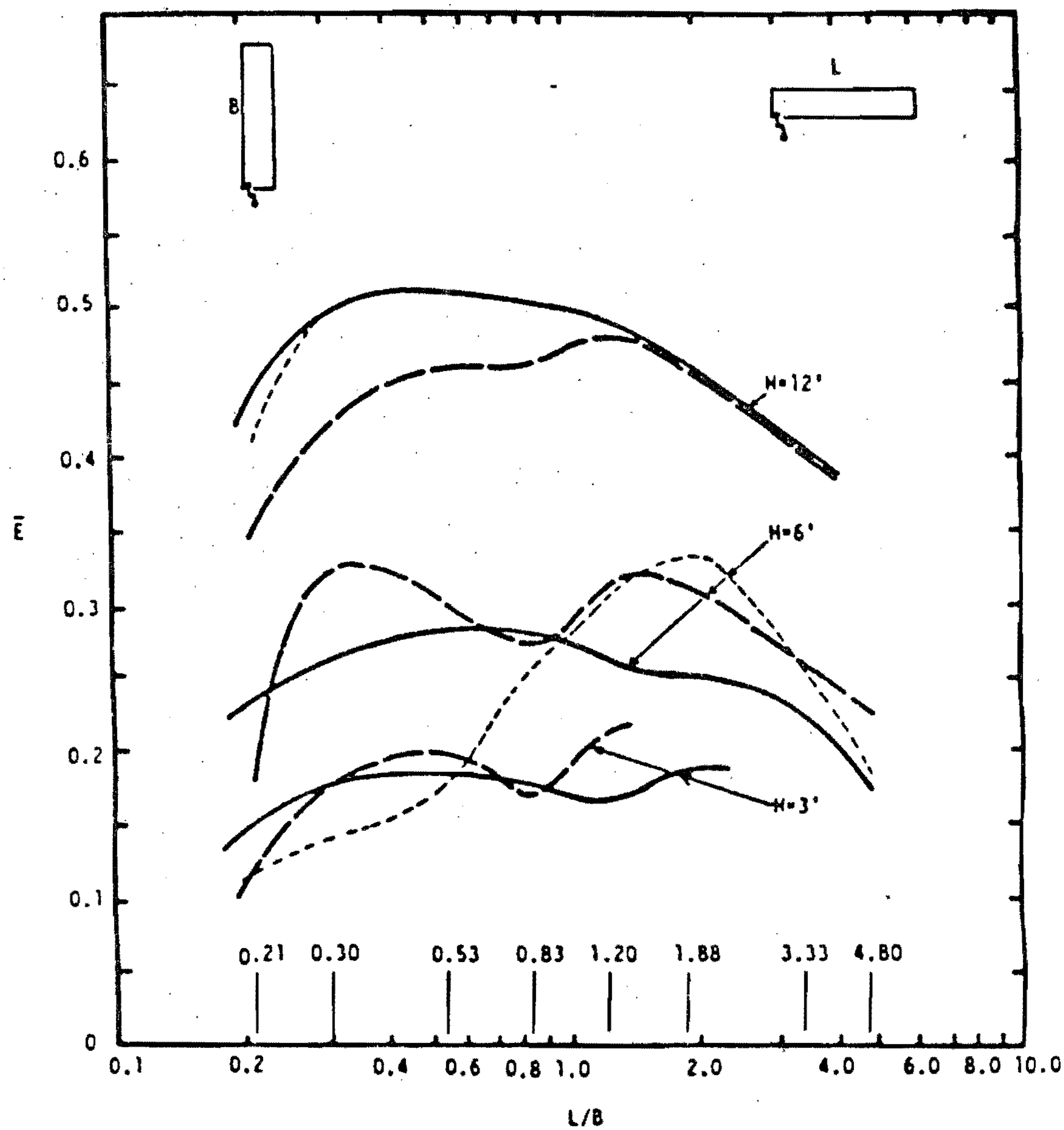


Figure 9. Average Exchange Coefficients, Single Asymmetric Entrance, Summary Plot

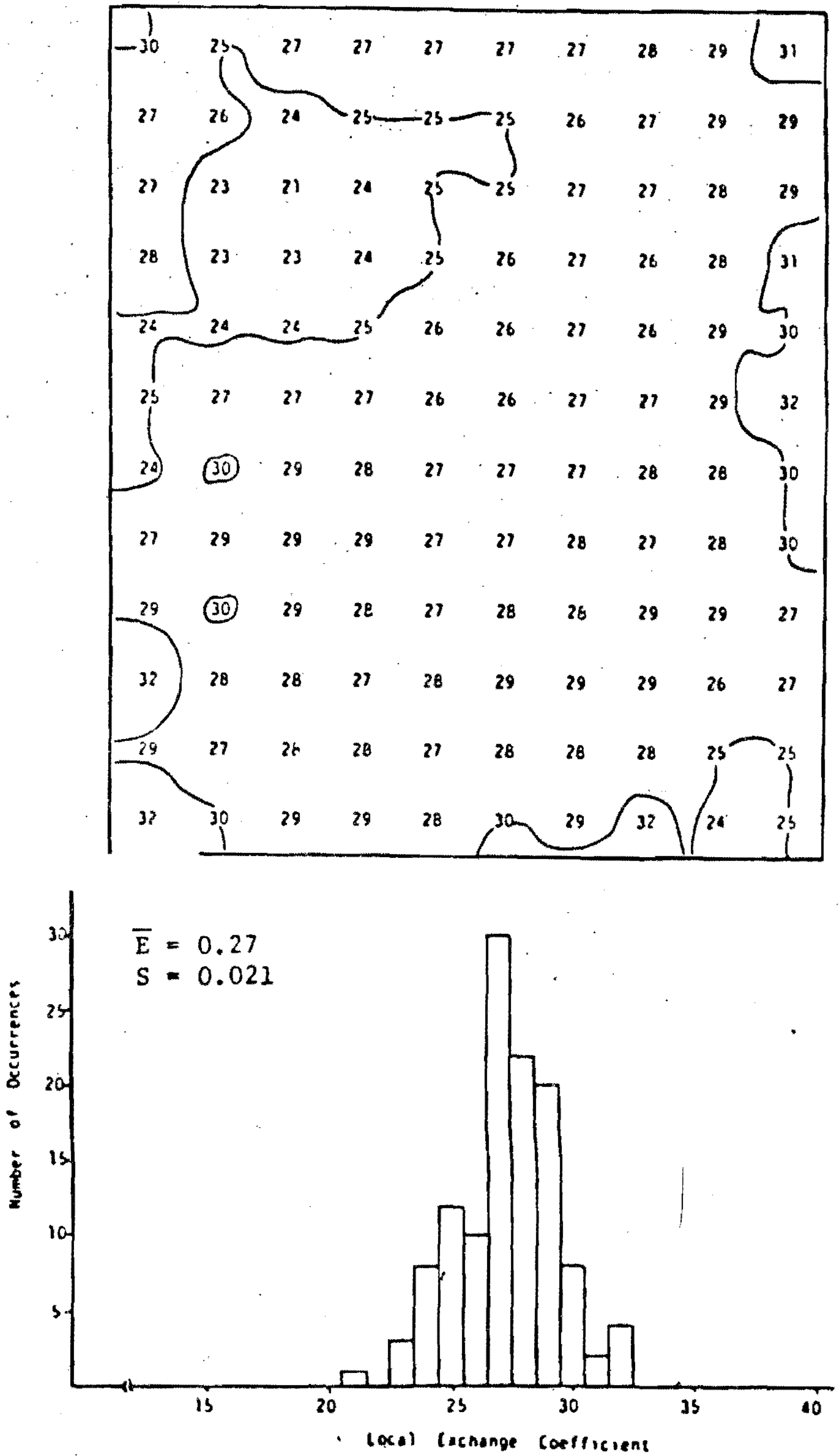


Figure 10. Square Corners, Single Entrance, H = 6 feet, w = 125 feet, L/B = 0.83

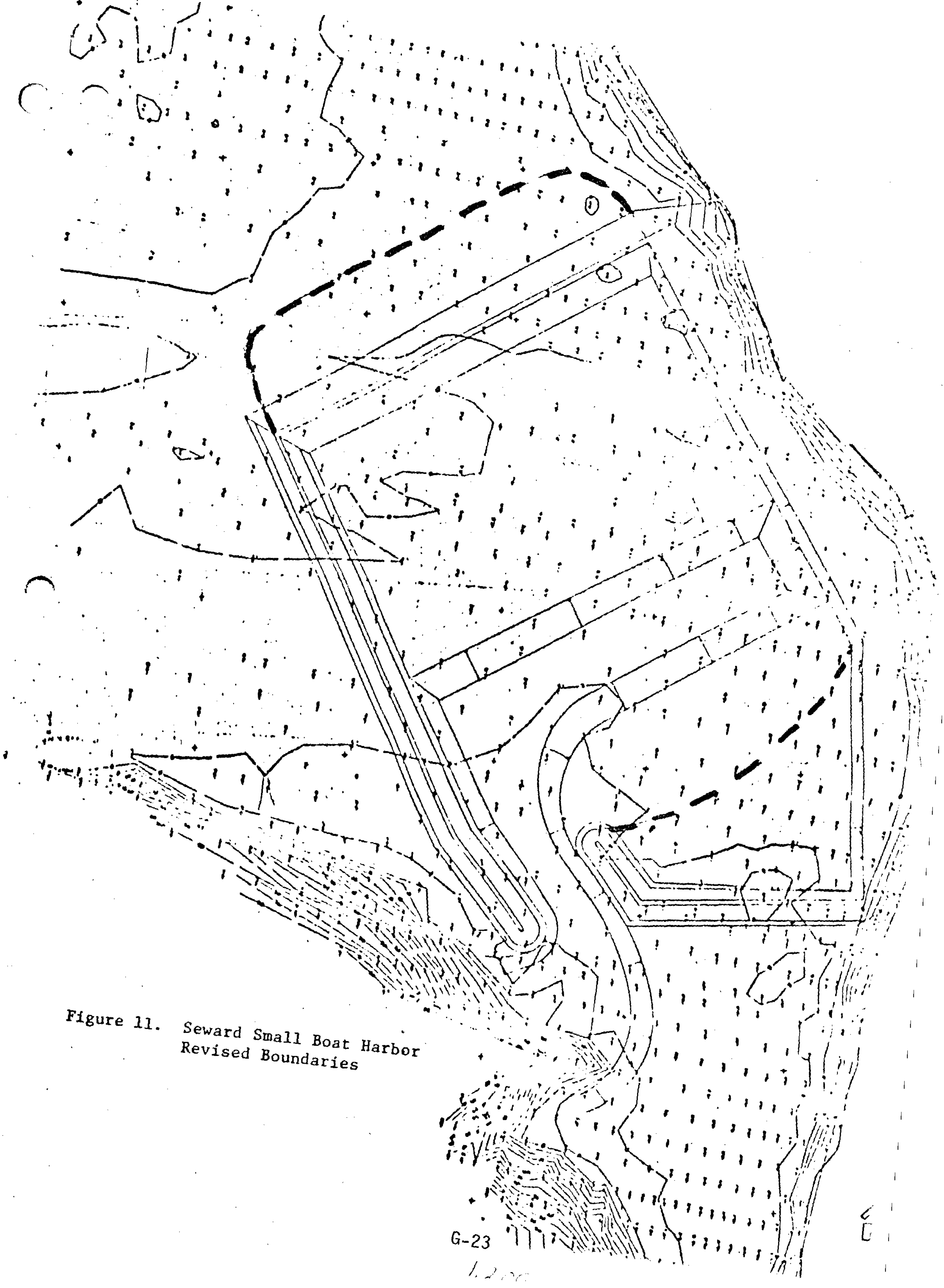


Figure 11. Seward Small Boat Harbor
Revised Boundaries

basin as shown in Figure 10 is quite uniformly mixed at the 6-foot tidal range, with an $\overline{E}$ of 0.27, slightly higher than the 0.24 for the Seward site for an 8.3-foot range.

Conclusions

The shape and location of the southern boundary to the small boat harbor proposed at the Seward site adversely affects its mixing and flushing characteristics. Although the harbor is quite uniformly mixed at the mean range, the overall exchange coefficient is lower than the general basin shape and tidal prism ratio would suggest. During the neap tides, the exchange in the southern sector is very low, and if this harbor were in the Puget Sound region, very likely it would not meet regional criteria for an acceptable marina design.

Recommendations

The harbor should be reshaped along the configuration sketched in Figure 11 wherein the re-entrant southern boundary has been eliminated and the internal corners rounded. The associated loss in surface (moorage) area could be recovered by moving the northern boundary a compensatory distance northward. The general aspect ratio nor tidal prism of the basin would be altered significantly; the flooding jet would still penetrate to the distal boundary. A performance approximating that given on Figures 9 and 10 for the L/B ratio of 0.83 would be expected, and these would meet general marina criteria.

In some cases an improvement in tidal prism ratio and, hence, exchange, can be achieved by reducing basin depths in critical areas. For instance, the southeast sector of the Seward harbor site might be dredged only to -6 or -8 feet MLLW. This approach does not appear well suited to the subject site, however, because of the dominant influence of the re-entrant sector, the potential sediment problems, and the subsequent requirement for zoning the area for shallow-draft vessels.

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APPENDIX H

STATEMENT RECIPIENTS

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Federal Agencies

Office of Environmental Analysis, Federal Maritime Commission
U.S. Department of Transportation, Region X
Director, Alaska Region, National Weather Service
Commander/ Director, U.S. Army CRREL, Hanover, New Hampshire
Coastal Engineering Research Center
Office of the Chief of Engineers, Civil Works Programs
National Park Service
Manager, Alaska Outer Continental Shelf Office, Bureau of Land Management
Soil Conservation Service
Deputy Assistant, Secretary for the Environment, U.S. Dept. of Commerce
Chief, Alaska Division, U.S. Army CRREL, Fort Wainright, Alaska
Waterways Experiment Station
Environmental Protection Agency, Washington, D.C.
Environmental Protection Agency, Region X
Director, Alaska Operations Office, Environmental Protection Agency
Director, Bureau of Land Managment, District Office
Dept. of Housing and Urban Development
North Pacific Division, U.S. Army Corps of Engineers
Special Assistant to the Secretary, U.S. Dept. of Interior
Field Supervisor - WAES, U.S. Fish and Wildlife Service
U.S. Forest Service, Chugach National Forest
Dept. of Transportation, Alaska Region
Study Director, Water Resources Studies, U.S. Dept. of Interior
Commander, 17th Coast Guard District
Area Director, U.S. Fish and Wildlife Service
National Marine Fisheries Service, Anchorage
Regional Director, National Marine Fisheries Service, Juneau
Director, Anchorage Field Office, National Ocean Survey
Director, Office of Environmental Project Review
State Director, Bureau of Land Management
District Chief, U.S.G.S., Water Resources Division
Advance Council on Historic Preservation
Board of Engineers for Rivers and Harbors
Area Director, Bureau of Indian Affairs
Alaska Resources Library
Pacific Northwest Area, MARAD
Honorable Ted Stevens, United States Senator
Honorable Frank Murkowski, United States Senator
Honorable Don Young, Representative in Congress

State Agencies

Honorable Jay Hammond, Governor
Honorable Don Gilman, Alaska State Senator
Honorable Patrick M. O'Connell, Alaska House of Representatives
Dept. of Community and Regional Affairs, Local Government Assistance Div.
Director, Division of Land and Water Management
Commissioner, Dept. of Community and Regional Affairs
Dept. of Natural Resources, Southcentral District
A-95 Clearinghouse, State-Federal Coordinator
Dept. of Environmental Conservation, Southcentral Regional Office

Alaska Department of Commerce and Economic Development
Commissioner, Department of Natural Resources
Commissioner, Alaska Department of Fish and Game
Seward Field Office, Alaska Department of Fish and Game
Dept. of Natural Resources, State Archaeologist

Organizations

University of Alaska, Anchorage, Marine Advisory Program
Alaska Federation of Natives
Kenai Chapter, Alaska Conservation Society
Anchorage Audubon Society
Library, University of Alaska, Fairbanks
Seward Community Library
Cook Inlet Region, Inc.
Z. J. Loussac Library
Director, Institute of Water Resources, University of Alaska, Fairbanks
Environmental Center, West Anchorage High School
Anchorage Group, Sierra Club
Executive Secretary, Alaska Conservation Society
Trustees for Alaska
Director, Institute of Marine Science
Library, University of Alaska, Anchorage
American Institute of Merchant Shipping
Arctic Information and Data Center
State Representative, Friends of the Earth
Alaska Center for the Environment

Local Government

Honorable Donald W. Cripps, Mayor, City of Seward
Ronald Garzini, Seward City Manager
Honorable Stan Thompson, Mayor, Kenai Peninsula Borough

Individuals

Sigvald J. Strandbert
Robert G. Strother
Mike Dauven
Warren E. Jackson
Dick Lowman
James Kross
Kenneth Kendrick
Don Hanson
John F. Gillespie
Dale R. Lindsey
Einar T. Meining
Jim Cameron
Michael L. Walker
Lyle D. Johnson
Beverly D. Dunham
Frank Flavin
Herman E. Leirer
Donald J. Oldon
Darryl J. Schaefermeyer
Earl G. Drayton