Detailed Project Report
and
Final Environmental Impact Statement
for
Sand Island Shore Protection
Honolulu, Hawaii

State of Hawaii
DEPARTMENT OF LAND AND NATURAL RESOURCES
State Parks, Outdoor Recreation & Historic Sites

89:164-02

March 16, 1989

The Honorable William Paty, Chairman
Board of Land and Natural Resources
Kalanimoku Building
1151 Punchbowl Street
Honolulu, Hawaii 96813

Dear Mr. Paty:

Based on the recommendation of the Office of Environmental Quality Control, I am pleased to accept the Final Environmental Impact Statement for Sand Island Shore Protection as satisfactory fulfillment of the requirements of Chapter 343, Hawaii Revised Statutes, and the Executive Order of August 23, 1971. This environmental impact statement will be a useful tool in the process of deciding whether the action described therein should be allowed to proceed. My acceptance of that statement is an affirmation of the adequacy of that statement under the applicable laws, and does not constitute an endorsement of the proposed action.

When you make your decision regarding the proposed action itself, I hope you will weigh carefully whether the societal benefits justify the environmental impacts which will likely occur. These impacts are adequately described in the statement and, together with the comments made by the reviewers, will provide you with a useful analysis of alternatives to the proposed action.

With kindest regards,

Sincerely,

JOHN WAIHEE

bcc: Hon. John C. Lewin
Dr. Marvin T. Miura

DIVISION OF STATE PARKS, OUTDOOR RECREATION AND HISTORIC SITES

DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE OF HAWAII

This Environmental Document is Submitted
Pursuant to Chapter 343, HRS

FINAL ENVIRONMENTAL IMPACT STATEMENT

SAND ISLAND SHORE PROTECTION

Honolulu, Oahu, Hawaii

PROPOSING AGENCY:

Division of State Parks, Outdoor Recreation and Historic Sites
Department of Land and Natural Resources
P. O. Box 621
Honolulu, Hawaii 96809

ACCEPTING AGENCY:

Governor, State of Hawaii

2/1/89

William W. Paty
Chairperson
Board of Land and Natural Resources

Date

DRAFT
DETAILED PROJECT REPORT
AND
ENVIRONMENTAL IMPACT STATEMENT
SAND ISLAND SHORE PROTECTION, OAHU, HAWAII

TABLE OF CONTENTS

	Page
Table of Contents	i

MAIN REPORT

I. INTRODUCTION	
A. Purpose	1
B. Study Authority	1
C. Study Area	1
1. State of Hawaii	
2. Oahu	
3. Sand Island	
D. Scope of the Study	4
E. Study Participants and Coordination	4
F. Report Preparation	4
G. Prior Studies	5
II. PROBLEM IDENTIFICATION	
A. Purpose	6
B. National Objectives	6
C. Profile of Existing Base Conditions	7
1. History and Culture	
2. Physical Setting	
3. Environmental Setting	
4. Economic Characteristics	
5. Recreational Resources	
D. Future (Without Project) Conditions	16
E. Problems and Needs	18
1. Historical Development	
2. Problem Description	
3. Related Problems and Needs	
F. Planning Objectives	30

		Page
III.	FORMULATION OF PRELIMINARY PLANS	
	A. General	31
	B. Possible Management Measures	31
	1. Nonstructural Measures	
	2. Structural Measures	
	C. Preliminary Screening	34
	1. Nonstructural Measures	
	2. Structural Measures	
IV.	DEVELOPMENT OF DETAILED PLANS	
	A. General	38
	B. Design Considerations	38
	C. Alternative Plan 1	38
	D. Alternative Plan 2	39
	E. Alternative Plan 3	40
V.	ASSESSMENT AND EVALUATION OF ALTERNATIVE PLANS	
	A. General	43
	B. Economic Feasibility	43
	1. Benefits	
	2. Costs	
	3. Benefit to Cost Comparison	
	C. Cost Apportionment	45
	D. Trade-Off Analyses	46
	E. Designation of NED Plan	47
	F. Candidate for the Recommended Plan	47
VI.	THE SELECTED PLAN	48
VII.	CONCLUSIONS AND RECOMMENDATIONS	49
VIII.	BIBLIOGRAPHY	50
	ENVIRONMENTAL IMPACT STATEMENT	

APPENDICES

APPENDIX A: PLAN FORMULATION CRITERIA AND COMPLIANCE REPORTS

APPENDIX B: PUBLIC INVOLVEMENT

APPENDIX C: GEOLOGY, FOUNDATIONS AND MATERIALS

APPENDIX D: ENGINEERING AND COST ESTIMATES

APPENDIX E: ECONOMIC EVALUATION

APPENDIX F: NATURAL RESOURCES

APPENDIX G: DRAFT EIS PUBLIC REVIEW PHASE, COMMENTS AND RESPONSES

LIST OF FIGURES AND PHOTOS

Figure No.	Title	Page
1.	Location Map	2
2.	Vicinity Map	3
3.	Wind Diagram	9
4.	Recreational Development Plan and Surrounding Uses	15
5.	1995 Harbor Master Plan	17
6.	Historical Development of Sand Island	19
7.	Erosion Progression: 1975-1982	follows pg 20
8.	Shoreline Erosion	follows pg 20
9.	Shoreline Protection Structures	33
10.	Alternative Plan 1	follows pg 38
11.	Alternative Plan 2	follows pg 40
12.	Alternative Plan 3	follows pg 40
13.	Typical Sections	41

Photo No.	Description	Page
1-3	Conditions Along Reach 1	21
4-7	Conditions Along Reach 2	22-23
8-9	Conditions Along Reach 3	24
10	Conditions Along Reaches 4 & 5	25
11	Sand Island State Park Improvement	25

LIST OF TABLES

Table No.	Title	Page
1.	Population Projections: 1975-2000	12
2.	Land Use	13
3.	Sand Island State Park Visitor Count	16
4.	Recreation Activity Needs	29
5.	Summary of Alternative Measures in Relation to Planning Objectives	35
6.	Cost Summary	44
7.	Economic Comparison	44
8.	Cost Apportionment	45
9.	Summary Comparison and System of Accounts	follows pg 46

SUMMARY

PROPOSED PROJECT: Sand Island Shore Protection

PROPOSING AGENCY: Department of Land and Natural Resources
Division of Water and Land Development
Division of State Parks
State of Hawaii

PROJECT LOCATION: TMK: 1-5-41:62
Honolulu, Oahu, Hawaii

PROJECT DESCRIPTION:

The study area is located on Sand Island on the southern coast of Oahu (Fig 2). Approximately 520 acres in area, Sand Island shelters Honolulu Harbor from the open sea and is connected to the Kapalama peninsula by a bascule bridge at its western end.

The study site consists of approximately 4700 feet of shoreline on the south side of the island adjacent to the State park.

The study focused on the evaluation of shore erosion and related problems at Sand Island State Park and their impacts upon the overall environmental, cultural, and recreational resources of the area. Alternative plans for protecting the shore from further erosion were developed, and the costs, benefits, and environmental impacts associated with implementing these plans were evaluated.

Three plans were evaluated for the Sand Island Shore Protection Study. These plans were Plan 1 - Riprap revetment, Plan 2 - Offshore protective structures, and Plan 3 - Combination

of Revetment and Offshore protective structures.

Plan 3 is the tentative recommended alternative because of its greater overall benefits. There is no nonstructural plan that will fulfill the goals of the project. The project is expected to have a beneficial impact on the environment in the study area by eliminating erosion along that stretch of shoreline, and by providing more rocky intertidal habitat for benthic organisms.

There are no unresolved issues. There is compatibility with land use plans and policies as shown in Table 2 (EIS-2,3). The permits that have been filed are the Shoreline Management Area permit and the Conservation District Use Application permit.

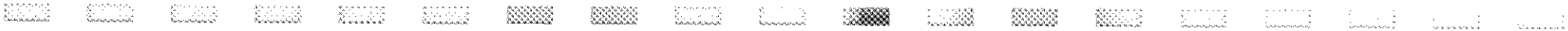
PURPOSE AND NEED FOR ACTION

The purpose of this study is to identify the cause and extent of erosion on the south shoreline of Sand Island and to determine the feasibility in providing protective measures at the problem area. The study area begins at the southeast corner of Sand Island next to the harbor entrance and terminates at the Island's southwest corner. Approximately 2000 feet of this shoreline is unprotected against wave action because of the partial or complete failure of the original revetment. The resulting erosion of the shoreline is in a progressive stage and is evident in the aerial photos in Figure 7.

The Sand Island area is the site of a variety of

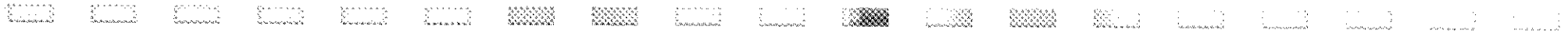
recreational opportunities. The nearshore waters around the island are an attractive resource that provides an assortment of recreational activities such as sailing and boating, water skiing, sunbathing, fishing, limu (seaweed) gathering, snorkeling, and swimming.

Due to the diversity of activities at the project location, action is needed in order to prevent further erosion of the shoreline.



SAND ISLAND
SHORE PROTECTION

MAIN REPORT



I. INTRODUCTION

A. PURPOSE

The purpose of this study is to identify the cause and extent of erosion on the south shoreline of Sand Island, Oahu, Hawaii, and to determine the feasibility and justification of Federal participation in providing protective measures at the problem area.

B. STUDY AUTHORITY

The Sand Island Shore Protection Study was initiated following a written request, dated 9 September 1981, from the Chairman of the Board of Land and Natural Resources, State of Hawaii.

The study and report were accomplished under the authority provided by Section 103a of the River and Harbor Act of 1962, as amended, and in accordance with the policies and procedures prescribed by the Chief of Engineers.

C. STUDY AREA

1. State of Hawaii

The Hawaiian Islands are centrally located in the Pacific Ocean, extending approximately 1,700 miles northwest to southeast from about 155° to 179° W longtitude and 19° to 28° N latitude. The eight major islands, seven of which are inhabited, form a 400-mile arc at the southeastern end of the archipelago (Figure 1).

Land area of the State totals 6,425 square miles. The Island of Hawaii, the "Big Island" accounts for 4,037 square miles. The remainder is divided among the Islands of Maui (728), Oahu (593), Kauai (549), Molokai (261), Lanai (139), Niihau (70), Kahoolawe (45), and the northwest leeward islands, all of which are small islets, rock atolls, or exposed reefs (total of 3 square miles).

2. Oahu

Oahu is the third largest island in the State in terms of land area and includes a total coastline of approximately 137 statute miles. It serves as the center of business, government, social, cultural, economic, and military activities for the State of Hawaii. Honolulu, the State capital, is located on the Island of Oahu, approximately 2,400 miles southwest of the US Mainland.

3. Sand Island

The study area is located on Sand Island on the southern coast of Oahu (Fig 2). Approximately 520 acres in area, Sand Island shelters Honolulu Harbor from the open sea and is connected to the Kapalama peninsula by a bascule bridge at its western end.

The study site consists of approximately 4,700 feet of shoreline on the south side of the island adjacent to the State park.

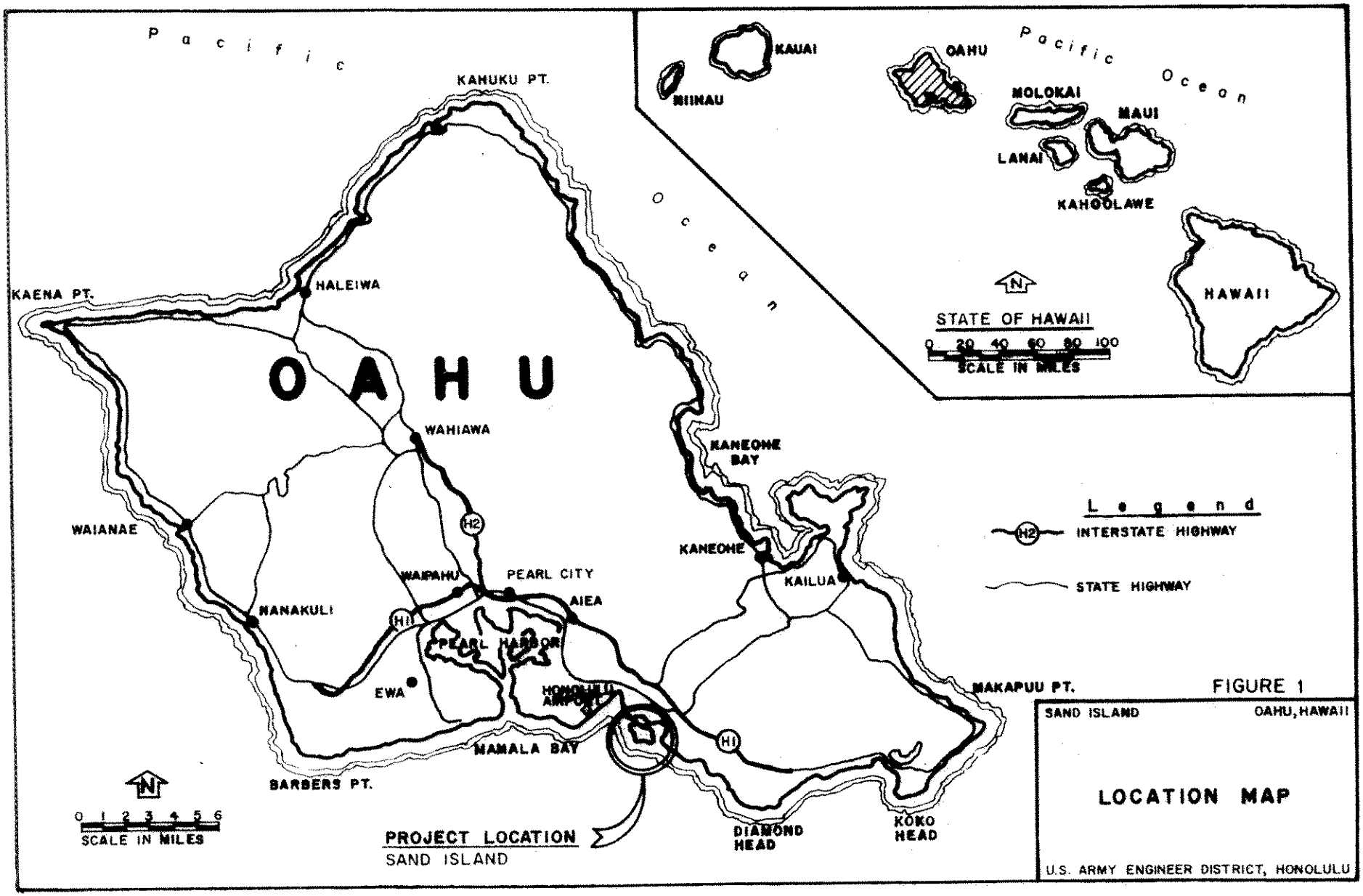


FIGURE 1

SAND ISLAND — OAHU, HAWAII

LOCATION MAP

U.S. ARMY ENGINEER DISTRICT, HONOLULU

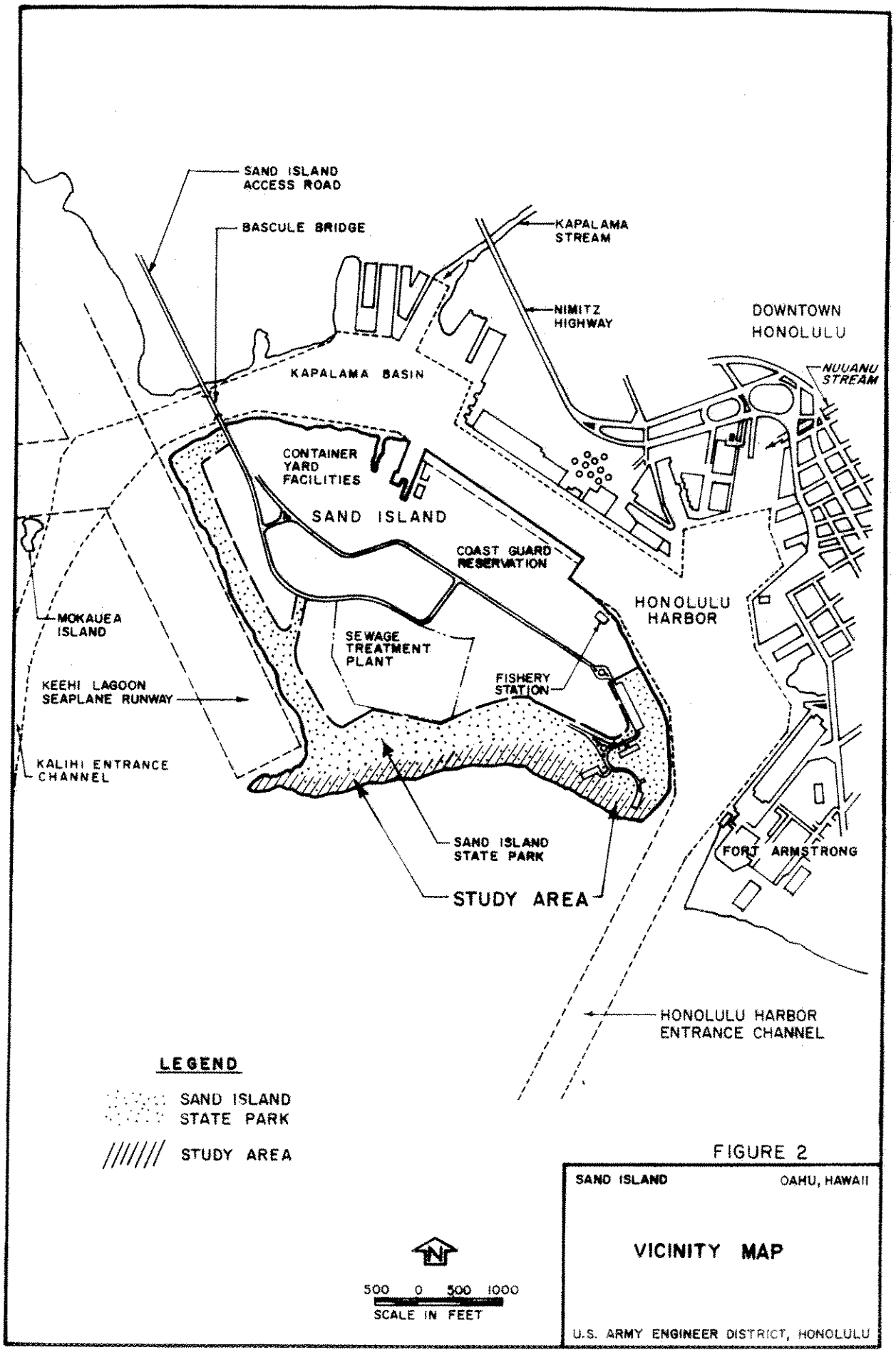


FIGURE 2

SAND ISLAND OAHU, HAWAII

VICINITY MAP

U.S. ARMY ENGINEER DISTRICT, HONOLULU

D. SCOPE OF THE STUDY

The study focused on the evaluation of shore erosion and related problems at Sand Island State Park, Oahu, Hawaii, and their impacts upon the overall environmental, cultural, and recreational resources of the area. Alternative plans for protecting the shore from further erosion were developed, and the costs, benefits, and environmental impacts associated with implementing these plans were evaluated.

Studies conducted included archaeological-cultural site investigations, hydrographic and topographic surveys, geologic, foundations and materials investigations, fish and wildlife studies, oceanographic and meteorological studies, engineering designs, economic evaluations and environmental assessments.

All studies were conducted in sufficent depth and detail to define the problem, to develop alternative plans for public review and comment, and to evaluate those alternative plans for selection of a recommended course of action.

E. STUDY PARTICIPANTS AND COORDINATION

The U.S. Army Corps of Engineers, Honolulu District, was responsible for conducting and coordinating the overall study and preparing the study report. Studies and investigations were performed with the assistance of the State of Hawaii, Department of Land and Natural Resources (DLNR), Division of State Parks, Outdoor Recreation and Historic Sites, which initially requested the study, and serves as local sponsor.

Governmental agencies (Federal, State, and local), community groups, and private interests were contacted during the study to help identify study concerns, to obtain pertinent study information, and to develop and evaluate alternative plans. A list of those contacted and the Public Involvement program are presented in Appendix B.

F. REPORT PREPARATION

This Detailed Project Report (DPR) constitutes the project document for construction approval for the Corps of Engineers small shore protection projects. Construction plans and specifications can be initiated after acceptance of the DPR by the Chief of Engineers.

This document consists of a main report and a series of appendices. The main report is a self-contained document which describes the planning process and includes the Environmental Impact Statement. The appendices contain technical and detailed information and background data to support the information contained in the main report.

Appendix A, Plan Formulation Criteria and Compliance Reports, contains specific information regarding the study authority, legislative requirements, planning criteria and constraints, and local cooperation requirements that contribute to the plan formulation process of the study. Also included in this appendix are the evaluation reports required by Executive Order 11988 on Flood Plain Management, Section 404 of the Clean Water Act, and the Coastal Zone Management Act.

Appendix B, Public Involvement, describes the public involvement program and contains pertinent correspondence and public comments received during the study and evaluation period.

Appendix C, Geology, Foundations and Materials, contains the analyses and data relevant to the geologic, soils and foundation design assumptions.

Appendix D, Engineering and Cost Estimates, contains the engineering analyses and data relevant to the design of the proposed shore protection improvements. This appendix also provides cost estimates for each alternative.

Appendix E, Economic Evaluation, contains the economic background, data, and analyses for determining the benefits associated with each alternative plan.

Appendix F, Natural Resources, contains the Fish and Wildlife Service Coordination Act Report consultation with the National Marine Fisheries Service.

G. PRIOR STUDIES

A reconnaissance report on shore protection at Sand Island was completed by the Honolulu Engineer District in March 1982. The report established the Federal interest in providing shore protection for the study area and served as the basis of this DPR.

Another DPR and Environmental Statement, completed in September 1978, studied the feasibility of providing protection for the Sand Island shoreline fronting Honolulu Harbor and the entrance channel. This DPR recommended the construction of 2,500 feet of protective revetment. Construction was completed in September 1980.

II. PROBLEM IDENTIFICATION

A. PURPOSE

The purpose of Problem Identification is to further define the study area and the problems to be addressed in the study. This includes describing the base conditions, identifying public concerns, establishing planning criteria, and analyzing the problems. Public concerns which relate to water and related land resource problems are identified and then refined based on national and local policies.

To help determine the resource management[1/] problems the base condition of the study area is first defined. The base condition comprises the existing economic, social, and environmental characteristics of the area. Future conditions are then projected and analyzed to determine the "most probable future"[2/] which would prevail over the area without any changes to existing resource management plans. This analysis describes the "without condition" criterion. Planning objectives[3/] are then formulated based on the problems and needs of the area related to the "without condition" criterion.

1/ "Resource management" involves the development, conservation, enhancement, preservation, or maintenance of water and related land resources to achieve the goals of society expressed nationally and locally.

2/ "Most probable future" is the projection of basic demographic, economic, social, and environmental parameters, which is used as the basis for defining the "without condition" and the planning objectives for a particular study.

3/ "Planning objectives" are the national, state, and local water and related land resource management needs (opportunities and problems) specific to a given study area that can be addressed to enhance National Economic Development or Environmental Quality.

B. NATIONAL OBJECTIVES

The Principles and Standards (P&S) for Planning Water and Related Land Resources have traditionally defined the national objectives of national economic development (NED) and environmental quality (EQ). These national objectives guide the formulation and analysis of alternative plans by the Corps of Engineers, Tennessee Valley Authority, Bureau of Reclamation and Soil Conservation Service. Under P&S, the national objectives of NED and EQ were evaluated on an equal basis. The new Principles and Guidelines (P&G), which replaced the P&S, now seek to further one specific objective, the promotion of national economic development:

"The Federal objective of water and related land resources planning is to contribute to national economic development consistent with protecting the Nation's environment pursuant to National environment statutes, applicable executive orders, and other Federal planning requirements.

"Contributions to national economic development are achieved by increasing the net value of the national output of goods and services, expressed in monetary units." 1/

Although EQ is no longer a specific national objective within the new P&G, the P&G in no way repeals any of the existing environmental statutes, nor does it diminish their applicability. Mitigation of adverse effects must continue to be incorporated in the formulation process, and environmental quality considerations must continue to be an integral component of a comprehensive planning process.

C. PROFILE OF EXISTING BASE CONDITIONS

The social, physical, environmental and economic characteristics are briefly described to provide the reader with the general background of the study area. More detailed and specific descriptions are provided in the appendices.

1. History and Culture

As Sand Island is mainly reclaimed land, there is very low probability of prehistoric archaeological sites being located by the planned activities. At present there are no State or National registered sites of historic or prehistoric significance here.

The 38-acre "Quarantine Island" built from 1904-1906 was the site of the immigrant processing facility early in the century. This now central portion of Sand Island served as Hawaii's main World War II internment camp for Japanese "detainees." Reclaimed land nearer to the harbor and entrance was the site for military defense works constructed in the 1940's. Several structures remain and have been incorporated into the present Sand Island State Park.

2. Physical Setting

a. Topography and Physical Features. Sand Island was created by deposition of material from adjacent dredging first in Honolulu Harbor and later in Keehi Lagoon on a shallow reef and sand bar offshore of the harbor. The present island is relatively flat rising from sea level to an elevation of about 8 feet, with occasional small knolls and berms slightly higher.

1/ Economic and Environmental Principle and Guidelines for Water and Related Land Resources Implementation Studies. Water Resources Council, September 9, 1982.

b. Climate. The climate of the Sand Island area is typical of the leeward coastal lowlands of Oahu. The area is characterized by abundant sunshine, predominant trade winds (most persistent through the summer months, May through September), equable temperatures, moderate humidity, and the infrequency of severe storms.

Northeasterly trade winds predominate 65 percent of the year with monthly mean velocities ranging from 8 to 24 miles per hour. Wind conditions for the remainder of the year are illustrated by a wind diagram (Figure 3).

Rainfall is relatively low, averaging 20 to 25 inches a year. Considerable variation from month to month is not unusual, especially during the cooler season when major storms provide much of the rain.

The difference in mean temperature varies only 7 degrees Farenheit (based on the 1941-1970 period) between the warmest months (August and September) and the coolest months (January and February) of the year. Daily maximums run from the high 70's in winter to the mid 80's in summer, and daily minimums from the mid 60's to low 70's, respectively.

c. Oceangraphic Features. The location of Sand Island makes it highly susceptible to wave attack from the southerly direction with wave heights up to 15 feet. It is also vulnerable to tsunamis (seismic seawaves) which can cause appreciable runup or vertical water rise. The tidal data shown below were obtained from the US Coast and Geodetic Survey and are referenced to mean lower low water (MLLW).

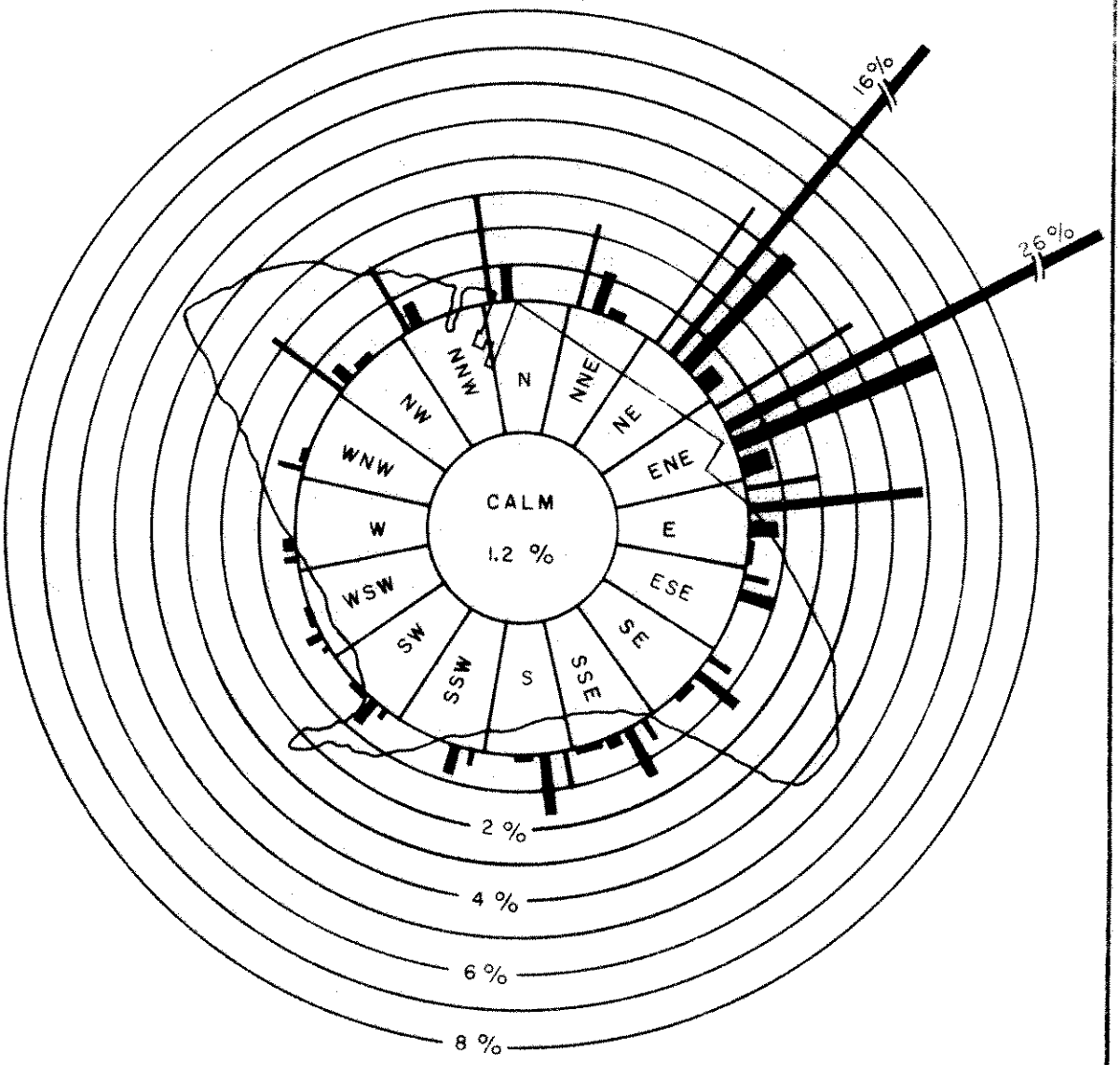
Honolulu Harbor*

Level	Gage Height in Feet
Highest tide observed	3.50
Mean higher high water	1.90
Mean high water	1.40
Mean tide level	0.80
Mean low water	0.20
Mean lower low water	0.00
Lowest tide observed	-1.30

*Measurement period from 1941 - 1959

d. Geology and Soils. The Honolulu Harbor complex is located within the narrow coastal plain, about two miles wide, along Oahu's southcentral coast. The coastal plain ranges in elevation from 0 to 10 feet above sea level and is primarily composed of relic coral reef rocks deposited during prehistoric

HONOLULU INTERNATIONAL AIRPORT
OAHU, HAWAII



NOTE: THE PERCENTAGES AND THE DIRECTIONS ARE AVERAGES DURING THE 13 YEAR PERIOD, 1950 TO 1962 INCLUSIVE.

LEGEND:

- 3.0 - 8.0 MPH
- 8.0 - 18.0 MPH
- 18.0 - 24.0 MPH
- OVER 24.0 MPH
- —8 %— TOTAL % OF YEAR

SOURCE – HONOLULU USWB

FIGURE 3

SAND ISLAND OAHU, HAWAII

WIND DIAGRAM

U.S. ARMY ENGINEER DISTRICT, HONOLULU

(Pleistocene) time when the sea level was higher and is overlain by more recent terrestrial alluvium. Coral reefs surround most of Oahu, extending seaward from the shoreline to form a submarine shelf. The top of the coral reef at the harbor entrance, prior to harbor dredging and filling, stood at 6 to 8 feet below the water surface.

Sand Island is located at the seaward edge of the coastal plain. Basement rock in the area is Koolau basalt, overlain by a reef flat.

Surface and substrata soils of Sand island consist of fill material from port dredging operations. The fill material is characterized by silty sand and coral gravel, which has high porosity and permeability. The conditions of the landfill vary due to the incremental formation of Sand Island. On the older sections some topsoil has evolved or accumulated from dumping activity and is sustaining vegetation. Topsoil has been placed on the State Park grounds for landscaping purposes.

3. Environmental Setting

a. Terrestrial Biota. The terrestrial portion of the study area is primarily developed park land, with some undeveloped land which is planned for additional park development. The vegetation consists of lawn grasses, common trees, shrubs and weeds. There are no exceptional trees nor other unique vegetation in the area.

The fauna on Sand Island is composed of common exotic birds and introduced mammals, and common small reptiles. There are no terrestrial endangered or threatened species in the study area.

b. Marine Biota. The ocean portion of the study area is relatively depauperate. Sixteen species of fish, four species of coral and several species of echinoderms and algae are common but not abundant.

The "tide pools" which have developed in the eroded area behind the existing breakwater provide sheltered habitat for small juvenile fish, especially surgeon fish and goat fish.

4. Economic Characteristics

a. Economic Base. Hawaii is a prosperous state with a growing population and economy. Between 1950 and 1980, the total resident population increased over 93 percent from 498,000 to 965,000. During The same period, the gross State product increased from $900 million to over $11.5 billion. The three largest contributors to the State's economy are tourism, defense expenditures, and agriculture, the bulk of the last activity being in the production of sugar and pineapple. The

most rapid growth during the last several years has been in the tourist industry, which in 1970 became the State's leading export industry. Tourist arrivals totaled 1,520,000 in 1970 and 3,650,000 in 1980. Tourist expenditures were approximately $600 million in 1970 and increased to $3.0 billion in 1980, an increase of about 500 percent. This is compared to an increase of slightly over 200 percent for defense spending during this same period. Growth of the tourist industry, together with the State economy in general, is expected to continue.1/

The Island of Oahu with the major part of the State's population has led the region's economic surge. Oahu, the center of the major military establishment in the State, also has a considerable agricultural and food processing industry as well as the State's largest tourist destination area at Waikiki Beach. These, together with Federal civilian employment, are the basic industries of the Oahu economy.

b. Population. The State of Hawaii's resident population has grown from 154,000 in year 1900, to 633,000 in 1960, 770,000 in 1970, and to 965,000 in 1980. This population is relatively young and racially diversified. Migration has been a major factor in rapid growth. Between 1970 and 1980, there was a net in-migration (excluding military personnel) of 101,000, accounting for 54 percent of the total civilian population growth. The resident population of the island of Oahu in 1980 was 763,000, with an estimated 365,000 living in the Honolulu District.2/ This reflects a population density of 1,290 persons per square mile for the island, and 4,510 persons per square mile for the Honolulu District.

Population projections prepared by the State Department of Planning and Economic Development point to continued growth and are summarized in Table 1.

c. Access and Utilities. All activities on Sand Island are served primarily by Nimitz Highway (State Highway 92) which runs parallel to the inland shore of Honolulu Harbor and offers from six to eight lanes of divided highway.

1/ State of Hawaii Department of Planning and Economic Development; Data Book 1982; Honolulu, Hawaii; November 1982.

2/ Ibid.

Table 1. -- POPULATION PROJECTIONS: 1975 TO 2000

(Excerpt from DATA BOOK 1982, State of Hawaii, Department of Planning and Economic Development; November 1982, page 35.)

Year	De facto population 1/		Resident population 2/			
					Age	
	State total	Oahu	State total	Oahu	Under 15 years	65 years and over
1975 3/	941.3	752.7	884.0	714.3	213.8	54.6
1980 4/	1,052.4	821.9	965.0	762.9	226.0	76.2
1985	1,133.3	866.0	1,020.9	803.8	231.3	93.7
1990	1,229.8	917.6	1,091.5	845.0	246.4	111.7
1995	1,325.0	965.7	1,163.8	885.8	261.2	127.4
2000	1,395.3	996.2	1,225.9	917.4	273.2	142.0

1/ Including visitors present but excluding residents temporarily absent. The estimates of visitors present and residents absent are annual averages.

2/ Including armed forces stationed or homeported in Hawaii and their dependents living in Hawaii but excluding visitors present.

3/ Estimated.

4/ Census data (except de facto population, which is estimated).

Source: Hawaii State Department of Planning and Economic Development, Preliminary Intercensal Population Estimates, 1970-1980 (Statistical Report 147, July 9, 1981), tables 2 and 3 and underlying data; Revised Population and Economic Projections, 1975-2000 (March 1, 1978), pp. 4-5; and De Facto Population Projections for Counties, 1978-2000 (Statistical Memorandum 79-5, April 26, 1979).

Access to Sand Island is limited to the Sand Island Access Road and a two-lane, 250-foot-long bascule bridge which spans the Kalihi entrance channel. Plans for an ultimate four-lane parkway on Sand Island to accommodate the anticipated traffic increases due to the expanded container yard facilities and the State park development are being considered by the State DLNR. Plans are also being developed by the State of Hawaii, Department of Transporation to add a second bridge alongside the bascule bridge. Sand Island State park is presently served by the two-lane asphaltic concrete road which extends the length of Sand Island.

The Honolulu Harbor area, including Sand Island, is adequately serviced by power, water, telephone, and health and safety facilities.

d. Land Use. Table 2 shows a breakdown of land ownership uses for the State of Hawaii and the City and County of Honolulu (Oahu). Both categories show unused open space and agriculture as the largest categories. Recreation space on Oahu comprised only 1.7% of the total, whereas the State had 6.9% of its land use in recreation.

TABLE 2. LAND USE 1/
(Acres)

Land Use	State of Hawaii		Oahu	
	Acres	Percent	Acres	Percent
All Uses 2/	4,045,343	100.0	373,006	100.0
Residential	66,527	1.6	27,702	7.4
Manufacturing	3,836	0.09	1,503	0.40
Mfg. Services	11,023	0.27	2,805	0.75
Commercial	2,390	0.06	1,563	0.42
Services	122,854	3.0	52,669	14.1
Social & Cultural	7,821	0.19	4,135	1.1
Recreation	280,481	6.9	6,322	1.7
(Improved Recreation)	(5,185)	(0.13)	(2,748)	(0.74)
Agriculture	1,346,704	33.3	75,096	20.1
Transportation	6,120	0.15	1,763	0.47
Unused Open Space	2,197,587	54.3	199,448	53.5

1/ Totals may not add due to rounding.
2/ Excludes public streets and highways.

Source: The State of Hawaii Data Book, 1982, Hawaii State Department of Planning and Economic Development.

Present use of Sand Island includes harbor and maritime industries, light industrial activities, a sewage treatment facility, and recreation. Recreation facilities are located within 140 acres designated as park lands, and operated by the State Parks Division, DLNR. The park is being developed incrementally as funding permits.

In addition, another 70 acres have been set aside by the State in a land bank, with its eventual use to be determined at such time when the needs of maritime and recreational activities are better defined.

5. Recreational Resources

Among its multiple uses the Sand Island area is the site of a variety of recreational opportunities. The nearshore waters around the island are an attractive resource that provides an assortment of recreational activities such as sailing and boating, water skiing, sunbathing, fishing, limu (seaweed) gathering, snorkeling, and swimming.

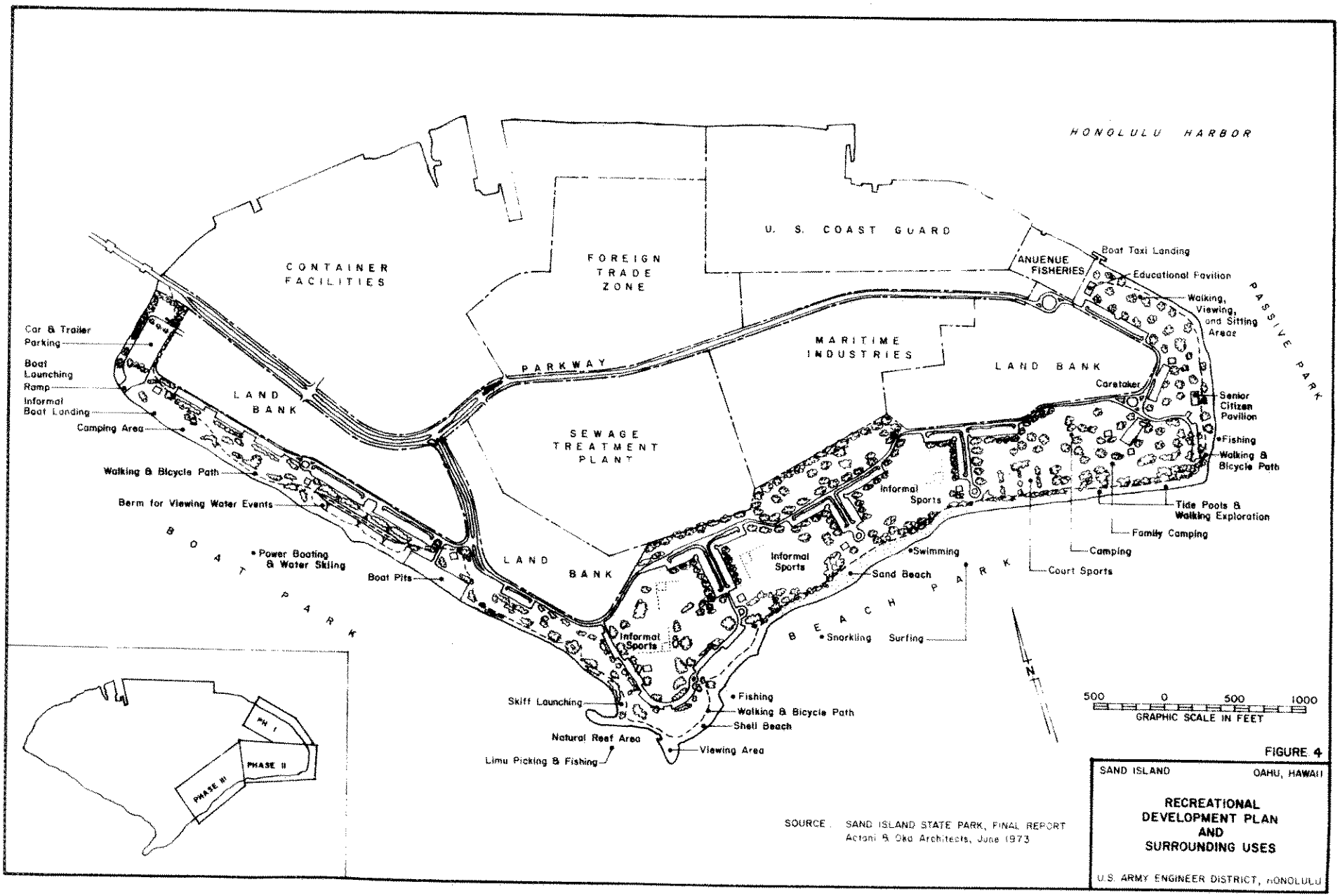
Two unique resources in the study area are the tide pools that have developed along 600-700 feet of the shoreline behind the existing revetment and the surf zone offshore of the sand beach. Both are sensitive to any structural changes in the shoreline and will require assessments of possible negative impacts.

The State of Hawaii, in June 1973 released Sand Island State Park, Final Report 1/ to serve as the Master Plan to guide in the proper development of the onshore areas adjacent to these water-recreational resources (Figure 4). Approximately 140 acres is under the jurisdiction and administration of the DLNR, Division of State Parks, Outdoor Recreation and Historic Sites.

The Master Plan established three general park themes compatible with the existing resources: (1) Boat park along the Keehi Lagoon shore; (2) beach park along the ocean shore, which includes the study area; (3) passive park along the harbor shore.

The first phase of development, which was completed in October 1976, includes approximately 13 acres of passive recreation area along the harbor shoreline on the southeastern end of Sand Island. The second and third phases, nearly completed now, developed camping, picnic and field areas, and water-oriented or beach park facilities along the ocean shoreline of Sand Island. The final phase, which is to establish the boat park along Keehi Lagoon will probably occur within 2-4 years pending availability of funds.

1/ Prepared by Aotani & Oka Architects, Inc., for the Department of Land and Natural Resources, Division of State Parks, Outdoor Recreation and Historic Sites.



SOURCE: SAND ISLAND STATE PARK, FINAL REPORT
Actani & Oka Architects, June 1973

FIGURE 4

SAND ISLAND OAHU, HAWAII

RECREATIONAL DEVELOPMENT PLAN AND SURROUNDING USES

U.S. ARMY ENGINEER DISTRICT, HONOLULU

Sand Island State Park has already established itself as a major regional recreation center judging by the count of users tabulated by the Division of State Parks:

TABLE 3. SAND ISLAND STATE PARK VISITOR COUNT

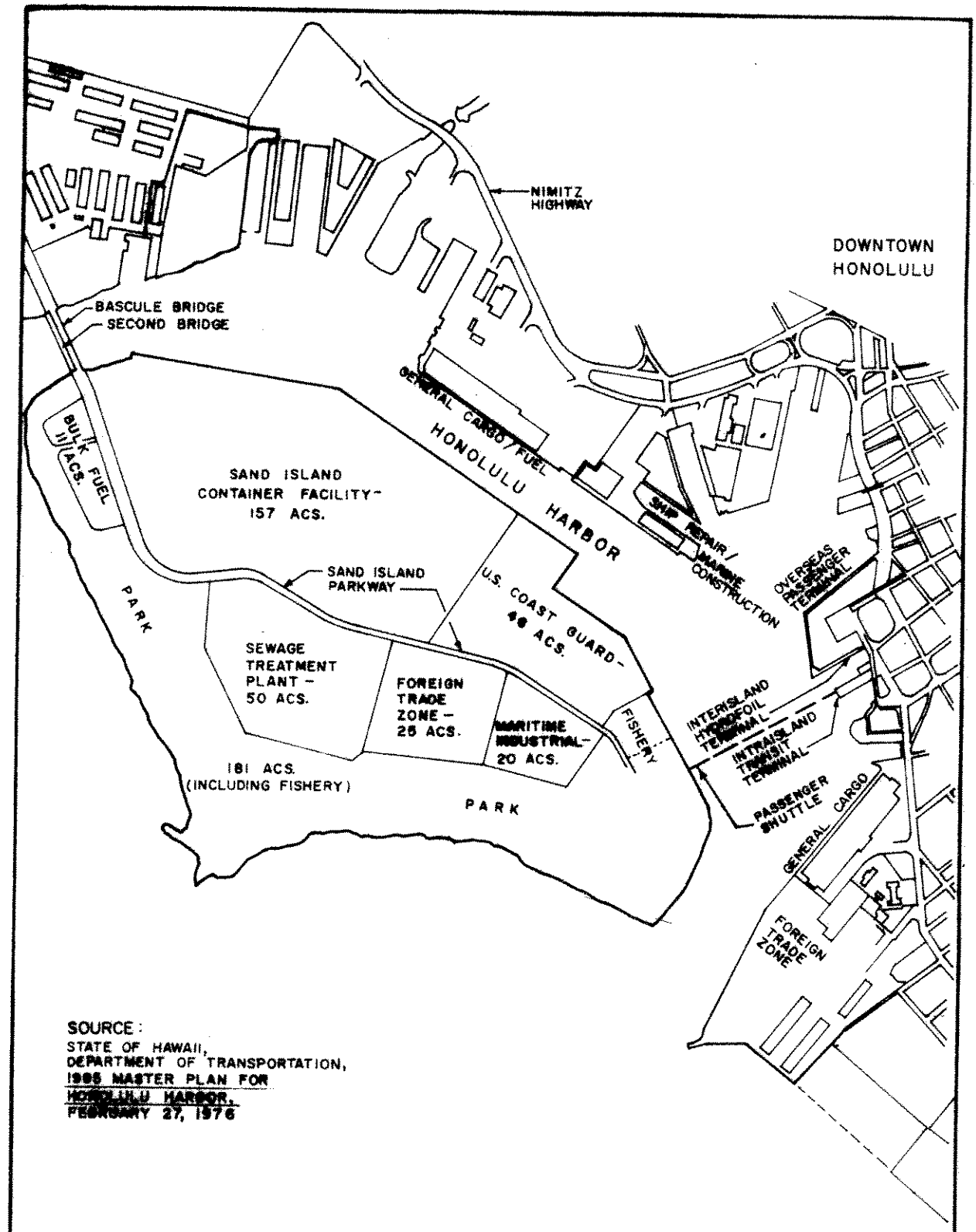
Year Ending	Developed Acreage Improved	Developed Acreage In Use	Visits (1000)	Remarks
June 30, 1976	13	0	0	Phase I developed.
June 30, 1977	13	13	165	Phase I developed.
June 30, 1978	43	13	224	Phase I developed.
June 30, 1979	43	43	285	Phase II developed.
June 30, 1980	43	43	174	Park closed most of year because of construction.
June 30, 1981	66	43	238	Phase III incr 1 developed. Park closed most of the year because of construction.
June 30, 1982	83	43	651	Phase I & II open to public. Phase III incr 2 developed.

D. FUTURE (WITHOUT PROJECT) CONDITIONS 1/

Future plans for the development of the Honolulu Harbor area are guided by the "1995 Master Plan for Honolulu Harbor." This plan was developed by the Multi-Modal Task Force in 1976 as a policy statement for the growth, improvement, reorganization and consolidation of land usage at Hononlulu Harbor (Figure 5). This Master Plan takes into consideration the various interests of governmental agencies, private industry, and community organizations. The development of Sand Island State Park is an integral part of the Master Plan. This document has been approved as the long-range plan for Honolulu Harbor by Governor George R. Ariyoshi, April 23, 1976.

The Downtown Improvement Association (DIA) has produced a Waterfront Design concept of Honolulu Harbor which places emphasis on redevelopment of the Downtown Waterfront to become not only a functional and attractive maritime center, but also a "people-pleasing" place. One of its proposals calls for linking the downtown area to Sand Island State Park via shuttle ferries.

1/ The without-project condition is the most likely condition expected to exist over the planning period in the absence of a plan, including any known change in law or public policy (P&S §713.805).



SOURCE:
STATE OF HAWAII,
DEPARTMENT OF TRANSPORTATION,
1995 MASTER PLAN FOR
HONOLULU HARBOR,
FEBRUARY 27, 1976

FIGURE 5

SAND ISLAND — OAHU, HAWAII

1995 HARBOR MASTER PLAN

U.S. ARMY ENGINEER DISTRICT, HONOLULU

The study area is located on Sand Island State Park, which is about 75% developed at this time. This park is expected to play an increasingly important role in providing shoreline access and ocean related recreational opportunities for the Island of Oahu, and the residents of west Honolulu in particular. Shoreline access has become a significant problem for the residents of the Honolulu metropolitan area. It is not likely that the park use of the study area will be changed to any other uses in the foreseeable future.

If no Federal action is taken to provide adequate shore protection, Sand Island State Park will continue to experience erosion. The extent to which erosion will continue to progress inland cannot be predicted precisely, but because Sand Island is a man-made island consisting of dredged material from Honolulu Harbor, it is doubtful that the shoreline will reach a stabilized condition without any artificial protection. This loss of land will continue to be a threat to the park and all its improvements, such as, comfort stations, pavilions, showers, observation towers, paved roads and parking, utilities and landscaping.

E. PROBLEMS AND NEEDS

1. Historical Development

The first seawalls appeared on Sand Island, then known as Quarantine Island, in 1906 when the Honolulu Harbor entrance channel was deepened to 35 feet and widened to 400 feet by the Army Corps of Engineers, under the Congressional Authorization for improvement of Honolulu Harbor (River and Harbor Act of 3 March 1905). A 3-foot-high reinforced concrete seawall was constructed around Quarantine island in 1906, when it was developed to an oval shape of approximately 38 acres utilizing the dredged material from the harbor entrance improvements (see Figure 6). An L-shaped temporary seawall was also constructed during the same year along the entrance channel and inner harbor areas to retain and protect the approximately 24 acres of reclaimed land (named Sand Island by 1908) developed between the harbor entrance channel and Quarantine Island.

In 1907, dredged material from the inner harbor was placed on and around the reclaimed land described previously, and the temporary seawall was replaced by a permanent U-shaped rubblemound seawall, 2,500 feet in length. The "new" rubblemound seawall was extended 600 feet along the southern end, 1,300 feet along the harbor entrance channel, and 600 feet along tne inner harbor side of the reclaimed land. Dredging of the inner harbor by the Corps of Engineers occurred under the River and Harbor act of 3 March 1905, which also authorized deepening of the harbor to 35 feet and widening to a general width of 1,200 feet. At this point, Sand Island consisted of approximately 32 acres of 7-foot high roughly rectangular land, and approximately 24 acres of irregularly-shaped low reclaimed land (total 56 acres). A U.S.G.S. monument, known as South Base, was established near the eastern shoreline of Sand Island in 1907.

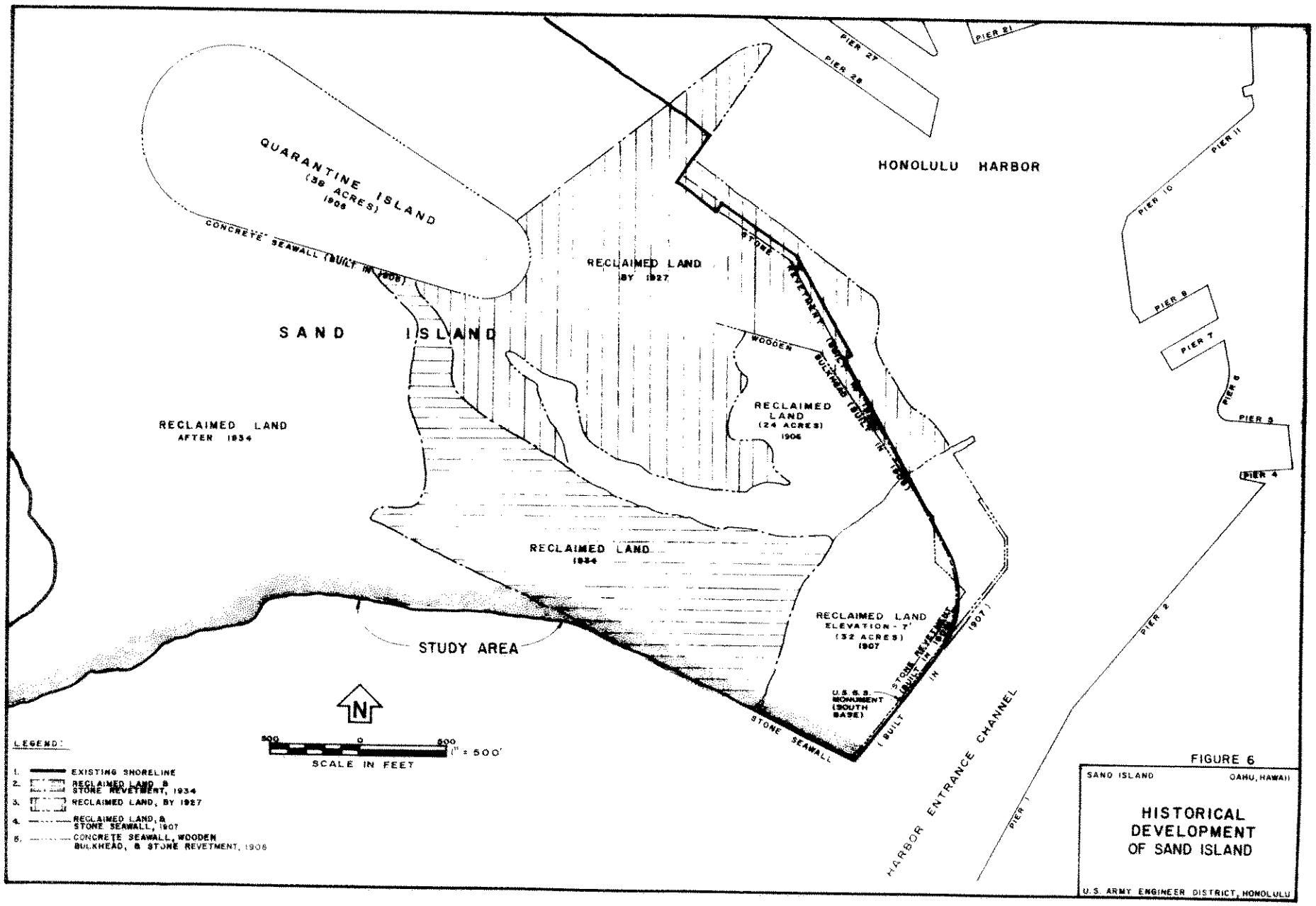


FIGURE 6

SAND ISLAND OAHU, HAWAII

HISTORICAL DEVELOPMENT OF SAND ISLAND

U.S. ARMY ENGINEER DISTRICT, HONOLULU

Dredged material from what is now Kapalama Basin was placed in the area between Quarantine Island and Sand Island and by 1927, these two small islands were land-connected and from then on have been singularly referred to as Sand Island. Both private interests and the territorial government were responsible for the dredging operations.

The seawall constructed in 1907 remained around Sand Island until 1934 when the Corps of Engineers removed a major portion of it for harbor expansion which included removal of a 300-foot wide strip of Sand Island, to provide a smoother turning radius for large vessels. After widening was completed, a 3,400-foot long stone revetment having a one-horizontal to one-vertical slope was constructed to protect the new shoreline. This stone revetment was tied into the original 1907 seawall at the South Base location and terminated within the present U.S. Coast Guard property.

After 1934, the Corps of Engineers' harbor widening and land reclamation activities occurred primarily in the western portion of Honolulu Harbor, including the western shores of Sand Island. Sand Island attained its present shoreline configuration by the mid-1940's.

2. Problem Description.

The 4,700 feet of shoreline within the study area begins at the southeast corner of Sand Island next to the harbor entrance and terminates at the Island's southwest corner. Approximately 2,000 feet of this shoreline is unprotected against wave action because of the partial or complete failure of the original revetment. The resulting erosion of the shoreline is in a progressive stage and is evident in the aerial photos in Figure 7.

For convenience of discussion, the study area can be divided into 5 reaches as shown in Figure 8. Reach 1 consist of 500 feet of the original stone seawall construction in 1907. This reach appears generally stable. However, the structure is over-topped regularly. Coral rubble and small boulders are scattered over the backshore area and scour damage is evident (see Photo No. 1-3).

Reach 2 consists of 1,000 feet of the original structure constructed in 1934. The structure is presently freestanding and consists of boulders placed in a roughly trapezoidal configuration. Large waves regularly overtop the structure, which has resulted in scouring and loss of fill material through the voids between the boulders. Numerous breaches in the structure permit continued erosion of the shore. Debris tossed landward of the structure during storms collect along the shore and create a nuisance and hazard to park users. The structure currently functions as a breakwater and is situated approximately 20 to 40 feet seaward of the eroded shore (Photo No. 4-7).

This erosion action has created a unique situation along this reach of the shoreline--the area shoreward of the structure is now functioning as a tidepool resource with partial protection provided by the original revetment.

	APPROX. SCALE	DATE OF PHOTO
UPPER PHOTO	1"=200'	3-25-75
LOWER PHOTO	1"=215'	9-29-82


1500 FT
REACH 5
1200 FT
REACH 4
800 FT
REACH 3
1000 FT
REACH 2
500 FT
REACH 1
PACIFIC OCEAN
SAND ISLAND
OAHU, HAWAII
SHORELINE
EROSION
U.S. ARMY ENGINEER DISTRICT, HONOLULU

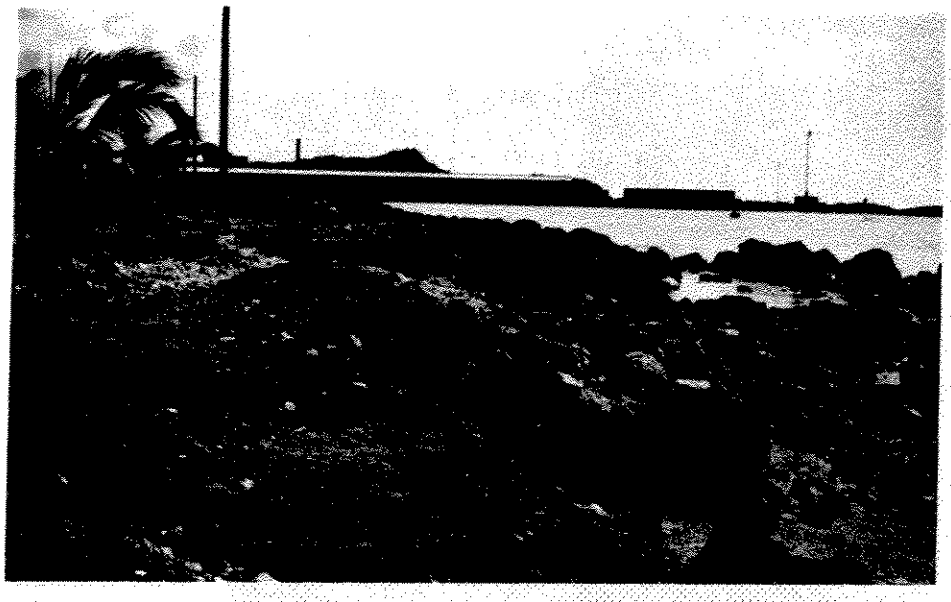


Photo No.1

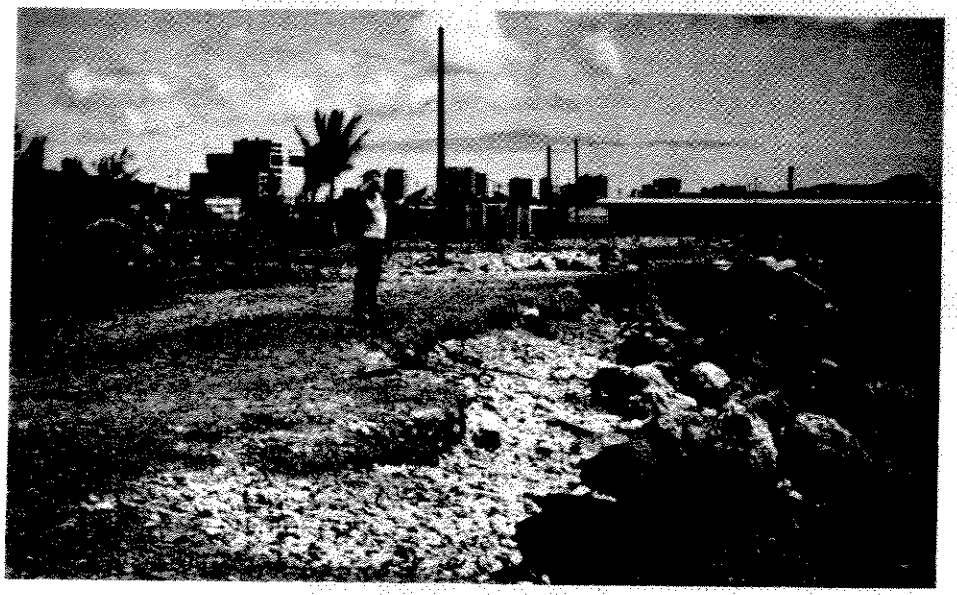


Photo No. 2

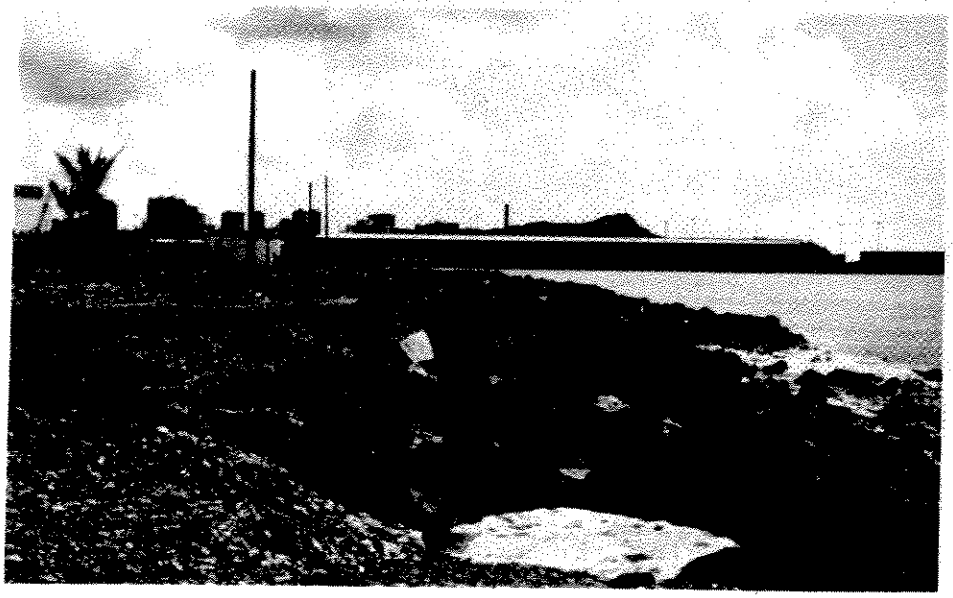


Photo No. 3

Various stages of erosion along Reach 1.

The plan shows Sand Island State Park serving primarily the recreational needs of planning area 21 (Honolulu District) and 29 (Aiea-Pearl City). Most of the coastline in the vicinity of Sand Island is not accessible to the public because of the commitment of shoreline areas for the Pearl Harbor Naval Base, Hickam Air Force Base, Honolulu International Airport, and Honolulu Harbor. The 1980 inventory of beach acreage available to the 282,000 residents of planning areas 21, 24 and 29 totalled 61.8 acres, a ratio of 0.2 acres per 1,000 persons, one of the lowest in the State.

The needs for recreation are reflected in Table 4 compiled by the Division of State Parks and revised following input by the community at public workshops. It indicates that demand for coastal recreation activities in planning areas 21 and 29 is not being met by existing facilities. It therefore becomes crucial to eliminate or substantially reduce the erosion problem at Sand Island State Park.

The numerical codes shown in the table on Revised Recreation Activity Needs indicate the action taken regarding the ranking. Codes 1 to 6 indicate that the rank has been revised and codes 7 to 9 indicate that there have been no revisions. The numerical codes are explained below.

Code 1 indicates that the need ranking has been revised to a higher level based on statements of: lack of or inadequate facilities (including support facilities); lack of or inadequate programs; lack of or inadequate access to resource or facility; conflict with other uses which might be hazardous; physical features which are dangerous to recreation; game and fish resources which have been depleted or adversely affected; coastal and inland resource features which have been polluted or adversely affected; and lack of information on the availability of programs and facilities.

Code 2 indicates that the need ranking has been revised to a higher need based on statements of crowded conditions, including seasonal peaks.

Code 3 indicates that the need ranking has been revised to a higher need based on statements of: poor maintenance of facilities, including upkeep and security; and regulations and other management practices which inhibit increased participation.

Code 4 indicates that the need ranking has been revised to a higher need based solely on community response because no participation was noted in the survey data.

Code 5 indicates that the need ranking has been revised to a higher need based on the response but not included in the County (or regional) summary because the revision was based on a site specific observations.

Code 6 indicates that the need ranking has been revised to a lower need based on statements of the prohibitive costs of facilities.

TABLE 4. REVISED RECREATION ACTIVITY NEEDS: CITY AND COUNTY OF HONOLULU - 1980

		Revised Need Ranking								
		(21)	22	23	24	25	26	27	28	(29)
	Activity	HONOLULU SUMMARY	KAHALA TO KALIHI	EWA	CENTRAL OAHU	EAST HONOLULU	KOOLAUPOKO	KOOLAULOA	NORTH SHORE	WAIANAE	AIEA-PEARL CITY
REGIONAL	Hiking	M	H8	*8	M9	L8	L4	M6	M9	L9	L8
	Hunting	L	L6	L4	*9	L4	L4	L4	L9	*9	L4
	Camping at an Inland Park	M	L8	*8	H9	H8	L6	H5	*9	*9	L8
	Golf	H	H8	*8	H9	H8	M6	L5	H9	L9	H8
	Diving	M	M7	M1	L9	M7	L8	H4	L9	H9	M1
	Surfing	M	M7	H1	*9	M7	M8	H5	M9	M9	M1
	Canoe Paddling	H	H1	L4	*9	H1	M4	H1	*9	*9	H4
	Fishing	H	(H1)	H7	*9	H1	M7	H1	M9	M9	(H1)
	Swimming/Sunbathing at a Beach Park	H	(H1)	H7	*9	H7	H1	H1	H9	L9	(H7)
	Picnicking at a Beach Park	H	(H1)	H7	*9	H7	H5	H1	L9	L9	(H1)
	Camping at a Beach Park	H	(H4)	H3	*9	H4	H8	H7	H9	H9	(H4)
	Boating from Boat Launch Ramps	H	H7	H5	L9	H7	H8	H1	L9	H9	H7
	Boating from Slips and Moorages	M	L8	H8	*9	H8	H1	L5	L9	L9	*8
LOCAL	Active Games	H	L9	M9	L9	L9	L9	L9	H9	H9	L9
	o Field Games	H	H1	H7	H9	H1	H7	H2	H9	H9	H7
	o Court Games	H	H1	H1	L9	H1	H1	H1	H9	L9	H7
	Tennis	M	H1	M6	H9	H7	M3	H1	H9	L9	H7
	Swimming/Sunbathing at a Pool	H	L8	H7	H9	H8	L6	H7	H9	L9	H8
	Walking	H	H7	L6	H9	H7	H8	H7	H9	H9	H8
	Jogging	H	H1	M7	H9	H7	H7	H1	M9	M9	H8
	Picnicking at an Inland Park	M	H1	*8	*9	H1	M8	*8	L9	H9	H1
	Attending Outdoor Events	M	H1	L4	L9	L8	M8	L8	L9	M9	M8
	Bicycling	M	H1	H7	H9	H1	M6	H1	M9	M9	H1
	Motorcyling	L	L7	L7	L9	L8	L8	H1	L9	L9	L8
	Others	M	L9	*9	M9	M9	L9	*9	M9	M9	M9

* Insufficient data/no supply/no demand.
L = Low M= Medium H= High

Code 7 indicates that the need ranking has not been revised because the community rank is the same as the projected need.

Code 8 indicates that the need ranking has not been revised because the workshop vote did not identify a majority position or because no reasons were given to support a revision in ranking.

Code 9 indicates that the need ranking has not been revised because no respondents were available from the planning area at that workshop, or no responses were given.

b. Aesthetics. Much of the shoreline of the park within the study area is presently in very poor condition. The unpleasant visual impact is a combination of the deteriorating revetment, areas of severe erosion, and the remnants of World War II concrete rubble and debris.

Restoration of the existing degraded shoreline of the study area will greatly improve the overall appearance and aesthetic quality of the park.

F. PLANNING OBJECTIVES

Based on the analyses of social, economic, and environmental aspects of the study area, the identification of problems and needs; and the concerns and wishes of the public and local sponsor, the following planning objectives have been developed to guide the formulation and evaluation of alternative plans of improvement for shore erosion problems within the study area, consistent with the Federal NED objective.

1. Eliminate or substantially reduce shoreline erosion within the study area.

2. Protect and enhance recreational activities and educational opportunities along the shoreline.

3. Preserve and enhance the visual/aesthetic qualities of the park and shoreline.

4. Protect and enhance the water quality and fish and wildlife resources of the study area.

III. FORMULATION OF PRELIMINARY PLANS

A. GENERAL

This section of the report is directed toward the development and evaluation of alternative measures to resolve the problems and needs of the study area and to fulfill the planning objectives defined in the previous section. A preliminary screening of possible solutions will eliminate obviously inappropriate plans. Those considered to be most feasible will be carried into detailed planning and design. Detailed analyses will involve the examination of the environmental impacts, technical adequacy, economic efficiency and social acceptability of alternative plans within the framework of national and local planning objectives.

The formulation and evaluation of the alternative measures were based on the Water Resources Council's Principles and Guidelines, statutory and regulatory requirements of the Federal Government, and related Corps of Engineers regulations.

B. POSSIBLE MANAGEMENT MEASURES

In accordance with Corps of Engineers' planning policies and regulations, various types of management measures must be examined for applicability and feasibility, depending on the study area and problem. They may also be used in a combination of ways to complement each other. Local desires may also dictate the possible utilization of various measures as one measure may be more desirable by one community or individual homeowner. Management measures are usually classified as either nonstructural or structural and are identified and described in this section.

1. Nonstructural Measures

In accordance with Corps of Engineers planning policies and regulations, nonstructural measures must be examined for applicability and feasibility.

a. Vegetative Stabilization. Planting vegetation along the eroding shoreline may reduce the rate of erosion within the study area. The type of vegetation selected must be capable of adapting to the low rainfall and wave exposure of the study area.

b. Shoreline Management. Shoreline management at Sand Island State Park would involve planning for shoreline uses which would be compatible with the recognized erosion risk. Open-space park use is considered compatible with such recognized risk; however under shoreline management, a setback zone would be established along the shoreline, in which no damageable structures would be constructed. All future damageable structures would be confined to interior areas where erosion would not threaten them. Existing facilities within the recognized setback zone would be reconstructed to withstand erosion or relocated to the interior area.

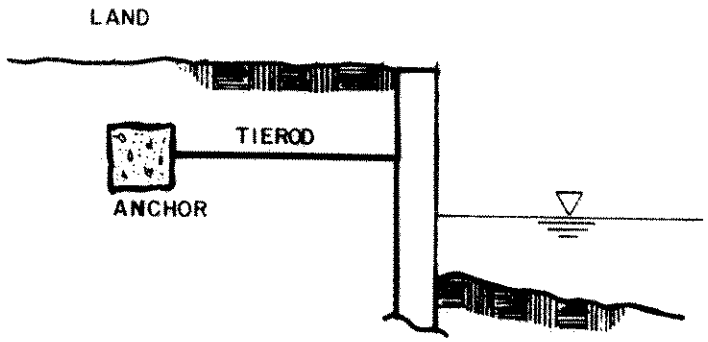
2. Structural Measures (Figure 9)

a. Bulkhead. A bulkhead is a structure which retains or prevents sliding of land and protects land against erosion damages. Precast concrete sheet pile, steel sheet pile, or timber pile can be installed in an upright position along the shoreline and held in that position by tie-rods anchored to concrete blocks buried in the inland area.

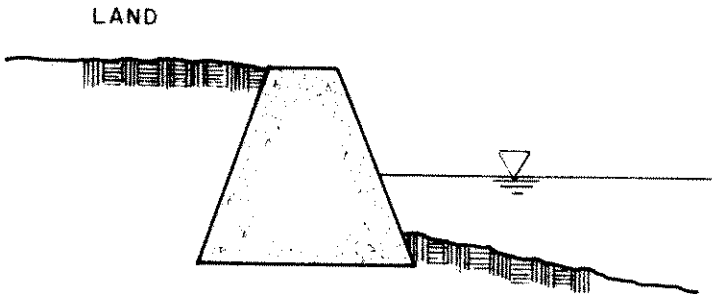
b. Seawall. A seawall is a structure separating land and water areas, primarily designed to prevent erosion and other damages caused by wave action. Seawalls are similar to the gravity retaining walls used on dry land. The stability of a seawall against wave and earth forces depends on its massive weight. The facing is generally vertical or a steep slope.

c. Revetment. A revetment is a facing of stone, concrete blocks, sandbags, or other materials, built to protect a scarp, embankment, or shore structure against erosion caused by wave action. Revetments can be permeable or nonpermeable depending on the choice of materials.

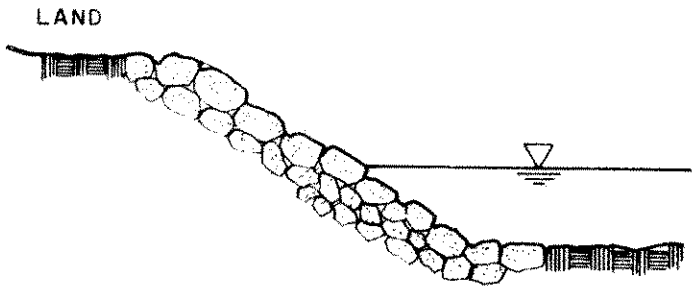
d. Offshore Breakwater. An offshore breakwater is a structure designed to protect an area from wave action. This structure is usually constructed to intercept the movement of littoral material by dissipating the wave forces that would normally move it. In the same manner, an offshore breakwater can provide shoreline protection by dissipating wave energy that would normally strike the shore and cause erosion. Offshore breakwaters may be built as low profile structures, or to a height sufficient to prevent overtopping under design wave conditions, depending on the degree of protecion desired. They can be continuous for long distances or segmented with passages between to allow exchange of water, and are generally of rubblemound construction.



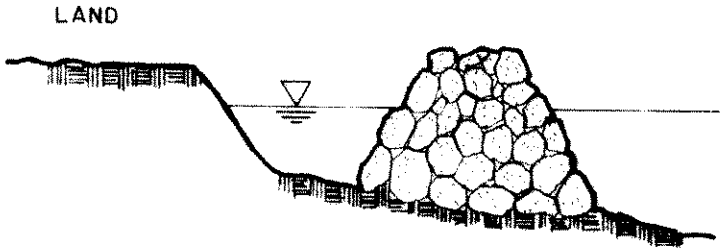
BULKHEAD



SEAWALL



STONE REVETMENT



OFFSHORE BREAKWATER

FIGURE 9

SAND ISLAND OAHU, HAWAII

SHORELINE PROTECTION STRUCTURES

U.S. ARMY ENGINEER DISTRICT, HONOLULU

C. PRELIMINARY SCREENING

Management measures are further considered here. Viability and applicability of each measure to the problems and needs of the study area are discussed and evaluated on the basis of the technical, economic, environmental, and social criteria defined in this section of the report, and the planning objectives defined in the previous section. An evaluation matrix has been prepared to facilitate the preliminary screening process and shows the relationship of each alternative measure to the four planning objectives developed for this study (Table 5).

Public input to this preliminary screening process came from the Kalihi-Palama Community Council. At its October 4, 1982 meeting, the Council indicated that it would prefer an ungrouted rock structure, as opposed to concrete. The members also expressed a desire to see the tide pools preserved.

1. Nonstructural Measures.

   a. Vegetative Stabilization. In order to successfully implement this measure, the shoreline would have to be specially prepared for seeding or planting. The type of vegetation planted or seeded would have to be tolerant of recurring salt water inundation, and be able to quickly develop a sufficient amount of root biomass to resist erosive and physical damage due to wave action, and human foot traffic. In addition, the vegetation must be suited to the low rainfall conditions of Sand Island. This measure is not considered an acceptable alternative partially because of the difficulties associated with successfully establishing a fully developed root system. More importantly, vegetatively barriers are not capable of protecting the shore from anticipated over-topping waves and can only be considered a partial solution or a measure to be used in conjunction with other measures.

   b. Shoreline Management. This alternative does not prevent erosion nor does it substantially meet any of the other planning objectives established for this study. Establishment of the erosion setback area would also be very difficult due to the problems associated with estimating the future configuration or width of erosion area. It is likely that liberal amounts of land would have to be set aside to allow for the uncertainty of estimating the limits of erosion-prone areas. Since the erosion would not be reduced, existing facilities and structures located within this setback zone may be damaged or lost unless reconstructed or relocated inland. Discussions with State Parks representatives indicate that this alternative would not be compatible with their plans to maximize recreational opportunities on Sand Island. It also precludes the accrual of additional benefits for the "with-project" condition. Therefore, implementation of shoreline setback would not be a feasible or acceptable alternative to those most concerned about the recreational opportunities and resources of Sand Island.

TABLE 5. SUMMARY OF ALTERNATIVE MEASURES IN RELATION TO PLANNING OBJECTIVES

○ Does not meet planning objectives

◒ Partially meet planning objectives

● Meet planning objectives

PLANNING OBJECTIVES	ALTERNATIVES					
	NONSTRUCTURAL		STRUCTURAL			
	Vegetative Barriers	Shoreline Management	Offshore Breakwater	Stone Revetment	CRM Seawall	Bulkhead
1. Eliminate or substantially reduce shoreline erosion at the study area.	◒	○	●	●	●	●
2. Protect and enhance recreational activities and educational opportunities along the shoreline.	◒	◒	◒	◒	◒	◒
3. Preserve and enhance the visual/aesthetic qualities of the park and shoreline.	◒	○	◒	◒	◒	◒
4. Protect and enhance the water quality and fish and wildlife resources of the study area.	◒	◒	●	●	◒	◒

2. Structural Measures.

a. Bulkhead. A bulkhead would retain the greatest area of usable land for Sand Island State Park since its vertical configuration would require very little space for installation. However, this alternative has certain significant disadvantages, which do not conform with planning objectives and evaluative criteria.

Because of its vertical face, a bulkhead along the shoreline would present safety hazards to park users and greatly diminish the recreational resource capability of the shoreline by further impeding access to the land-water interface. Its high reflectivity of waves would also adversely affect the offshore surfing areas. The cost of a bulkhead is very high compared to a gravity seawall or a stone revetment, primarily due to the extensive concrete "deadman" anchoring system. Visually, a bulkhead's impact on Sand Island State Park would be less than appealing.

On the basis of the high cost of construction and the large-scale impact on the park's shoreline, as expressed by the Kalihi-Palama Community Council, this alternative was not considered as a viable alternative for further detailed evaluation.

b. Seawall. The vertical configuration of a seawall allows maximum use of land areas for Sand Island State Park, and a cement-rubble-masonry (CRM) seawall would be more aesthetically pleasing than a solid concrete structure. However, like the bulkhead, a seawall would present safety hazards to park users, have little wave energy dissipation capability, virtually eliminate the recreational resources of the shoreline, and disrupt the offshore surfing zone with reflected waves. Because of these factors, the seawall alternative was not considered for further evaluation.

c. Revetment. Although the sloping face of a revetment requires a certain amount of usable land area from the park, it appears to be relatively compatible with the planning objectives of this study. A permeable stone structure has excellent capacity for dissipating wave energy and has wildlife enhancement values in providing a marine habitat and refuge for small fish. Its visual impact is not quite as severe, and its cost not as high, as a seawall or a bulkhead.

The revetment alternative appears to be a workable solution and will be considered for further study with appropriate effort to mitigate any negative impacts.

d. Offshore Breakwater. Offshore breakwaters appear to be also well-suited for this area. The nature of the construction materials and design creates an efficient wave energy absorber with a very small reflection coefficient. This alternative would also create a sheltered swimming area, and not interfere with the existing tide pools. Like the revetment, a permeable stone structure would also create a marine habitat for small fish, mollusks, and crustaceans.

Although more costly to install than revetments, offshore breakwaters will be considered for further study as a viable alternative.

IV. DEVELOPMENT OF DETAILED PLANS

A. GENERAL

This section of the report is directed toward the development of detailed design and evaluation for analyzing specific plans and configurations. The formulation of design plans was guided by specific technical, economic and environmental criteria which are documented in the supporting appendices, and the four specific planning objectives, or desired outputs, that were developed to further the Federal objective of National Economic Development. These four objectives are reiterated here:

1. To eliminate or substantially reduce shoreline erosion at the study area.

2. To protect and enhance recreational activities and educational opportunities along the shoreline.

3. To preserve and enhance the visual and aesthetic qualities of the park and shoreline.

4. To protect and enhance the water quality and fish and wildlife resources of the study area.

Planning guidance was also provided by special interest groups, the local sponsor and the general public via meetings, workshops and correspondences. Appendix B provides a detailed account of these inputs to the planning process.

Based upon the preliminary evaluation and screening, three alternative plans were considered the most feasible at this stage and are developed in greater detail in this section.

B. DESIGN CONSIDERATIONS

Subsurface investigations were conducted along the shoreline of the study area. These included onshore drilling for core samples, sieve analyses of the materials, stability analyses and visual observation and hand-pick probing of the offshore conditions by the FM&S scuba dive team. These investigations guided in the design and layout of the structural measures. All data, design assumptions and conclusions drawn from these investigations are provided in Appendix C.

Hydraulic design of the structures were guided by the US Army Coastal Engineering Research Centers Shore Protection Manual. Analyses, computations and conclusions are provided in Appendix D.

The hydraulic analyses and computations show that runup elevations for the offshore breakwater and revetment can be expected to reach 14.6 feet and 12.6 feet, respectively. However, to realize cost savings for the project and to lessen the visual impacts associated with those heights, the crest elevations for both structures were reduced to 8.0 feet (MLLW).

An existing 66-inch sewage force main line from the Ala Moana Pump Station crosses under the Honolulu Harbor entrance channel and enters Sand Island near the eastern limit of the study area. Since it lies approximately 28 feet below sea level at this location, it will not be affected by construction activities near the surface.

C. ALTERNATIVE PLAN 1: REVETMENT

The revetment as an alternative was briefly described in the previous section and was determined to merit further consideration.

This alternative requires the construction of 1,950 feet of stone revetment from the southeast corner of Sand Island to the sand beach (Figure 10). The proposed structure will follow the existing eroded shoreline of the study area.

The first 500 feet of the existing revetment, identified as Reach 1, though damaged from overtopping waves, appears stable below the ocean water surface level with armor stones ranging from two to three tons. Onshore borings down to depths of 30 feet revealed no coral rock formation; subsurface materials consisted mainly of silts, sands, gravels and cobbles. Reconstruction of the revetment is therefore proposed for this reach. Existing stones and backfill material will be removed down to 0.0 feet (MLLW) and a new revetment rebuilt from 0.0 to 8.0 feet (MLLW) as shown on the cross-section in Figure 13. Suitable stones from the existing revetment will be salvaged and used in the reconstruction. A 5-foot step berm will be maintained at the junction between the old and new revetment.

The existing revetment in Reaches 2 and 3 is too dilapidated for rehabilitative efforts and will require total reconstruction. Approximately 1,450 feet of revetment with a cross-section as shown in Figure 13 will follow the eroded shoreline. Suitable stones will be salvaged and used in the new revetment.

A continuous reef exists in the vicinity of the proposed toe from 10-70 feet of the water's edge. The reef rock should contain the revetment toe thus preventing migration and scour. Therefore, design of the toe in this reach requires placement of the toe just slightly below ground grade (Figure 13).

All reaches of the revetment structures will have a crest width of 15 feet (3 stones) to reduce overtopping damages. In addition, stone sizes in Reach 1 has been increased by 50% to further mitigate these effects.

D. ALTERNATIVE PLAN 2: OFFSHORE BREAKWATERS

Offshore breakwater structures were described in the previous section and determined to provide suitable erosion protection for the study area's shoreline.

This alternative plan requires the construction of nine detached offshore breakwater structures fronting approximately 2,000 feet of shoreline (see Figure 11). They would be placed about 120 feet offshore in waters ranging in depths of 2-1/2 through 12 feet. Their berms would be 15 feet wide and crest height at 8.0 feet (MLLW). Stone sizes were increased by 50% and would range from 5 to 8 tons for the armor layer and 1,000 to 1,600 lbs. for the core.

Investigations of the offshore conditions revealed partially covered, continuous and moderately hard coral reef rock with an apparent thickness in excess of one foot. Exact mapping of the shoreward edge of this reef was prevented by talus and sand deposits but was estimated to be as far as 70 feet offshore of the existing revetment.

All of the offshore breakwater structures will be placed on this reef to eliminate the need for toe protection structures.

E. ALTERNATIVE PLAN 3: COMBINATION

The two previous alternatives of revetment and offshore breakwater structures would probably work equally well at eliminating the shore erosion problem of the study area. However, as shown in Table 5 of Section III, the three other planning objectives of this study are not fully satisfied by the implementation of either of these two alternatives. Concerns were also expressed by the general public and the local sponsors to preserve the tide pools along the shoreline and to minimize impacts on the surfing area by offshore structures (see Appendix B).

These objectives and inputs guided in the development of this alternative plan--a combination of revetment and offshore breakwater structures.

This alternative divides the structural plan of improvement into three reaches in an effort to mitigate the negative impacts to the recreational resources cited by the public (see Figure 12).

The deteriorating revetment in Reach 1 would be rehabilitated by excavting the back fill and removing the existing stones down to elevation 0.0 feet (MLLW) and a new structure rebuilt as shown in Figure 13. The existing revetment below 0.0 feet (MLLW) will be kept intact.

The next 600 feet of the shoreline requires the placement of three detached offshore breakwaters to provide erosion protection. These are proposed to insure the preservation of the existing tide pools that have naturally developed shoreward of the existing revetment. The offshore ground conditions are as described in Subsection D. The breakwaters will be placed entirely on reef foundation in waters ranging in depths of 5 to 8-1/2 feet and rise to elevation 8.0 feet (MLLW). It is expected that sand will gradually accrete behind the structures further enhancing the recreational resource of this reach.

A participant at the November 1982 public workshop, and another at the July 1983 public meeting commented that even with the offshore structures the tide pools will lose their lake surface stillness for wading by toddlers and small children. For this reason, about 200 feet of the existing structure will be left intact along this reach, and a stone wall enclosure added to tie it onto the shore, to provide the desired shelter. The local sponsor's request (see Appendix B, Section II) to investigate the possibility of connecting one of the offshore structures to the shoreline was considered, but determined to be unacceptable because of cost and because the offshore breakwaters are protective structures and should not be used for any other purpose.

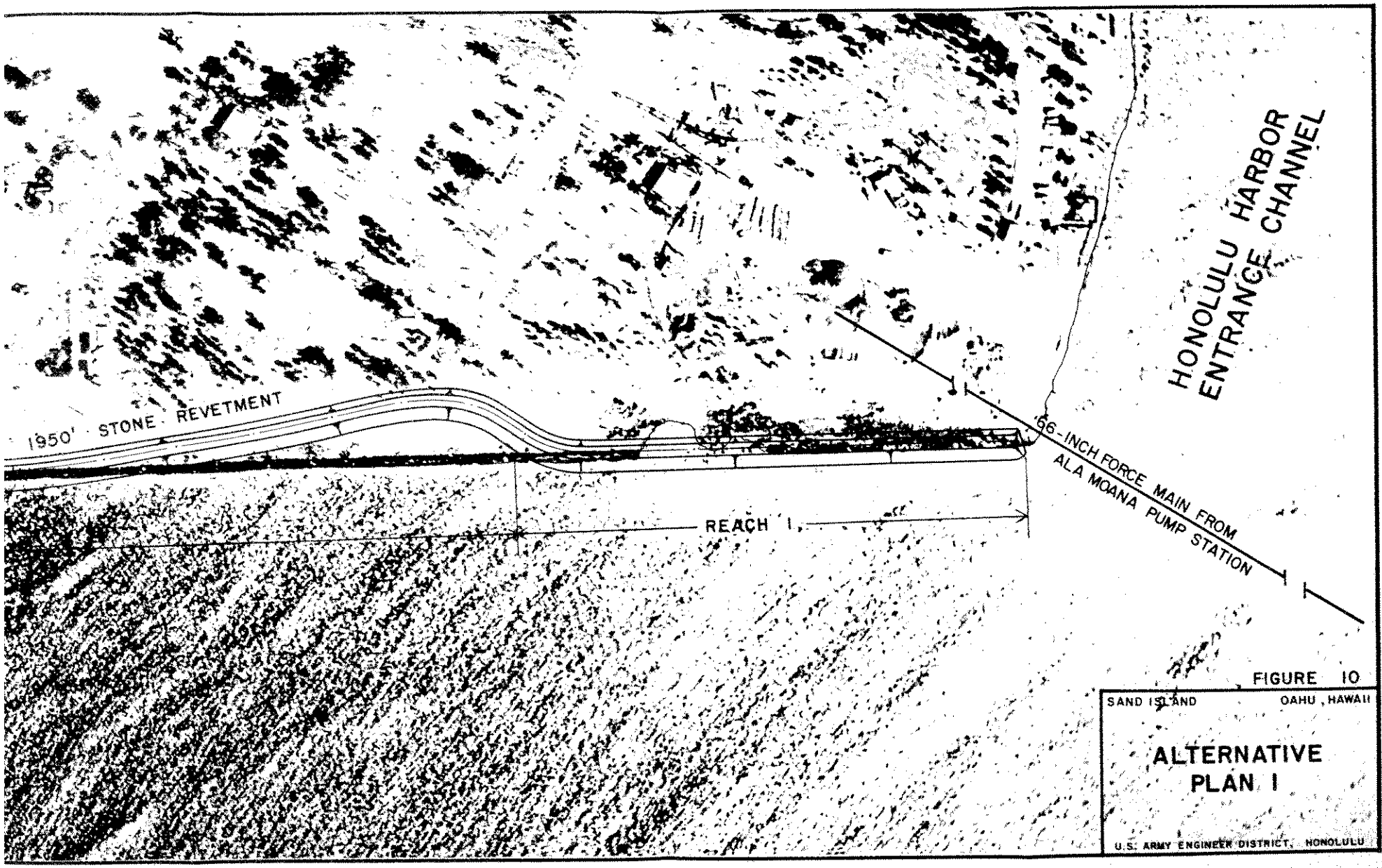


FIGURE 10

SAND ISLAND OAHU, HAWAII

ALTERNATIVE PLAN 1

U.S. ARMY ENGINEER DISTRICT, HONOLULU

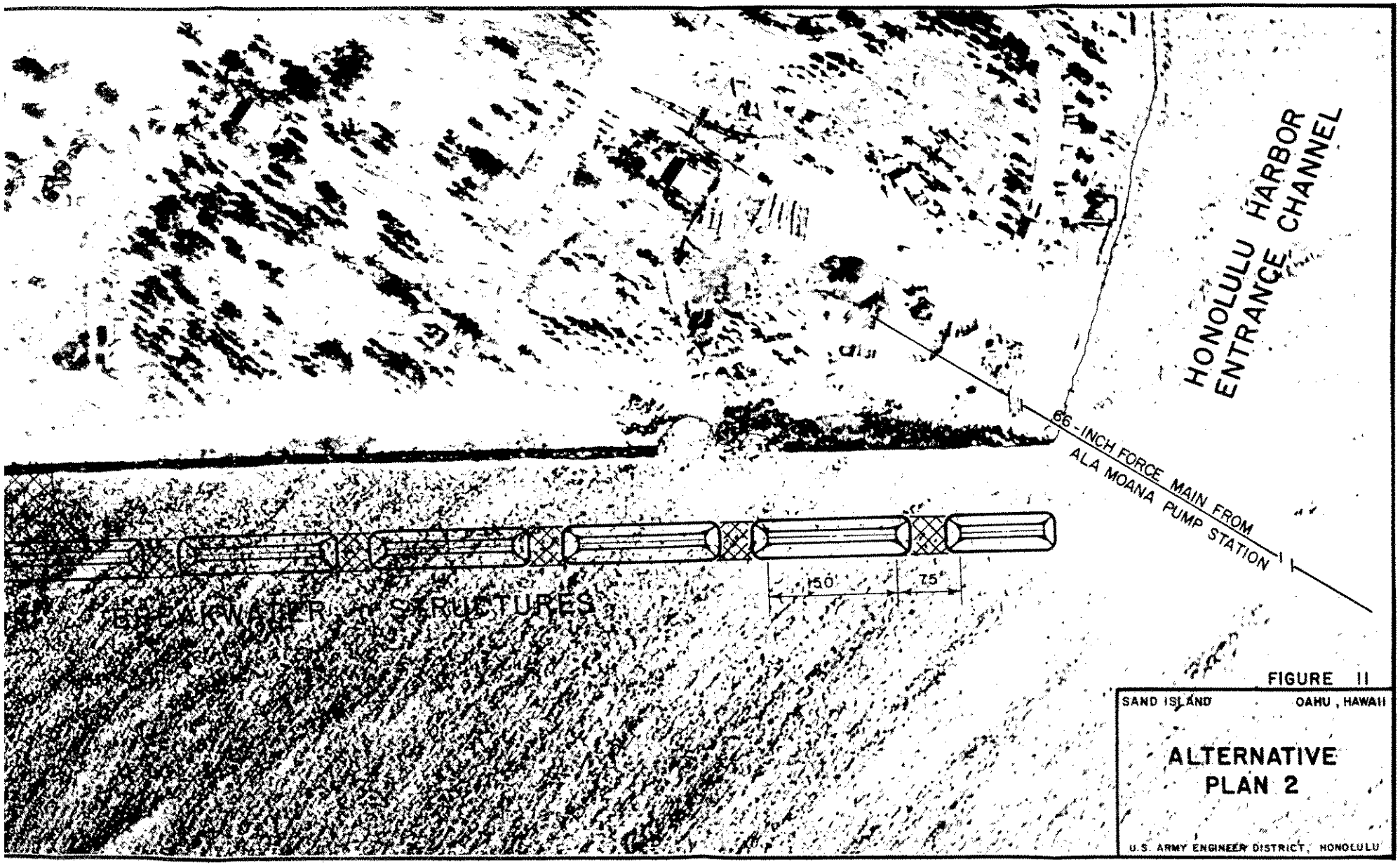


FIGURE II

SAND ISLAND OAHU, HAWAII

ALTERNATIVE PLAN 2

U.S. ARMY ENGINEER DISTRICT, HONOLULU

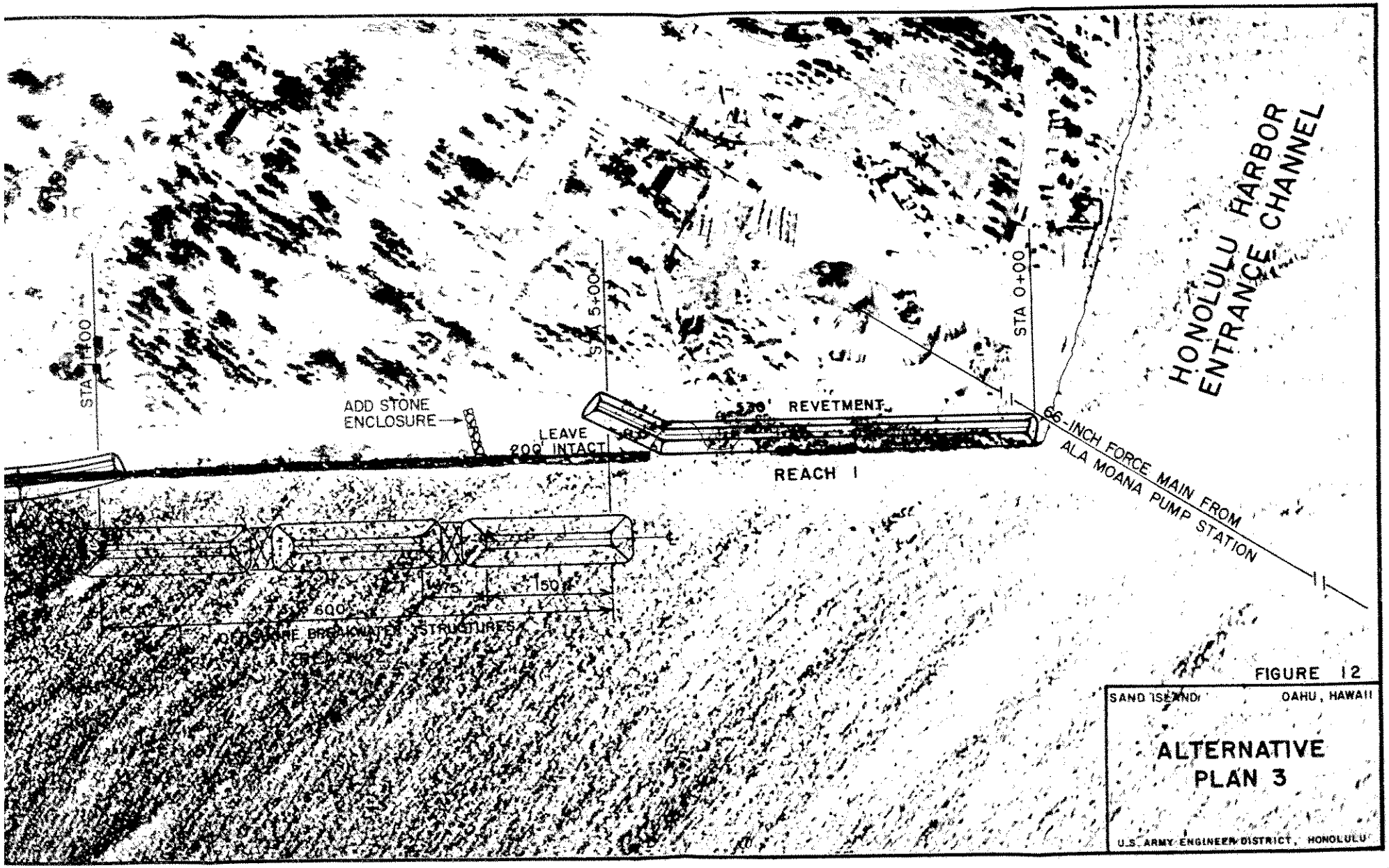
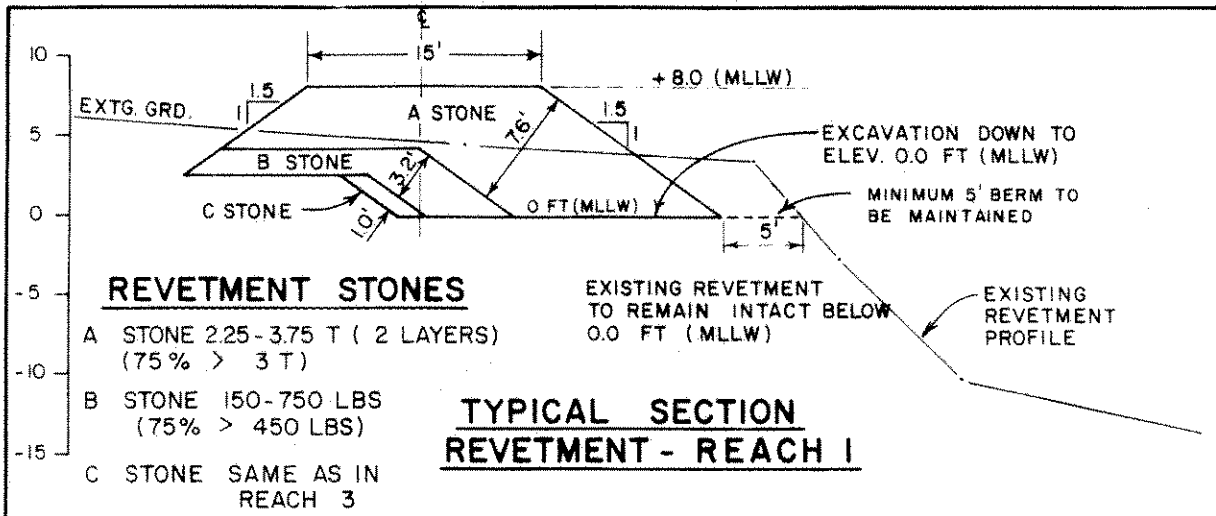


FIGURE 12

SAND ISLAND, OAHU, HAWAII

ALTERNATIVE PLAN 3

U.S. ARMY ENGINEER DISTRICT, HONOLULU



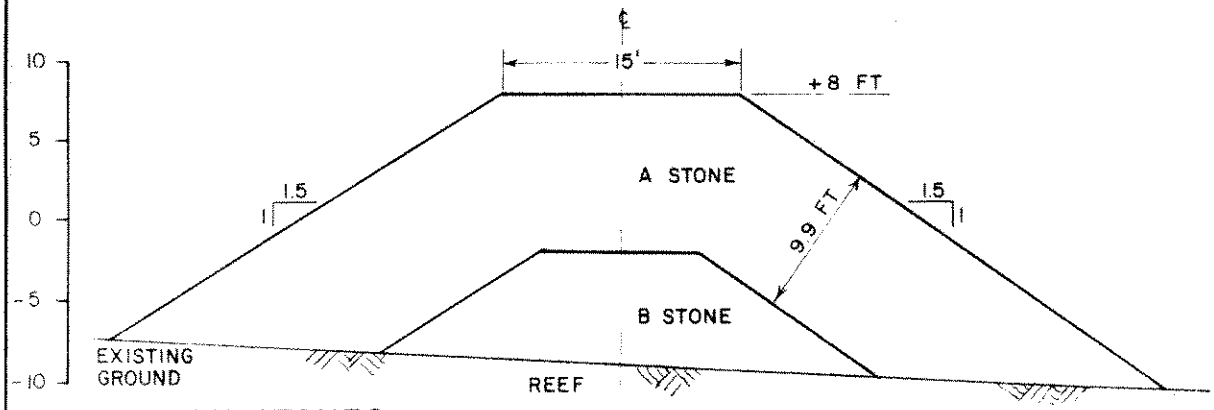
REVETMENT STONES

A STONE 2.25-3.75 T (2 LAYERS)
(75% > 3 T)

B STONE 150-750 LBS
(75% > 450 LBS)

C STONE SAME AS IN
REACH 3

TYPICAL SECTION
REVETMENT - REACH 1

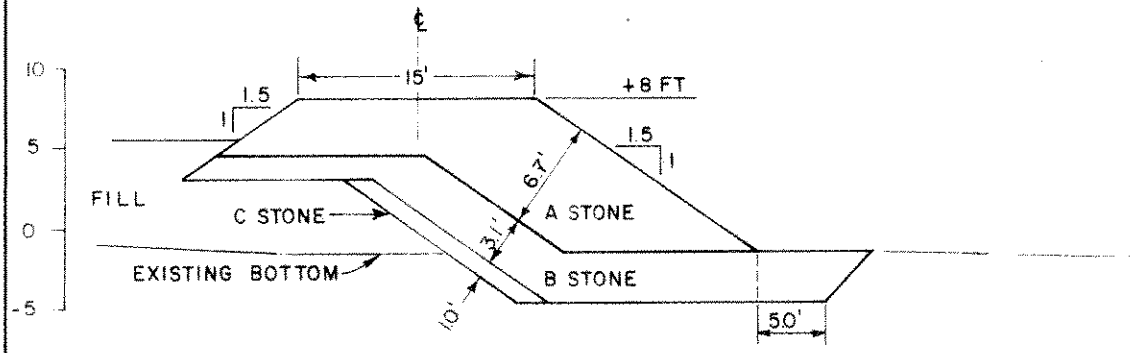


SECTION STONES

A STONE 5T-8T, 2 LAYERS
(75% > 6.5 T)

B STONE 1000-1600 LBS
(75% > 1300 LBS)

TYPICAL SECTION
OFFSHORE BREAKWATER
REACH 2



REVETMENT STONES

A STONE 1.5-2.5T, 2 LAYERS
(75% > 2T)

B STONE 100 - 500 LBS
(50% > 300 LBS)

C STONE

SIEVE SIZE	% PASSING
10"	100
3"	60-90
3/4"	0-55
No.16	0-15

TYPICAL SECTION
REVETMENT - REACH 3

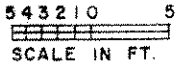


FIGURE 13

SAND ISLAND OAHU, HAWAII

TYPICAL
SECTIONS

U. S. ARMY ENGINEER DISTRICT, HONOLULU

The final stretch of the study's shoreline requires the construction of 820 feet of stone revetment. Extension of the breakwater structures from the previous reach into this one was considered in the early planning stage but met with objections from surfers. This alternative plan, therefore, seeks to mitigate impacts on the surf zone by proposing shoreline structures in this reach.

The subsurface and offshore ground conditions are as described in Subsection C and detailed in Appendix C. The typical cross-section for the revetment is depicted in Figure 13.

Approximately 34,000 square feet of parkland lost through progressive erosion will be reclaimed by backfilling behind a section of the structure (identified as Reach 3 in Figure 8). Fill material will be provided by excavation spoils from other reaches of the shoreline.

V. ASSESSMENT AND EVALUATION OF ALTERNATIVE PLANS

A. GENERAL

This section is oriented to assess the specific alternatives previously described to evaluate which alternative best meets the planning objectives, national and local objectives and the community desires. P&G provides some guidelines on how some of these evaluations are to be made, detailing uniform methods of measurement.

B. ECONOMIC FEASIBILITY

The economic assessment of the alternative plans were guided by the following economic criteria:

a. The benefits should exceed the costs, and the net benefits should be maximized as much as practicable. A plan that reasonably maximizes net NED benefits, consistent with the Federal objective, is to be formulated and is to be designated as the NED Plan.

b. The costs are to be based on the latest unit prices and assumptions based on the prevailing conditions. The benefits and costs should be expressed in comparable quantitative economic terms to the fullest extent possible. Annual costs should be based on a 50-year period of analysis and a 8-1/8 percent interest rate, and should include the annual maintenance cost.

1. Benefits.

Benefits accruing from each alternative were derived by estimating the increase in the quality of recreational activity of the study area. Procedures, methods and calculations for this analysis are documented in Appendix E.

These benefits were determined to be: $300,000 for Plan 1; $384,000 for Plan 2; and $422,000 for Plan 3.

2. Costs.

Estimated project first costs were developed from June 1983 price levels and assumptions based on the prevailing physical conditions and construction methods suitable to the project area. The first cost includes an allowance for contingencies, engineering and design, and supervision and administration. Preauthorization study costs are excluded from the project first costs. The average annual costs include interest (8-1/8 percent) and amortization (50 years) of the project first cost and the estimated annual maintenance cost of the improvement works. Detailed cost breakdowns and estimating assumptions are provided in Appendix D.

The following table summarizes the costs of the alternative plans developed in Appendix D:

TABLE 6. COST SUMMARY

	ALT 1	ALT 2	ALT 3
Construction Cost	$1,359,000	$2,982,000	$1,986,000
Engineering and Design[1/]	75,000	110,000	80,000
Supervision & Administration	88,000	194,000	134,000
Indirect non-Federal Costs	20,000	20,000	20,000
Project First Cost	1,542,000	3,306,000	2,220,000
Interest During Construction (IDC) Cost	95,000	249,000	151,000
PROJECT INVESTMENT[1/]	$1,637,000	$3,555,000	$2,371,000
TOTAL PROJECT INVESTMENT[2/]	$1,724,500	$3,642,500	$2,458,500
Annual Maintenance Costs	$5,700	$44,800	$20,800

1/ Excludes pre-authorization study costs.
2/ Includes pre-authorization study costs ($87,500).

3. Benefit to Cost Comparison.

The following table presents a summary of the estimated costs and benefits associated with each plan. The benefit to cost comparisons or ratios (B/C) are the arithmetic proportions of the average annual benefits to average annual costs insofar as these factors can be expressed in monetary terms. The comparisons represent the degree of tangible economic justification for each alternative plan.

TABLE 7. ECONOMIC COMPARISON

	ALT 1	ALT 2	ALT 3
Project Investment[1/]	$1,637,000	$3,555,000	$2,371,000
Est. Annual Charges			
Interest & Amortization[2/]	135,700	294,800	196,600
Maintenance Costs	5,700	44,800	20,800
Total Annual Cost	141,400	339,600	217,400
Est. Annual Benefits	300,000	384,000	422,000
Est. Benefit to Cost Ratio	2.1	1.1	1.9
Net NED Benefits	$ 158,600	$ 44,400	$ 204,600

1/ Project Investment includes all costs associated with the project except pre-authorization study costs.

2/ Based on interest rate of 8-1/8% amortized over 50 years.

TABLE 9. SUMMARY COMPARISON OF ALTERNATIVE PLANS AND SYSTEM OF ACCOUNTS

DESCRIPTION	BASE CONDITION	WITHOUT CONDITION (NO ACTION)	ALTERNATIVE PLAN 1	ALTERNATIVE PLAN 2	ALTERNATIVE PLAN 3
A. PLAN DESCRIPTION	Existing 30ac park in study area includes approximately 1900 ft of stone revetment in various stages of deterioration.	Continual deterioration of the revetment and erosion of park land.	Construction of 1950 ft of stone revetment, following the existing shoreline of study area.	Construction of 9 detached offshore breakwaters fronting approximately 2000 ft of the study area.	Construction of 2 reaches of revetment totalling 1350 ft and 3 detached offshore breakwaters fronting 600' of shoreline.
B. IMPACT ASSESSMENT					
1. Economic					
a. Public Facilities and Services	Threat of erosion damage to facilities near the shoreline.	Continued erosion hazard to facilities.	Adequately protects all park facilities.	Same as Plan 1.	Same as Plan 1.
b. Commitment of Economic Resources	Loss of 34,000 sq feet of park land and related improvements (sod, waterlines, landscaping plants, etc.) due to erosion.	Continued loss of improved park land.	Commitment of 29,700 tons of basaltic rock and related manpower and energy resources.	Commitment of 50,500 tons of basaltic rock and related manpower and energy resources.	Commitment of 39,400 tons of basaltic rock and related manpower and energy resources.
c. Recreation	30ac park with good beach and shoreline park resources for swimming, wading, sunbathing, jogging, camping, fishing, surfing, picnicking, etc. Avg. annual value of these activities estimated at $900,000.	Continued erosion to adversely affect all shoreline recreation activities. Avg. annual value of recreation activities remain at $900,000.	Eliminates erosion of shoreline. Increases the annual value of recreation activities to $1,200,000.	Eliminates erosion of the shoreline. Increases the annual value of recreation activities to $1,284,000.	Eliminates erosion of the shoreline. Increases the annual value of recreation activities to $1,322,000.
2. Environmental					
a. Marine Environment	Coral cover less than 1%.	No impact.	No impact.	Negligible impact.	Negligible impact.
b. Terrestrial Environ.	Park facilities and improvements.	Continued erosion of park lands.	Eliminates erosion.	Eliminates erosion.	Eliminates erosion.

Table 9 (Continued)

DESCRIPTION	BASE CONDITION	WITHOUT CONDITION	PLAN 1	PLAN 2	PLAN 3
c. Fish and Wildlife	Common fish and invertebrates present but not abundant.	No impact.	Increases rocky subtidal habitat.	Same as Plan 1.	Same as Plan 1.
d. Marine Flora	Common algae present but not abundant.	No impact.	No impact.	Additional hard subtidal substrate for algae growth.	Same as Plan 2.
e. Aesthetics	Visual impact of deteriorating revetment, concrete rubble and erosion.	Further visual degradation of shoreline.	Elimination of base condition impacts. Restoration of pleasant seascape.	Same as Plan 1.	Same as Plan 1.
f. Historic Resources	World War II defense facilities incorporated into park features.	No impact.	No impact.	No impact.	No impact.
g. Endangered Species	No terrestrial species present. Juvenile Green Turtles may forage in the area.	No impact.	No impact.	No impact.	No impact.
h. Air, Noise and Water Pollution	(See item No. 3 below)				
3. Sec 122 (PL91-611) Requirements					
a. Air Pollution	Good due to prevailing offshore winds.	No impact.	No impact (Some dust during construction).	Same as Plan 1.	Same as Plan 1.
b. Noise Pollution	Generally quiet, except for aircraft using Honolulu Int'l Airport.	No impact.	No permanent impact (Some increase during construction).	Same as Plan 1.	Same as Plan 1.
c. Water Pollution	Ocean waters designated Class "A". No natural fresh water on Sand Is.	No impact.	No permanent impact (Some turbidity during construction).	Same as Plan 1.	Same as Plan 1.

Table 9 (Continued)

DESCRIPTION	BASE CONDITION	WITHOUT CONDITION	PLAN 1	PLAN 2	PLAN 3
d. Destruction or Disruption of Manmade and Natural Resources	N/A	N/A	Destroys 600' of land-water interface provided by the tide pools.	Encroaches & disrupts part of the surf zone.	No impact.
	There are no impacts on the other categories required of Sec 122 resulting from any of the 3 Plans.				
C. PLAN EVALUATION					
1. Contributions to the Planning Objectives.					
a. Eliminate or substantially reduce shoreline erosion at the study area.	Study area in various stages of erosion.	Erosion to continue unabated.	Erosion eliminated.	Same as Plan 1.	Same as Plan 1.
b. Protect and enhance recreational & educational resources along the shoreline.	Fishing, wading, swimming & exploring activities conducted in existing conditions.	Activities to be increasingly affected by the deteriorating shoreline.	Eliminates tide pools & related recreational/ educational activities. Enhances all other activities.	Part of surf zone impacted. Enhances all other activities.	Enhances all shoreline recreational & educational activities.
c. Preserve and enhance the visual/ aesthetic qualities at the study area.	Visual impacts from the deteriorating revetment, concrete rubble & erosion.	Continued degradation of the shoreline.	Restores shoreline and seascape scenery.	Same as Plan 1.	Same as Plan 1.

Table 9 (Continued)

DESCRIPTION	BASE CONDITION	WITHOUT CONDITION	PLAN 1	PLAN 2	PLAN 3
d. Protect and enhance the water quality and fish and wildlife resources of the study area.	Class "A" waters. Common fish and invertebrates present but not abundant.	Same as Base Condition.	Increases rocky subtidal habitat. Temporary turbidity of nearshore waters during construction.	Same as Plan 1.	Same as Plan 1.
2. Response to Associated Evaluation Criteria.					
a. Acceptability	N/A	Low	Medium	Medium	High
b. Completeness	N/A	N/A	Complete with periodic maintenance.	Same as Plan 1.	Same as Plan 1.
c. Effectiveness	N/A	Not effective.	Effective at eliminating erosion.	Same as Plan 1.	Same as Plan 1.
d. Efficiency	N/A	Not efficient.	Efficient.	Moderately efficient.	Efficient.
3. Implementation Responsibilities					
Corps of Engineers	N/A	N/A	Provide estimated project first cost share of $912,500; design, plans and specifications and supervision and administration during construction.	Same as Plan 1.	Same as Plan 1.

Table 9 (Continued)

DESCRIPTION	BASE CONDITION	WITHOUT CONDITION	PLAN 1	PLAN 2	PLAN 3
State of Hawaii	Provide maintenance and clean-up of eroded areas.	Same as Base Condition.	Provide estimated project cost share of $724,500 and local assurances and cooperation.	Provide estimated project first cost share of $2,642,500 and local assurances & cooperation.	Provide estimated project first cost share of $1,458,500 and local assurances & cooperation.

Table 9 (Continued)

ACCOUNT	FOOTNOTES	ALTERNATIVE PLAN 1	ALTERNATIVE PLAN 2	ALTERNATIVE PLAN 3
D. SYSTEM OF ACCOUNTS				
1. NATIONAL ECONOMIC DEVELOPMENT (NED Account)				
Project Investment		$1,637,000	$3,555,000	$2,371,000
Average Annual Benefits		300,000	384,000	422,000
Average Annual Costs		141,400	339,600	217,400
Net NED Benefits		$ 158,600	$ 44,400	$ 204,600
Benefit-to-Cost Ratio		2.1	1.1	1.9
2. ENVIRONMENTAL (EQ Account)				
a. EQ Enhanced				
Terrestrial Environment	(1, 6, 9)	Protects park land from erosion.	Same as Plan 1.	Same as Plan 1.
Marine Environment	(1, 6, 9)	Increases subtidal rocky habitat.	Same as Plan 1.	Same as Plan 1.
Aesthetic Resources	(1, 6, 9)	Restores degraded shoreline.	Same as Plan 1.	Same as Plan 1.
Recreational Resources	(1, 6, 7, 9)	Adds 2000 ft of revetment for fishing.	Adds 2000 ft of nearshore waters for swimming and wading.	Adds 1500 ft of revetment for fishing. Adds 500 ft of protected nearshore waters for swimming and wading.
b. EQ Degraded				
Air, Noise and Water Pollution	(1, 6, 9)	Temporary negative impacts during construction occurs.	Same as Plan 1.	Same as Plan 1.
Recreational Resources	(1, 6, 7, 9)	Destroys land-water interface at tide pools.	Structures interfere with part of surf zone. Reduces available shoreline for fishing.	No degradation.
3. REGIONAL ECONOMIC DEVELOPMENT (RED Account)	Detailed regional income, population distribution and employment analyses not performed. Study area and regional area evaluations not separable. NED account applies to region.			

Table 9 (Continued)

ACCOUNT	FOOTNOTES	ALTERNATIVE PLAN 1	ALTERNATIVE PLAN 2	ALTERNATIVE PLAN 3
4. OTHER SOCIAL EFFECTS (OSE Account) Education	(1, 6, 8, 9)	Destroys tide pools for exploration activities.	Adds 2000' of protected near shore waters for exploration.	Adds 500 ft of protected nearshore waters for exploration.

INDEX OF FOOTNOTES:

TIMING

1. Impact is expected to occur prior to or during implementation of the plan.
2. Impact is expected within 15 years following plan implementation.
3. Impact is expected in a longer time frame (15 or more years following implementation).

UNCERTAINTY

4. The uncertainty associated with impact is 50% or more.
5. The uncertainty if between 10% and 50%.
6. The uncertainty is less than 10%.

EXCLUSIVITY

7. Overlapping entry: fully monetized in NED account.
8. Overlapping entry: not fully monetized in NED account.

ACTUALITY

9. Impact will occur with implementation.
10. Impact will occur only when specific additional actions are carried out during implementation.

11. Impact will not occur because necessary additional actions are lacking.

C. COST APPORTIONMENT

Section 103 of the 1962 Rivers and Harbors Act provides that under special conditions, beach erosion protection of a state, county, or other publicly owned shore park and conservation area is eligible for Federal cost sharing up to 70 percent of the total project cost, exclusive of land costs, up to the $1 million Federal limitation. In order for the maximum 70 percent Federal participation to be applied to parks and conservation areas, all of the following specified criteria must be met to the satisfaction of the Chief of Engineers.

a. The land must be publicly owned.

b. The park must include a zone extending landward from mean low water line which excludes all permanent human habitation. This excludes summer residences, but does not preclude residences of park personnel or management and administrative buildings.

c. The park must include a beach suitable for recreational use.

d. The park must provide for preservation, conservation, and development of the natural resources of the environment.

e. The park or conservation area must extend landward a sufficient distance to include protective dunes, bluffs or other natural features which will absorb and dissipate wave energy and flooding effects of storm tides. The purpose of this requirement is to provide a protective buffer zone which would prevent damage of upland property and development.

f. Full park facilities must be provided for appropriate public use.

All three alternative plans fulfill the provisions for 70% Federal cost sharing, but are limited to the $1 million Federal cost share limitation. The following table summarizes the cost apportionment between Federal and non-Federal interests for the three alternatives.

TABLE 8. COST APPORTIONMENT

	ALT 1	ALT 2	ALT 3
Federal			
Total Project Investment	$1,724,500	$3,642,500	$2,458,500
Less Non-Federal Contribution	724,500	2,642,500	1,458,500
Total Federal Contribution 1/	1,000,000	1,000,000	1,000,000
Total Federal Contribution 2/	912,500	912,500	912,500
Non-Federal			
Indirect Costs	20,000	20,000	20,000
Cash Contribution	704,500	2,622,500	1,438,500
Total Non-Federal Contribution	724,500	2,642,500	1,458,500
PROJECT INVESTMENT 2/	$1,637,000	$3,555,000	$2,371,000

1/ Federal limitation; includes pre-authorization study costs.
2/ Excludes pre-authorization study costs.

D. TRADE-OFF ANALYSES

In addition to the economic or monetary factors analyzed for each plan, trade-off analyses must also include the environmental, social, regional and aesthetic effects associated with each plan and consideration of how well each plan meets tests of completeness, effectiveness, efficiency and acceptability.

Table 9 facilitates the evaluation and comparison of these criteria for each plan. It also tabulates the base condition and the "without-project" condition as they relate to each criterion.

E. DESIGNATION OF THE NED PLAN

Principles and Guidelines state, "A plan that reasonably maximizes net national economic development benefits, consistent with the Federal objective, is to be formulated. This plan is to be identified as the national economic development (NED) plan."

Cost and benefit estimates to date indicate that Alternative Plan 3 has the highest net NED benefits; it is therefore designated the NED Plan.

F. CANDIDATE FOR THE RECOMMENDED PLAN

It is recommended that Alternative Plan 3 be designated the Recommended Plan. In addition to the optimal NED benefits realized by this Plan, this alternative best satisfies the planning objectives of this study by:

a. preserving the natural tide pools of the study area

b. contributing in efforts to alleviate the shortage of beaches in central leeward Oahu

c. enhancing the recreational and educational opportunities in the study area.

The desires of the sponsor, public, and special interest groups are also best met by this alternative.

VI. THE SELECTED PLAN

A. RATIONALE FOR SELECTION.

The selection of the most desirable plan of improvement involved comparison and tradeoffs among the alternative plans. Ranking of the alternative plans was performed on the basis of (1) beneficial and adverse effects of each alternative; (2) relative contribution to the planning objectives; and (3) response to associated evaluation criteria as listed in Table 9. A key criterion pertinent to plan selection was that Plan 3 has the highest net NED benefits of the three plans evaluated.

Based on the comments received during coordination and review of the draft Detailed Project Report with Federal, State and County agencies, and during the public meeting conducted on 26 July 1983, Plan 3 appeared to be most desirable. Considerable attention and input received during the entire planning process focused on the importance of preserving the tidepool resource of the study area.

In view of its cost-effectiveness, the desires of the sponsor and local and Federal agencies, and environmental considerations, Plan 3 is selected for implementation.

B. PLAN IMPLEMENTATION.

1. Plans and Specifications.

Construction Plans and Specifications will be prepared by the Corps of Engineers upon authorization of the project. During this stage the following will also be conducted:

a. Obtaining any necessary rights-of-way and easements,
b. Obtaining local assurances in accordance with Section 221 of the River and Harbor Act of 1970, and
c. Completing all Federal, State and County compliance documents and obtaining all necessary permits for construction.

2. Construction Schedule.

Construction will require approximately 20 months to complete. Construction will be accomplished by contract to a private construction firm through competititve bidding under Corps of Engineers supervision.

3. Maintenance.

The State of Hawaii, Department of Land and Natural Resources will be responsible for all maintenance measures of the completed project.

4. Federal Funding.

The preparation of Plans and Specification and the initiation of construction must be approved and authorized by the Chief of Engineers. U. S. Army Corps of Engineers' priority for funding of construction under the small projects authority is based on the needs and merits of similar projects nationwide and the availability of funds.

VII. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS.

The purposes of this report were to identify the cause and extent of erosion on the south shoreline of Sand Island and to determine the feasibility and justification of Federal participation in providing protective measures at the problem area. Based on the severity of the erosion problem, the needs and desires of the community, the expected benefits and costs and environmental impacts of the alternatives investigated, Plan 3 is concluded to be the most feasible and suitable plan.

The proposed plan is economically justified as demonstrated by the benefit-to-cost comparison of 1.9. The net NED benefits are optimized by this plan and are estimated to be $204,600. The estimated project investment cost is $2,371,000 consisting of $912,500 for the Federal share and $1,458,500 for the non-Federal share. The State of Hawaii has agreed to provide the necessary local cooperation agreements.

B. RECOMMENDATIONS.

The District Engineer recommends that Alternative Plan 3 as presented in this report be approved and constructed, provided that local interests furnish the assurances satisfactory to the Secretary of the Army that they will:

1. Provide without cost to the United States all lands, easements and rights-of-way necessary for construction of the project.

2. Hold and save the United States free from claims for damages due to the construction work and subsequent maintenance of the project, excluding damages due to the fault or negligence of the United States or its Contractors.

3. Maintain and operate all works in accordance with regulations prescribed by the Secretary of the Army.

4. Subject to the Federal limitation of $1,000,000, provide a cash contribution for the balance of the total construction cost of the project. The total non-Federal contribution is currently estimated to be $1,500,000; the exact amount will be determined after all costs are finalized.

5. Assure continued ownership of the shore upon which the amount of Federal participation is based and its administration for public use during the economic life of the project.

6. Comply with Title VI of the Civil Rights Act of 1964 (P.L. 88-352).

Michael M. Jenks
Colonel, Corps of Engineers
District Engineer

VIII. BIBLIOGRAPHY

1. State of Hawai, Department of Planning and Economic Development, STATE COMPREHENSIVE OUTDOOR RECREATION PLAN, 1975. Prepared by Aotani and Hartwell Associates, Inc.

2. State of Hawaii, Department of Land and Natural Resources, STATE RECREATION PLAN, Technical Reference Document, September 1980. Technical assistance and Consulant Services furnished by Aotani and Associates, Incorporated.

3. State of Hawaii, Department of Planning and Economic Development, DATA BOOK, 1982, A Statistical Abstract.

4. State of Hawaii, Department of Transportation, 1995 Master Plan for Honolulu Harbor, February 1976.

5. State of Hawaii, Department of Land and Natural Resources, Sand Island State Park, Final Report, June 1973. Prepared by Aotani and Oka Architects.

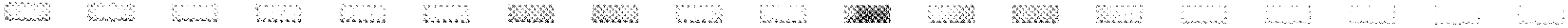
6. US Army Engineer District, Honolulu, Sand Island Shore Protection, Detailed Project Report and Environmental Statement, September 1978.

SAND ISLAND
SHORE PROTECTION

ENVIRONMENTAL
IMPACT STATEMENT
Final

APPENDIX A (EIS)

404(b)(1) EVALUATION



A. DISCHARGE OF DREDGED OR FILL MATERIAL, SAND ISLAND SHORE PROTECTION CLEAN WATER ACT, SECTION 404(b)(1), FACTUAL DETERMINATION.

1. SPECIAL AQUATIC SITES

a. Sanctuaries and Refuges. None.

b. Wetlands. None

c. Mudflats. None

d. Coral Reefs. None in immediate project area which could be affected by the proposed discharge.

e. Riffle and Pool Complex. None.

2. HUMAN USE CHARACTERIZATION

a. Recreational and Commercial Fisheries. Sand Island supports a large recreational fishery, consisting of pole fisherman. The rocky shoreline does not lend itself to throw netting or other types of net fishing. Spearfishing is occasionally done seaward of the area fished by the shorebound pole fishermen. Honolulu Harbor is used to catch bait fish (Nehu, Stolephorus purpureus) for the Skipjack Tuna fleet, but the project area is well away from the baiting area, and the open coastal habitat is not suitable for Nehu.

b. Water Related Recreation. Wading, swimming, snorkeling and surfing are significant recreational activities off Sand Island State Park. The surfing site is located near the beach at the west end of the project site. Effect:

Base Condition	Plan 1	Plan 2	Plan 3
Wading, Swimmning, Snorkeling	Eliminates wading, no effect on swimming or snorkeling.	Improves wading, swimming, no effect on snorkeling.	Improves wading, swimming, no effect on snorkeling.
Surfing Site	No effect.	Offshore structures will interfere with surfing.	No effect.

c. Aesthetics. The vista from the ocean shore of Sand Island is essentially unbroken, except for the deteriorated revetment at the shoreline. Due to the height of the back shore, an observer can look over the revetment at the unbroken ocean horizon. Effect: Plan 1 will have no effect on the view. Plans 2 and 3 will add offshore structures which will disrupt the view of the ocean horizon.

d. National Monuments. None.

e. National Seashores. None.

f. National Wilderness Areas. None.

g. Research Sites. None

h. National Historic Sites. None.

3. PHYSICAL SUBSTRATE DETERMINATION

a. Size Gradation and Coarseness. The Sand Island discharge site substrate consists of previously dredged material and shallow reef flat, depending on the plan selected. Effect: The discharge is associated with the construction of protective structures which will cover the substrate and raise the bottom elevations from mean lower low water (MLLW) or below to approximately +8 feet MLLW.

b. Compaction. Not applicable. The discharge involves the construction of revetments or breakwaters composed of basalt rock.

c. Bottom Elevation/Contour. See table below.

Base Condition	Plan 1	Plan 2	Plan 3
Water depths before discharge	0.0 to -2 feet MLLW	-5 to -12 feet MLLW	0.0 to -12 feet MLLW
Elevation after discharge	+8 feet MLLW	+8 feet MLLW	+8 feet MLLW

d. Material Movement. The shore is eroding at the rate of approximately 10,000 square feet per year, primarily from storm waves. There is minimal littoral drift. Effect: All of the plans will eliminate shoreline erosion in the project area, and none of them will affect the slight littoral drift.

e. Deposition. Not applicable.

4. WATER QUALITY, CIRCULATION, FLUCTUATION AND SALINITY DETERMINATION

a. Current Velocity, Direction and Pattern. The currents at Sand Island are strongly influenced by the tides. The net transport is southwesterly, away from the coast for most of the year, but the net current is weak, ranging from 0.01 knot to 0.41 knot.

b. Downstream Flow. Not applicable.

c. Normal Water Fluctuations. The water fluctuations along the Sand Island shoreline are tidal, and range from mean low of 0.2 to a mean high of 1.9 feet. Lowest tide observed was -1.3 feet, and the highest +3.5.

d. Salinity Gradient/Stratification. Not applicable.

e. Potability. Not applicable.

f. Water Physical Characteristics. Water chemical and physical characteristics are generally oceanic. There are no wastewater discharges along the shore. Effect: None of the plans will effect the chemical or physical characteristics of the water..

g. Pathogens/Biological Content. Fecal coliform concentrations are generally within the standards for Class "B" waters in the entrance channel to Honolulu Harbor. The open coastal waters, however, are designated Class "A," and according to the State Department of Health, the sampling stations located

around Sand Island have exceeded the State's water quality standards for total coliform, fecal coliform and nitrogen. Effect: The project is not expected to have an effect on pathogens/biological activity regardless of the plan chosen.

5. SUSPENDED PARTICULATE AND TURBIDITY DETERMINATION

a. Turbidity Determination. The waters off the shore of Sand Island are turbid due to the erosional sediments constantly entering the water. Periodic maintenance dredging of Honolulu Harbor also contribute to normal turbidity along the shore. Effect: None of the plans will have a significant effect on turbidity, since the discharge will be clean stone, and minimal excavation is expected in the water.

6. CONTAMINANT DETERMINATION

a. Initial Evaluation	All Plans
(1) Material proposed for discharge	Basalt rock
(2) Source	Commercial quarry and some of the stone from the existing revetment.
(3) Contaminants can flow into the quarry site?	No.
(4) Material previously tested?	No.
(5) Can pesticides enter the quarry site?	No.
(6) Spills or disposal of contaminents have been documented in the past?	No.
(7) Natural deposits of minerals or other substances harmful to man are present at the quarry site?	No.

b. Findings.

(1) The material proposed for discharge consists of uncontaminated stone.

(2) The material classifiction for the basalt stone is Category 5, discharge without potential for environmental contamination.

7. AQUATIC ECOSYSTEM AND ORGANISMS DETERMINATION

Aquatic Organisms.

a. The aquatic organisms present at the site are all common shallow water varieties and are not abundant. Effect: No signifcant effect expected.

b. The threatened Green Turtle may forage in the general area, but is not expected to be abundant in the area due to lack of sizable quantities of preferred food. Effect: None expected.

8. DETERMINATION. The discharge of clean basalt stone into the nearshore waters under all plans does not significantly degrade water quality or human use of the water. The stone is not expected to contain contaminants or cause prolonged turbidity problems, nor is it expected to degrade the aquatic environment in any way.

9. MATERIAL PROPOSED FOR DISCHARGE

	Plan 1	Plan 2	Plan 3
Basalt Rock	29,700 tons	50,500 tons (Additional 18,000 T for the temporary causeways)	39,400 tons (Additional 6,100 T for the temporary causeways)

FINAL
ENVIRONMENTAL IMPACT STATEMENT
SAND ISLAND SHORE PROTECTION STUDY
OAHU, HAWAII

The responsible local cooperating agency is the State of Hawaii, Department of Land and Natural Resources.

The responsible lead federal agency is the US Army Engineer District, Honolulu, Hawaii.

The US Fish and Wildlife Service is a cooperating federal agency.

Information, displays and figures referred to in the Main Report and Appendices are incorporated as a part of this Environmental Impact Statement.

Abstract: The proposed project will provide shore protection and passive recreational area improvements along the completed portion of the Sand Island State Park, Phase II. Three alternatives were considered, an ungrouted riprap revetment along the entire stretch; a series of offshore protective structures; and a combination of revetment and offshore structures. The combination alternative is the tentative recommended alternative because of its favorable benefits and environmental effects. No significant environmental impacts are expected and there will be no effect on any candidate, proposed or listed threatened or endangered species of plant or animal.

If you would like further information on this environmental impact statement, please contact:

Dr. James E. Maragos, Chief
Environmental Resources Section
US Army Engineer District, Honolulu
Building T-1
Fort Shafter, HI 96858
Phone: (808) 438-2264

Mr. Clyde Hosokawa
Department of Land and Natural Resources
Division of State Parks
1151 Punchbowl Street
Honolulu, Hawaii 96813

hone: (808) 548-2696

TABLE OF CONTENTS

Title	Page
COVER SHEET	i
TABLE OF CONTENTS	ii
SUMMARY	EIS-1
NEED FOR AND OBJECTIVES OF THE ACTION	EIS-4
ALTERNATIVES, INCLUDING THE PROPOSED ACTION	EIS-4
AFFECTED ENVIRONMENT	EIS-9
Physical Setting	EIS-9
Recreation	EIS-9
Natural Hazards	EIS-10
Water Quality	EIS-10
Sedimentation and Sediment Quality	EIS-10
Noise	EIS-10
Air Quality	EIS-10
Historic Resources	EIS-10
Biological Resources	EIS-11
a. Terrestrial Resources	EIS-11
b. Marine Resources	EIS-11
c. Endangered Species	EIS-11
ENVIRONMENTAL EFFECTS	EIS-15
Recreation	EIS-15
Natural Hazards	EIS-16
Water Quality	EIS-16
Sedimentation and Sediment Quality	EIS-16
Noise	EIS-16
Air Quality	EIS-16
Historic Resources	EIS-16
Biological Resources	EIS-16
a. Terrestrial Resources	EIS-16
b. Marine Resources	EIS-16
c. Endangered Species	EIS-17
PUBLIC INVOLVEMENT	EIS-17
LIST OF PREPARERS	EIS-21
BIBLIOGRAPHY	EIS-22
APPENDIX A Section 404(b)(1) Evaluation	A-1

1. SUMMARY

1.1 MAJOR CONCLUSIONS AND FINDINGS. Three plans were evaluated for the Sand Island Shore Protection Study. These Plans were Plan 1 - Riprap revetment, Plan 2 - Offshore protective structures, and Plan 3 - Combination plan.

TABLE 1. PLAN FEATURES

Plan 1	Riprap revetment along 2,000 feet of the shoreline, tying into the existing revetment along the shore of the harbor entrance channel (Figure 10).
Plan 2	Series of offshore protective structures extending from the entrance channel along the shore for approximately 2,000 feet (Figure 11).
Plan 3	Combination of riprap revetment and offshore protective structures at selected locations along the 2,000 feet of shoreline in the study area (Figure 12).

Plan 3 is the tentative recommended alternative because of its greater overall benefits. There is no nonstructural plan that will fulfill the goals of the project.

No wetlands are involved, but part of the study area is in a tsunami inundation area. No prime agricultural lands are located in the area. No sites eligible or listed on the State or National Registers of Historic Places are affected. The effects of the discharge of fill material were evaluated under section 404(b)(1) of the Clean Water Act. For all plans, the fill material will be clean quarry stone, classified as Category 5, not requiring testing. Additionally, some stone from the existing deteriorating revetment may be used. The project is expected to have a beneficial impact on the environment in the study area by eliminating erosion along that stretch of shoreline, and by providing more rocky intertidal habitat for benthic organisms.

1.2 AREAS OF CONTROVERSY. None.

1.3 UNRESOLVED ISSUES. None.

1.4 RELATIONSHIP TO ENVIRONMENTAL REQUIREMENTS: See Table 2.

TABLE 2. RELATIONSHIP OF THE PLANS TO ENVIRONMENT PROTECTION STATUTES AND OTHER ENVIRONMENTAL REQUIREMENTS

Federal Statutes	Plan 1	Plan 2	Plan 3
Archaeological and Historic Preservation Act	Full	Full	Full
Clean Air Act	Full	Full	Full
Clean Water Act (See Section 6.2)	Full	Full	Full
Coastal Zone Management Act (See Section 6.2)	Partial	Partial	Partial
Endangered Species Act (See Section 6.2)	Full	Full	Full
Estuaries Protection Act	N/A	N/A	N/A
Federal Water Project Recreation Act	Full	Full	Full
Fish and Wildlife Coordination Act	Full	Full	Full
Land and Water Conservation Act	N/A	N/A	N/A
Marine Protection, Research and Sanctuaries Act	N/A	N/A	N/A
National Historic Preservation Act	Full	Full	Full
National Environmental Policy Act	Full	Full	Full
Rivers and Harbors Act	Full	Full	Full
Watershed Protection and Flood Prevention Act	N/A	N/A	N/A
Wild and Scenic Rivers Act	N/A	N/A	N/A
Executive Orders, Memoranda			
Flood Plain Management	Full	Full	Full
Protection of Wetlands	N/A	N/A	N/A
Environmental Effects Abroad of Major Federal Actions	N/A	N/A	N/A
Analysis of Impacts on Prime and Unique Farmlands	N/A	N/A	N/A
State and Local Statutes			
State EIS law (See Section 6.2)	Partial	Partial	Partial
State Coastal Zone Management Program (See Section 6.2)	Partial	Partial	Partial
County Special Management Area Permit (See Section 6.2)	Full	Full	Full

TABLE 2. RELATIONSHIP OF THE PLANS TO ENVIRONMENT PROTECTION STATUTES AND OTHER ENVIRONMENTAL REQUIREMENTS (CONT)

State Conservation District Use Application Permit (See Section 6.2)	Full	Full	Full
County General Plan	Full	Full	Full
County Development Plan (Primary Urban Center - Central)	Full	Full	Full
State Land Use Law	Full	Full	Full
State Water Quality Certification	Full	Full	Full

Required Federal Entitlements (Permits)

None required

NOTES:

a. Full (Full Compliance). Having met all requirements of the statute, Executive Order or other environmental requirements for the current stage of planning (either pre- or post-authorization).

b. Partial (Partial Compliance). Not having met some of the requirements that normally are met in the current stage of planning. Partial compliance entries should be explained in appropriate places in the report and/or EIS and referenced in the table.

c. Non-Compliance. Violation of a requirement of the Statute, Executive Order, or other environmental requirement. Non-compliance entries should be explained in appropriate places in the report and/or EIS and referenced in the table.

d. N/A (Not applicable). No requirement for the statute, Executive Order or other environmental requirement for the current stage of planning.

2. NEED FOR AND OBJECTIVES OF THE ACTION

2.1 STUDY AUTHORITY: This shore protection study was formed under Section 103 of the River and Harbor Act of 1962, as amended. This section authorizes the Corps of Engineers to construct small shore and beach restoration and protection projects. This is the second shore protection project proposed for Sand Island. The first project consists of an ungrouted riprap revetment along the easterly shore adjoining the entrance channel to Honolulu Harbor. Construction was completed in September 1980.

2.2 PUBLIC CONCERNS. In general, the public has expressed the need to:

a. Eliminate the severe erosion along the southern shoreline of the Sand Island Regional State Park, and

b. Remove the iron and concrete rubble which has become exposed along some stretches of the shoreline. At a public workshop held in November 1982, concern was indicated for the surfing site at the west end of the study area, and the "tide pools' which formed behind the existing revetment when the fill eroded.

2.3 PLANNING CONSIDERATIONS: The following goals were derived from considering the public concerns and management needs expressed during public and agency coordination on the project.

a. Eliminate or substantially reduce shoreline erosion within the study area.

b. Protect and enhance recreational activities and educational opportunities along the shoreline.

c. Preserve and enhance the visual/aesthetic qualities of the park and shoreline.

d. Protect and enhance the water quality and fish and wildlife resources of the study area.

e. Avoid impacting historic or archaeological resources.

f. Avoid significant adverse environmental impacts.

g. Avoid adverse impacts to any threatened or endangered species.

3. ALTERNATIVES

3.1 PLANS ELIMINATED FROM FURTHER STUDY.

a. Two nonstructural plans were briefly considered, but eliminated early in the study process. These were:

(1) stabilization of the shore with vegetation to reduce erosion; and

(2) shoreline management to eliminate damage to resources from the erosion which will occur.

It was determined the wave regime was too severe for vegetative stabilization, and the continued loss of park land by erosion made shoreline management an unacceptable alternative for the Department of Land and Natural Resources.

b. Two similar structural plans were briefly considered. These were:

(1) a sheet pile bulkhead; and

(2) a grouted rock or concrete seawall.

Both of these plans were eliminated early in the study due to safety considerations; the fact that the shoreline recreational resources (except fisning) would be virtually eliminated; and the problems caused by reflected waves from a vertical structure.

3.2 WITHOUT CONDITIONS: If no protective actions are taken, the park shoreline will continue to erode, reducing the land available for recreational activities, and adding sediments to the offshore marine environment. Since Sand Island consists almost entirely of dredged material fill which erodes easily, eventually the entire park would be eroded away. At some stage of that process, protective action would be required to prevent damage to the sewage treatment plant, the container yard and other inland commerical facilities.

3.3 PLANS CONSIDERED IN DETAIL.

a. Plan 1 - Revetment. This plan consists of constructing a revetment, ungrouted, with an outer layer of large armor stones, from the earlier Corps constructed revetment west for a distance of approximately 1,950 feet. The crest elevation is planned to be +8 feet mean lower low water (MLLW). The stone for the structure would come from an existing quarry and part of the existing deteriorated revetment which presently extends along the south shoreline.

b. Plan 2 - Offshore Breakwaters. This plan consists of constructing nine small breakwaters along the south shore for a distance of approximately 1,880 feet. Each breakwater would be 150 feet long at the crest, and approximately 200 feet long at the base. They would be placed offshore, so that their centerlines would be approximately 120 feet from the existing structure's centerline, with 75 feet between structures. Crest elevation is planned to be +8 feet MLLW. The stone for the structures would come from an existing quarry and part of the existing south shore revetment.

c. Plan 3 - Combination. Plan 3 is a combination of Plans 1 and 2. It consists of an ungrouted riprap revetment extending from the harbor channel shoreline west for a distance of 530 feet. Starting at the west end of the study area, another similar revetment would be built extending east for a distance of 820 feet. Between the two revetments, a series of three breakwaters would be placed, completing the approximately 1,950-foot reach of the protective project. The three breakwaters would be of the same size and spacing as for Plan 2.

3.4 COMPARISON OF ALTERNATIVE IMPACTS. (See Table 3) None of the alternatives will have serious adverse environmental impacts, and all will provide adequate protection to the shore. Each plan will cause some increased turbidity and siltation during construction, as well as increased noise, dust

TABLE 3. COMPARISON OF ALTERNATIVE IMPACTS

Resource	Base Condition	Plan 1	Plan 2	Plan 3
Recreation				
Swimming	Good at beach at west end of study area, poor along deteriorated revetment due to danger of injury.	No effect.	Adds 2,000 linear ft of protected nearshore waters for swimming.	Adds 500 linear ft of protected nearshore waters for swimming.
Snorkeling	Relatively depauperate biota near shore.	No effect.	No effect.	No effect.
Wading	Good at beach, good in "tide pools" for small children. Water too deep outside revetment.	Eliminates "tide pool" wading areas.	Adds 2,000 ft of protected shoreline for wading.	Improves 500 ft of protected shoreline for wading.
Sunbathing	Good at beach and grass areas of park.	Eliminates threat of erosion hazard to improved facilities.	Same as Plan 1.	Same as Plan 1.
Picnicking	Tables, fire boxes, toilets and much open space available.	Same as above.	Same as Plan 1.	Same as Plan 1.
Camping	Permitted, space available near shore. Toilet facilities available.	Same as above.	Same as Plan 1.	Same as Plan 1.
Jogging	Grass and walkways available.	No effect.	No effect.	No effect.
Surfing	Surf site located at west end of study area.	No effect.	Offshore structures will interfere with surfing.	No effect.
Fishing	Popular along entire shoreline.	Adds 2,000 linear ft of revetment fishing sites.	Reduces shoreline fishing locations.	Adds 1,350 linear ft of revetment sites.

TABLE 3. COMPARISON OF ALTERNATIVE IMPACTS (Contd)

Resource	Base Condition	Plan 1	Plan 2	Plan 3
Crabbing	For black crabs on rocks of revetments.	Provides 2,000 linear feet of rocky shoreline habitat.	Reduces shoreline rocky habitat.	Provides 1,350 linear feet of rocky shoreline habitat.
Field Trips	Good activities and facilities available for young children--open space for games, "tide pools," "climbables," toilets, drinking water, very light traffic.	Eliminates the "tide pools."	Adds 2,000 linear ft of protected waters for swimming, wading and exploring.	Adds 500 linear ft of protected waters for swimming, wading and exploring.
Natural Hazards				
Floods	Flood Zone "C," minimal hazards.	No effect.	No effect.	No effect.
Tsunamis	Inundation zone along harbor channel and west for 1500 ft.	No effect.	No effect.	No effect.
Water Quality	Ocean waters designated Class "A," no natural fresh water on Sand Island.	No long-term effects. (Slight increase in turbidity during construction.)	No long-term effects. (Some increase in turbidity during construction.)	No long-term effects. (Some increase in turbidity during construction.)
Sedimentation & Sediment Quality	Little of the sediment from Honolulu Harbor affects the study area.	No effect.	No effect.	No effect.
Noise	Generally quiet, except for aircraft using Honolulu International Airport.	No effect. (Some increase during construction)	No effect. (Some increase during construction)	No effect. (Some increase during construction)
Air Quality	Good due to prevailing offshore wind and no significant source of air pollution in the vicinity.	No effect. (Some increase of dust due to project construction)	No effect. (Some increase of dust due to project construction)	No effect. (Some increase of dust due to project construction)
Historic Resources	World War II defense facilities incorporated into park facilities.	No effect.	No effect.	No effect.

TABLE 3. COMPARISON OF ALTERNATIVE IMPACTS (Contd)

Resource	Base Condition	Plan 1	Plan 2	Plan 3
Biological Resources				
Terrestrial Flora	Introduced and common grasses, weeds, bushes and trees.	No effect.	No effect.	No effect.
Terrestrial Fauna	Common introduced birds, mammals and reptiles.	No effect.	No effect.	No effect.
Marine Flora	Common algae present but not abundant.	No effect.	Additional hard subtidal substrate provided for algae growth.	Some additional hard subtidal substrate provided for algae growth.
Marine Fauna	Common fish and invertebrates present but not abundant.	No effect.	Increased rocky subtidal habitat formed.	Some increased rocky subtidal habitat formed.
Endangered Species	No terrestrial species present. Juvenile Green Turtles may forage in the area.	No effect.	No effect.	No effect.

and traffic. Plan 1 will eliminate the "tide pools" in the central portion of the study area, but will greatly increase shoreline fishing sites. Plan 2 will provide greatly increased swimming and wading opportunities, but will reduce shoreline fishing sites and interfere with a surfing site. Plan 3 is a compromise, which retains the tide pools, adds new areas for swimming and wading, and does not interfere with the surfing site. Plan 3 is the environmentally preferred plan.

4. AFFECTED ENVIRONMENT

4.1 PHYSICAL SETTING.

a. The Hawaiian Islands are centrally located in the North Pacific Ocean. The eight major islands, seven of which are inhabited, form a 400-mile-long arc at the southeastern end of the archipelago and constitute 6,500 square miles of land area. The island of Oahu has a land area of approximately 600 square miles making it the third largest of the islands. The state capital is in the city of Honolulu on Oahu, and is the largest city in the State. Sand Island is located in Honolulu Harbor, on the south coast of Oahu (Figure 1). The study area is located along the southern shore of Sand Island, fronting the Sand Island Regional State Park.

b. Sand Island is composed of dredged material from Honolulu Harbor and the seaplane runways in Keehi Lagoon. In the late 1800's Sand Island consisted of an irregular patch of ground about 2 feet above sea level with several buildings on it used as quarantine facilities to house immigrants disembarking from ships. From 1935 through World War II, the island was part of the coastal defense of Pearl Harbor and Honolulu Harbor. Numerous military facilities were constructed there, including gun emplacements. During the war, the old quarantine facility was used to intern American citizens and aliens of Japanese descent living in Hawaii. Since that time, Sand Island has been used for a variety of light industrial activities, and now has a major sewage treatment plant, the container facility, a US Coast Guard base, the Anuenue Fisheries Research Center, and the park, as well as other light industrial activities.

4.2 RECREATION.

a. Recreational facilities are located within 140 acres designated as State Park lands, owned and operated by the Department of Land and Natural Resources, Division of State Parks, Outdoor Recreation and Historic Sites. The park is being developed incrementally as funding permits. Phase I, completed in 1976, includes approximately 10 acres of passive recreation park area along the harbor shoreline on the southeastern end of Sand Island. Phase II, completed in 1978, includes approximately 30 acres of beach park along the southern ocean shore. Subsequent phases of park development will involve completion of tne beach park along the ocean shoreline and a boat park along the Keehi Lagoon shoreline on the western end of Sand Island. The previous Corps project at Sand Island was confined to study area extending along the harbor shoreline, encompassing the Phase I development and a portion of Phase II. The present study area is confined to the oceanside shoreline, having recreational resources oriented towards beach park activities provided by the Phase II development.

b. The study area provides swimming, sunbathing, beach picnicking, camping, surfing, fishing, jogging, crabbing, snorkeling, and field trips by

young school children. It is one of only two facilities within the planning area providing swimming and sunbathing activities and is the only facility providing beach camping and surfing activities and a coral reef for snorkeling. The camping zone is in the western portion of the study area. Current shoreline recreation needs for this area exceed the supply. The park is used overwhelmingly by local island residents, particularly from tne Kalihi-Kapalama-Nuuanu areas of west Honolulu.

4.3 NATURAL HAZARDS. Sand Island is in Flood Zone "C" indicating flooding hazards are minimal. The State of Hawaii has identified a portion of the study area as a tsunami inundation area. Tne area extends from the shoreline adjoining the entrance channel of Honolulu Harbor inland west for a distance of 1,500 feet.

4.4 WATER QUALITY. The nearshore waters along the southern shore of Sand Island are designated Class "A" according to Chapter 54 of Title II, Administrative Rules on Water Quality Standards. It is the objective of this class of waters that their use for recreational purposes and aesthetic enjoyment be protected. Sand Island has no natural surface water features; but two nearby streams, Nuuanu Stream and Kapalama Stream, discharge into Honolulu Harbor, and thence, through the two harbor channels and out to sea.

4.5 SEDIMENTATION AND SEDIMENT QUALITY. The two streams which empty into Honolulu Harbor discharge a sizable quantity of sediment. Although data is not available to estimate the quantity, sediment accumulates in the harbor from all sources at the rate of approximately 50,000 cubic yards per year. Gradation analysis of bottom sediment samples indicate they are composed of a high percentage of land-derived silty clays and a small percentage of sand.

4.6 NOISE. The existing noise level on Sand Island is affected by overhead aircraft flights, boating activities in Keehi Lagoon, container yard activities, vehicle movements and scattered light industrial activities. The noise level in the study area is less than many other urban areas on the island, except for aircraft noise.

4.7 AIR QUALITY. Ambient air quality in the study area is good, due to the presence of the northeast tradewinds which predominate throughout the year and blow pollutants from inland areas out to sea. Problems of poor air quality may be more likely to occur when tradewinds diminish or give way to southerly winds. The nearest state air quality sampling station is located at the Department of Health building approximately one mile away. This station monitors for carbon and oxidants on a daily basis, and particulate matter, sulfur dioxide, and nitrogen dioxide on a less freqent basis. During the period January 1976 to March 1977 carbon monoxide exceeded the state standards 50 times (11% of the days sampled) and oxidants 3 times. Particulate matter, sulfur dioxide and nitrogen dioxide did not exceed state standards during the same time period.

4.8 HISTORIC RESOURCES. There are no sites on Sand Island which are listed on the State of Hawaii or the National Registers of Historic Places. Since the island is man-made, it is unlikely that any feature of prehistoric or early historic archaeological significance exists there. The site of the old quarantine station has some historical significance because of its use for housing immigrants at the turn of the century, and more recently, residents of Japanese ancestry during World War II. However, this site is located near the

center of the island, well outside the study area, and will not be affected by the proposed project. Defense facilities constructed on Sand Island during World War II still remain near the shore. These include gun emplacements and towers which have been incorporated into the park facilities. Similar structures at the southeastern end of Sand Island were evaluated for possible eligibility for the National Register of Historic Places as part of the planning process for the earlier Corps of Engineers shore protection study. They were determined by the Keeper of the Register, US Dept of the Interior, not to be eligible. Although they are near the shoreline, they are not in the study area and will not be affected by the proposed project. The shoreline itself was also protected by small pill boxes and concertina wire and other obstructions anchored to concrete blocks.

4.9 BIOLOGICAL RESOURCES.

a. Terrestrial Resources. The terrestrial plant resources of the study area are introduced common grasses, weeds and exotic trees and shrubs. The fauna consists of introduced mammals, birds and reptiles. Table 6 lists the mammals expected to occur on Sand Island, and which could periodically be found in the study area. The avifauna of the island and Keehi Lagoon consists mainly of exotic species and migratory species, with a few native species occasionally seen in Keehi Lagoon. Table 4 lists the birds recorded by the Hawaii Division of Forestry and Wildlife from Keehi Lagoon during the period 1976-1983, with an asterisk indicating the species observed in the immediate project area during a Corps survey in early 1983. Table 5 lists the terrestrial birds observed during the Corps survey.

b. Marine Resources. Honolulu Harbor and the nearshore area off Sand Island provide habitat for a number of marine fish and invertebrates, although their abundance is low. Table 7 is a list of fishes observed in Honolulu Harbor as reported by HECO and Tetra Tech in 1976, with asterisks indicating species observed off the southern shore of Sand Island during a Corps survey in early 1983. The fish of principal commercial value is the nehu (Hawaiian anchovy) which is used for bait by the Hawaiian skipjack tuna industry. The nehu is found in Honolulu Harbor but not offshore of the project area. Table 8 lists the macroinvertebrates observed during the Corps survey in 1983. As with fish, the abundance of these invertebrates is low in the shallow offshore area which would be affected by the project. Coral cover is less than 1%, with only random small heads of Porites sp., Pocillopora sp., and Montipora sp. in the area. The reef front varies from 200-600 feet from shore, and has more biological activity than the nearshore areas, but it is not a particularly productive area.

c. Endangered Species. The US Fish and Wildlife Service has stated that there are no species of plants or animals listed or proposed for listing as threatened or endangered, for which they have responsibility, which would be affected by the proposed project. The National Marine Fisheries Service advised that the project area is a likely foraging area for juvenile threatened Green Turtles (Chelonia mydas); however, they determined that the project is unlikely to affect this threatened species, and formal consultation will not be required under Section 7 of the Endangered Species Act.

TABLE 4. BIRDS RECORDED AT KEEHI LAGOON, OAHU
1976-1983

ENGLISH NAME	HAWAIIAN NAME	SCIENTIFIC NAME
I. NATIVE (RESIDENT) BIRDS		
1. Hawaiian stilt*	aeo	Himantopus himantopus knudseni
2. Black-crowned night heron	aukuu	Nycticorax nycticorax hoactli
*Endemic, endangered species		
II. MIGRATORY BIRDS		
1. Pacific golden plover*	kolea	Pluvialis dominica fulva
2. Black-bellied plover		Squatarola squatarola
3. Ruddy turnstone	akekeke	Arenaria interpres
4. Wandering tattler*	ulili	Heteroscelus incanum
5. Sanderling	hunakai	Crocethia alba
6. Glaucous gull	'opa'ipa'i	Larus hyberboreus
7. Franklin's gull	'opa'ipa'i	Larus pipixcan
8. Bonaparte's gull	'opa'ipa'i	Larus philadelphia
9. Ring-billed gull	'opa'ipa'i	Larus delawarensis
10. California gull	'opa'ipa'i	Larus californicus

TABLE 5. INTRODUCED (EXOTIC) BIRDS OBSERVED DURING 1983 CORPS STUDY

1. Lace-necked dove	manuku	Streptopelia chinensis
2. Barred dove	manuku	Geopelia striata
3. Mockingbird		Mimus polyglottos
4. Common mynah	manu-'ai-pilau	Acridotheres tristis
5. House sparrow	manu-li'ili'i	Passer domesticus
6. Cardinal	manu-'ula'ula	Richmondena cardinalis
7. House finch		Carpodacus mexicanus
8. Brazilian cardinal		Paroaria cristatus
9. Ricebird	manu-'ai-laiki	Lonchura punctulata
10. Cattle egret		Bulbulcus ibis
11. Red-vented bulbul		Pyconotus cafer

TABLE 6. MAMMALS
(Source: Final Environmental Impact Statement, Honolulu Harbor)

1. Black rat	iole nui	Rattus rattus
2. Brown rat	iole, Poo-wai	Rattus norvegicus
3. Hawaiian rat	iole	Rattus exulans hawaiiensis
4. House mouse	iole-liilii	Mus musculus domesticus
5. Mongoose	iole-manakuke	Herpestes auropunctatus
6. Feral cat	popoki	Felis catus
7. Feral dog	ilio	Canis familiaris

TABLE 7. CHECKLIST OF FISHES FROM HONOLULU HARBOR

Scientific Name	Local Name	Common Name
Abudefduf abdominalis	Maomao	Sergeant major
Abudefduf sordidus	Kupipi	
Acanthurus dussumieri		Surgeon fish
* Acanthurus mata	Pualu	Surgeon fish
Acanthurus nigrofuscus	Maii	Brown surgeon fish
Acanthurus nigrosis		Surgeon fish
**Acanthurus triostegus	Manini	Surgeon fish
Acanthurus xanthopterus	Pualua	Surgeon fish
Albula vulpes	Oio	Bonefish
Arothron hispidus		
Adioryz xantherythrus		
Aulostemus chinenis	Nunu	Stickfish
Canthigaster jactator	Oopu hue	Puffer
Caranx ignobilis	Pauuu	White jack
Caranx melampygus	Omilu	Blue jack
Caranx sexfaciatus	Papio	White jack
Chaetodon auriga	Kikakapu	Treadfin butterflyfish
* Chaetodon lunula	Kikakapu	Raccoon butterflyfish
* Chaetodon miliaris	Kikakapu	Lemon butterflyfish
**Chaetodon ornatissimus	Kikakapu	Ornate butterflyfish
Chaetodon unimaculatus	Kikakapu	Tear-drop butterflyfish
Chanos chanos	Awa	Milkfish
Chromis ovalis		Damselfish
Conger marjuratus		
* Ctenochaetus strigosus	Kole	Surgeon fish
Dascyllus albisella		White spotted damselfish
Diodon holocanthus		
Diodon hystrix		Porcupine
Elops hawaiinenis	Awaawa	Lady fish
Flammeo sammara		
Gomphosus varius	Hinalea uuku iiwi	Bird wrasse
Gymnothorax undulatus	Puhi	Moray eel
Hemiramphus depauperatus	Iliehe	Halfbeak
Hepatus sandvicensis	Manini	Convict tang
Kuhlia sandvicensis	Aholehole	Mountain bass
Lutjanus fulvus	Toau	Blacktailed snapper
Microcanthus strigatus		
Mugil cephalus	Ama ama	Mullet
Mulloidichthys auriflamma	Weke ula	
* Mulloidichthys flavolineatus	Weke ula ula	Sand goatfish
Myripristis borbonicus	Pauu	
Myripristis murdjan	Uu	
* Naso unicornus	Kala	Unicornfish
* Ostracion meleagris	Moa	Boxfish
* Parupeneus multifasciatus	Moano	Goatfish
Parupeneus porphyreus	Kumu	Goatfish
Peravagor spilosoma	Oiliuwi	Fantailed filefish
* Pomacentrus jenkinsi		Damselfish
**Rhinecanthus rectangulus	Humuhumunukunukuapuaa	Trigger fish
Scomberoides sanctipetri	Lai	Leatherback

TABLE 7. CHECKLIST OF FISHES FROM HONOLULU HARBOR (Cont)

Scientific Name	Local Name	Common Name
Sphyraena snodgrassi	Kaku	Barracuda
Sphyrna lewini		Hammerhead shark
Stethojulis balteatus	Hinalea	Wrasse
Stolephorous purpureus	Nehu	Hawaiian anchovy
**Thalassoma duperrey	Hinalea lauili	Saddle wrasse
**Thalassoma fuscum	Awela	Brown wrasse
Tilapia spp		Tilapia
Upeneus arge		
* Zanclus cornutus	Kihi Kihi	Moorish idol
Zebrasoma flavescens	Laipala	

Sources: HECO, 1976; and Tetra Tech, 1976

* Indicates species also observed during Corps survey.
** Indicates species observed during Corps Survey but not by HECO or Tetra Tech.

TABLE 8. MACROINVERTEBRATES AND ALGAE OBSERVED DURING CORPS SURVEY, 1983

Scientific Name	Common Name
Porites lobata	Lobe coral
Pocillopora meandrina	Rose coral
Montipora flabellata	Coral
Palythoa tuberculosa	Soft Coral
Porites brighami	Coral
Diadema paucispinus	Sea urchin
Tripneustes gratilla	Sea urchin
Holothuria atra	Sea cucumber
Actinopyga mauritiana	Sea cucumber
Grapsus grapsus tenuicrustatus	Black crab
Bryopsis sp.	Algae
Dictyosphaeria cavernosa	Green bubble algae
Dictyosphaeria versluysii	
Galaxaura rugosa	
Neomeris annulata	Green algae
Pterocladia caerulescens	Red algae
Porolithon gardineri	Coralline algae

5. ENVIRONMENTAL EFFECTS

5.1 RECREATION.

a. Swimming. With Plan 1, swimming would not be significantly affected. The beach is outside the area to be protected by the revetment and will, therefore, not be affected; and the new revetment will not significantly decrease the hazards of swimming near the rocks. Plan 2 will create a protected swimming area 3 to 10 feet deep for the entire length of the project, greatly increasing the total area for good swimming. Plan 3 will create a 500 feet protected swimming area 3 to 5 feet deep.

b. Snorkeling. Plan 1 will not affect this activity. Plan 2, although providing more intertidal and subtidal habitat will not significantly improve snorkeling because of the danger involved in swimming near the breakwaters to observe the marine life. Plan 3, being a combination of Plans 1 and 2, would also not be expected to have a significant impact on this activity.

c. Wading. Plan 1 will eliminate the "tide pools" and, therefore, the wading done in them. Plan 2 will increase the area for wading behind the offshore breakwaters. Plan 3 will also slightly increase the area for wading, since the tide pools will remain intact, and the area beyond and beneath the existing breakwaters will be added.

d. Sunbathing. None of the plans will have an effect on sunbathing.

e. Picnicking. None of the plans is expected to have an effect on picnicking or picnicking facilities.

f. Camping. None of the plans will have an effect on camping or camping facilities.

g. Jogging. None of the plans will have an effect on use of the park for jogging.

h. Surfing. The surf site located at the west end of the project site will be partially effected by the offshore protective structures proposed in Plan 2, but not affected by Plans 1 or 3.

i. Fishing. The shore protection revetments proposed in Plans 1 and 3 will increase the area of rocky fishing sites, which appear to be more popular than other areas. Plan 2 will reduce the area of convenient fishing sites along the shore.

j. Crabbing. All plans will increase the area of rocky intertidal habitat used by the black crab (Grapsus grapsus tenuecrutatus), therefore, this activity should be much improved.

k. Field Trips. Plan 1, by eliminating the erosion "tide pools," will decrease the number of activities available to the children during field trips. The very shallow, protected pools will not be available for wading or for observing marine life such as small fishes. Plan 2 will increase wading opportunity, but will also eliminate the pools and their easily observed marine life. Plan 3 is expected to enhance the "tide pools" and provide more area for wading, including some stillwater area for very young children.

1. Short-Term Construction Impacts. During construction, the contractor will be given an easement along the shoreline for the entire length of the project area as shown in Figure 8 of the Main Report. This easement will severely restrict access to the shoreline. Work completed and accepted from the Contractor will be returned for public use provided public safety and Contractor access to remaining sites is not restricted. Phasing of this work is anticipated, and will depend on contractor operational requirements. The Corps' Resident Engineer and the Contractor will coordinate to assure that every practical means is used to provide access to as much shoreline as possible throughout the construction period. Increased truck traffic during construction will result; however, possible temporary truck routes within the park will be investigated and coordinated with the Division of State Parks to prevent traffic congestion.

5.2 NATURAL HAZARDS.

a. Floods. None of the three plans will increase flood hazard risks.

b. Tsunamis. None of the plans will increase tsunami hazard risks.

5.3 WATER QUALITY. During construction of all the plans there may be a temporary increase in turbidity in the water. Excavation at the shoreline for the toe of the revetments of Plans 1 & 3 have the greatest probability of causing increased turbidity. The excavation, to be accomplished by clamshell, dragline, or similar equipment is expected to be minimal, especially in the area of the existing, deteriorated revetment of Reach 1. The other main source of turbidity will be the temporary causeways connecting the off-shore breakwaters of Plans 2 & 3 for equipment access. (See Figure 10, 11 & 12 of the Main Report.) These causeways will be removed as each breakwater is completed and their fill material is expected to be clean stone which will cause minimal turbidity. These temporary causeways may also be required for the maintenance of the offshore structures. For the long-term, turbidity is expected to decrease slightly due to the reduced erosion. No other water quality parameters are expected to be affected.

5.4 SEDIMENTATION AND SEDIMENT QUALITY. None of the plans will affect the amount of sediment or the sediment quality of that which originates from Honolulu Harbor channel. Erosional sediments from the Sand Island study area are expected to be virtually eliminated.

5.5 NOISE. There will be a temporary increase in the noise level during construction, but there will be no significant difference between any of the three proposed plans, and no long-term change in the noise level as a result of any of the plans.

5.6 AIR QUALITY. All three plans will create a temporary increase in the amount of dust in the air from construction. However, due to prevailing offshore winds there should be no significant effect to the inland park areas.

5.7 HISTORIC RESOURCES. No effect to the existing World War II defense facilities, which are incorporated into the park, are expected by any of the plans. No sites eligible for or listed on the State or National Register of Historic Places will be affected by the Alternative Plans.

5.8 BIOLOGICAL RESOURCES.

a. Terrestrial Resources. There will be no effect to the existing terrestrial flora or fauna in the study area.

b. Marine Resources.

(1) Flora. Plan 2 and 3 will provide additional hard subtidal substrate for algae growth. Plan 1 will have no significant effect.

(2) Fauna. Plan 2 will form an increased rocky subtidal and intertidal habitat. Plan 3 will also form an increased rocky intertidal and subtidal habitat offshore but will have no significant effect near shore. Plan 1 will have no significant effect.

c. Endangered Species. There are no terrestrial endangered or threatened species in the study area. Although juvenile Green Sea Turtles may forage in the general area, due to the general lack of preferred algae in the immediate project area, none of the plans is expected to have an effect on them.

6. PUBLIC INVOLVEMENT

6.1 PUBLIC INVOLVEMENT PROGRAM. The public involvement program has consisted of meetings and workshops with the public at large and with members of Federal, State and County agencies having interest in the proposed project. A meeting with the Kalihi-Palama Community Association was also held. Public concern over impacts was centered around the surfing site at the west end of the project area and the erosion "tide pools." Users of the park expressed support for the project and appeared to agree that no significant adverse impacts would be caused by the project.

6.2 REQUIRED COORDINATION. The following coordination must be completed with the following agencies:

a. Coastal Zone Management Act. Prior to plan implementation, a Federal consistency determination will be prepared by the Corps and concurrence requested from the State of Hawaii, Department of Planning and Economic Development, Coastal Zone Management Office.

b. Endangered Species. Coordination with the National Marine Fisheries Service has determined there is little possibility of the project effecting the threatened Green Turtle, and that formal consultation pursuant to Section 7 of the Endangered Species Act is not required. Correspondence by the Corps and the National Marine Fisheries Service on this issue are included in Appendix F.

c. National Historic Preservation Act. The State Historic Preservation Officer has determined the project does not occur on properties listed or determined eligible for listing on the Hawaii or National Register of Historic Places.

d. Fish and Wildlife Coordination Act. The US Fish and Wildlife Service has provided a Section 2(b) report which is included in Appendix F.

e. Clean Water Act, Section 404 Evaluation. The EIS contains an evaluation of the effects of the discharge of fill material in accordance with US Environmental Protection Agency requirements. The US EPA has an opportunity to review and comment on the EIS and the 404 evaluation.

f. State and County Approvals. The State of Hawaii, Department of Land and Natural Resources, is responsible for obtaining all necessary local permits and approvals and satisfying the requirements of Chapter 343, Hawaii Revised Statues and EIS Regulations. The Federal EIS and CZM consistency request discussed the construction impacts and compatibility of the action to local coastal zone management policies, but did not address actions to be planned by the State.

6.3 STATEMENT RECIPIENTS. The following agencies and public-at-large were sent copies of the draft environmental statement and survey report, and will be sent copis of the final report.

Federal Government

US Advisory Council on Historic Preservation
  Washington DC Office
  Western Project Review Office
US Environmental Protection Agency
  Office of Environmental Review
  Region IX
  Pacific Islands Office
US Army Corps of Engineers
  Coastal Engineering Research Center
US Department of Agriculture
  Washington D.C. Office
  Institute of Pacific Islands Forestry
  Soil Conservation Service
  Hawaii District Office
US Department of Energy
US Department of Commerce
  Secretary of Environmental Affairs
  National Marine Fisheries Service
    Southwest Region Office
    Pacific Program Office
  Office of Coastal Zone Management
US Department of the Interior
  Office of Environmental Review
  US Geological Survey, Hawaii Volcano Observatory
  Secretary Field Representative, Pacific Southwest Region
  US Fish and Wildlife Service
    Regional Office
    Pacific Islands Office
  National Park Service
    Office of Archaeological and Historic Preservation
    Interagency Archaeological Service
    Arizona Archaeological Center
    Pacific Southwest Region Office
    Hawaii State Office
US Department of Housing and Urban Development

Federal Government (Contd)

US Department of Health Human Services
Regional Office
US Department of Transportation
Federal Highway Administration
14th Coast Guard District

State Government

Governor George R. Ariyoshi
Hawaii Congressional Delegation
Department of Planning and Economic Development - Clearinghouse
Department of Health
Office of Environmental Quality Control
International Tsunami Information Center
Department of Land and Natural Resources
State Historic Preservation Officer
Division of State Parks
Division of Aquatic Resources
Forestry and Wildlife Division
Land Management Division
Water and Land Development Division
Conservation and Resources Enforcement Division
Oahu District Land Agent
Board of Land and Natural Resources
Marine Affairs Coordinator
Department of Transportation
Highways Division
Harbors Division
Department of Accounting and General Services
Attorney General
State Department of Agriculture
Board of Agriculture
Hawaii State Library
Oahu Island Branches

County Government

Mayor Eileen Anderson
Honolulu City Council
Oahu Legislative Delegation
Department of Parks and Recreation
Department of Planning
Planning Commission
Department of Public Works
Board of Water Supply
Office of Civil Defense
Department of Land Utilization

Organizations

Pacific Yacht Club
Pearl Harbor Yacht Club
Sea Grant/Marine Advisory Program
Lani-Kailua Outdoor Circle
Institute of Marine Biology
Kaneohe Yacht Club
Hawaii Yacht Racing Association
Waialua Boat Club
Waianae Big Game Fishing Club
Pokai Bay Boat Club
Save Our Surf
Shoreline Protection Alliance
Waikiki Yacht Club
Life of the Land
Greenpeace Foundation
Outdoor Circle
Pacific Diving Industries
Bishop Museum
Waimomi Outdoor Circle
Hawaii's Thousand Friends
Western Pacific Fisheries Mangement Council
Kalihi-Palama Community Council
Hawaii Audubon Society
University of Hawaii Yacht Club
Hawaii Kai Fishing Club
Sand Island Committee
La Mariana Sailing Club
Environmental Center, University of Hawaii
Center for Urban Affairs and Policy Research

6.4 PUBLIC VIEWS AND RESPONSES. Following is a summary of significant comments received. Not all comments are summarized here; however, all letters of comments and responses are reproduced in Appendix B.

a. Federal Agencies

(1) The National Marine Fisheries Service, Southwest Region determined that the proposed project is not likely to adversely effect the threatened Green Sea Turtle, therefore formal consultation pursuant to Section 7 of the Endangered Species Act is not required.

(2) The U.S. Fish and Wildlife provided a Section 2(b) report pursuant to the Fish and Wildlife Coordination Act. The report indicted the project would not have a significant adverse impact on fish and wildlife resources in the study area, but recommended several measures to mitigate construction impacts.

(3) The U.S. Environmental Protection Agency did not object to the project, classified it as Category LO-1, and had no comments.

b. State Agencies

(1) The State Department of Health has stated the discharge impacts on water quality are acceptable, and have been mitigated to the extent practical, and that the discharge will conform to State water quality standards.

(2) The State of Hawaii Historic Preservation Officer has stated the project does not occur on historic properties that are listed on the Hawaii Register or the National Register of Historic Places, or that have been determined eligible for inclusion on the National Register of Historic Places.

(3) State Department of Land and Natural Resources expressed concern over possible dredging, turbidity and sedimentation, inconvenience to the public due to access restrictions, public safety and maintenance responsibilities. The EIS addresses many of these concerns, and others will be addressed during later phases of the project as indicated in our letter of response.

(4) The Department of Planning and Economic Development expresed the desire to have the EIS discuss the Hawaii State Plan objectives and policies appropriate to this project, and the manner in which the project addresses these; however, since a State agency is the sponsor, it is assumed the proposed project is in conformance with the Hawaii State Plan and no discussion is required.

c. City and County of Honolulu Agenices

(1) The Department of Parks and Recreation believed the offshore breakwaters of Plan 3 should be extended through Reach 3 (Figure 8) to enhance launch and recovery of surfboards and formation of a sand beach in the area. This alternative was considered early in the planning process but was objected to by a surfer at the public workshop in November 1962.

(2) The Department of Land Utilization reminded the Corps of the requirement to obtain a Special Management Area permit for the project. This requirement will be satisfied by the local sponsor, the State Department of Land and Natural Resources.

(3) The Department of General Planning expressed concern over the increased trucking activity expected during construction. The impacts are discussed in the EIS and are not expected to significantly interfere with normal park traffic, as indicated in our letter of response.

d. No comments were received from organizations or individuals.

LIST OF PREPARERS

The following people were primarily responsible for preparing this Environmental Impact Statement.

Dr. James E. Maragos	Marine Ecology	BS, Zoology; Ph.D, Oceanography; 2 yrs postdoctoral research; 8 yrs environmental consultant; 8 yrs EIS studies, Corps of Engineers.	Review, overall impact assessment. (NEPA Coordinator)
Mr. William B. Lennan	Biology	BA, Zoology; 2 yrs postgraduate studies, University of Hawaii; 3 yrs fishery biologist, USFWS 1 yr environmental biologist Corps of Engineers.	Overall impact assessment.
Mr. David G. Sox	History and Culture	BA, MA Geography; 6 yrs research; 7 yrs EIS studies; Corps of Engineers.	Cultural and historical impact assessment.
Mr. David W. Cox	Archaeology	BA, Anthropology; 2 yrs postgraduate studies; w/diploma in cultural resources management, EWC; 1 yr EIS studies, Corps of Engineers.	Archaeological/ historic sites reconnaissance and impact assessment.
Mr. John I. Ford	Limnology	BS MS Zoology; 4 yrs EIS studies, Corps of Engineers; 1 yr, fishery biologist, USFWS	Fish and wildlife assessment.

BIBLIOGRAPHY

Downtown Improvement Association, Waterfront Redevelopment Committee; A Waterfront Design Concept for Honolulu Harbor; Honolulu, Hawaii; April 1976.

E-Cubed Science Services; Coastal Considerations in the Planning and Design of Sand Island Park Improvement; Honolulu, Hawaii; September 1974.

Environment Capital Managers, Inc.; Study of Waterborne Commerce of Hawaiian Containerizable Products and Trends; Prepared for U.S. Army Engineer Division Pacific Ocean, Department of the Army; Honolulu, Hawaii; September 1975.

Environmental Consultants, Inc., Populations Surveys, and Hawaiian Electric Co., Inc.; The Marine Biological Impact of the Honolulu Generating Station: A Summary of the 1975-76 Investigations; Honolulu, Hawaii; August 16, 1976.

Jordan, D.S., and Everman, B.W.; The Shore Fishes of Hawaii; Tokyo, Japan; 1973.

R.M. Towill Corporation; Final Environmental Impact Statement for Sand Island Parkway and Utilities Master Plan, Sand Island, Kapalama - Oahu, Hawaii; Honolulu, Hawaii; May 16, 1974.

Sea Engineering Services, Inc.; Design Wave Criteria, Sand Island Shore Protection; Honolulu, Hawaii; November 1977.

Sea Engineering Services, Inc.; Marine Environmental Considerations for the Proposed Ala Moana Sewage Pump Station Force Main Crossing at Honolulu Harbor; Prepared for Wilson Okamoto and Associates, Inc.; Honolulu, Hawaii; January 1975.

Sea Engineering Services, Inc.; Survey of the Physical Environment - Seaward Coastline, Sand Island; Prepared for E-Cubed Science Services; Honolulu, Hawaii; October 1973.

State of Hawaii, Department of Land and Natural Resources, Division of State Parks, Outdoor Recreation and Historic Sites; Final Environmental Impact Statement for Sand Island State Park; Prepared by Aotani and Oka Architects, Inc.; Honolulu, Hawaii; January 1975.

State of Hawaii, Department of Land and Natural Resources, Division of State Parks, Outdoor Recreation and Historic Sites; The Hawai'i Register of Historic Places 1974, Volume II - Hawai'i Interim Preservation Plan; Honolulu, Hawaii; March 1974.

State of Hawaii, Department of Land and Natural Resources, Division of State Parks, Outdoor Recreation and Historic Sites; Sand Island State Park Final Report; Prepared by Aotani and Oka Architects, Inc.; Honolulu, Hawaii; June 1973.

State of Hawaii, Department of Land and Natural Resources, Division of Water and Land Development; Climatologic Stations in Hawaii, Report R42; Honolulu, Hawaii; January 1973.

State of Hawaii, Department of Planning and Economic Development; Data Book 1977, A Statistical Abstract; Honolulu, Hawaii; November 1977.

State of Hawaii, Department of Planning and Economic Development; Census Statistical Areas Committee; Population and Housing Unit Estimates for Oahu Census Tracts, 1970 - 1976, Report CTC - 36; Honolulu, Hawaii; September 1977.

State of Hawaii, Department of Planning and Economic Development; State Comprehensive Outdoor Recreation Plan; Prepared by Aotani and Hartwell Associates, Inc.; Honolulu, Hawaii; December 1975.

State of Hawaii, Department of Transportation; "1995 Master Plan for Honolulu Harbor" (memorandum); Honolulu, Hawaii; February 1976.

State of Hawaii, Department of Transportation; Draft Environmental Impact Statement for the Proposed Sand Island Access Road Widening and Improvements; Honolulu, Hawaii; January 1981.

Tetra Tech, Inc.; Final Report, Study Areas II and VI-C Water Quality Analysis and Environmental Assessments Oahu, Hawaii; Prepared for Natural Commission on Water Quality; Pasadena, California; February 1976.

U.S. Army Coastal Engineering Research Center; Shore Protection Manual, Volumes I, II, and III; Washington, D.C.; 1975.

U.S. Army Corps of Engineers; Honolulu Harbor Survey Maps, 1905, 1906, 1909, 1914, 1916, 1918, 1919, 1921, 1925, 1927, 1930, 1932, 1933, 1934, and 1935; Honolulu, Hawaii.

U.S. Army Engineer District; Honolulu, Hawaii; Benefit Analysis for Oahu Deep-Draft Harbors; Honolulu, Hawaii; July 1976.

U.S. Army Engineer District Honolulu; Draft Detail Project Report, Kekaha Beach Erosion Control; Honolulu, Hawaii; July 1977.

U.S. Army Engineer District - Department of the Army; Final Environmental Statement Harbor Maintenance Dredging in the State of Hawaii; Honolulu, Hawaii; September 1975.

U.S. Army Engineer District - Department of the Army; Final Environmental Statement of Honolulu Harbor; Honolulu, Hawaii; July 1976.

U.S. Army Engineers Division, Pacific Ocean; Sand Island Shore Erosion-Reconnaissance Report; Honolulu, Hawaii; April 1976.

U.S. Department of Agriculture - Soil Conservation Service; Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii, in cooperation with the University of Hawaii Agricultural Experiment Station; Washington, D.C.; August 1972.

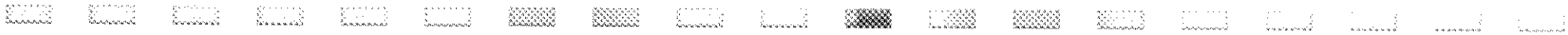
U.S. Department of Commerce, Bureau of the Census; Block Statistics, Honolulu, Hawaii Urbanized Area - 1970 Census of Housing; August 1971.

U.S. Department of Commerce; Local Climatological Data, 1976; Honolulu, Hawaii; Asheville, N.C.; 1976.

Water Resources Council; Water and Related Land Related Resources; Establishment of Principles and Standards for Planning; Federal Register, Volume 38, No. 174, Part III; Washington, D.C.; September 10, 1973.

Wilson Okamoto and Assoc., Inc.; Environmental Impact Statement for the Development of Container Handling Facilities at Sand Island; Prepared for Water Transportation Facilities Division, Department of Transportation; Honolulu, Hawaii; February 1978.

Wilson Okamoto and Assoc., Inc.; Final Environmental Impact Statement for the New Ala Moana Sewage Force Main; Prepared for Division of Sewers, Department of Public Works, City and County of Honolulu; Honolulu, Hawaii; November 1975.



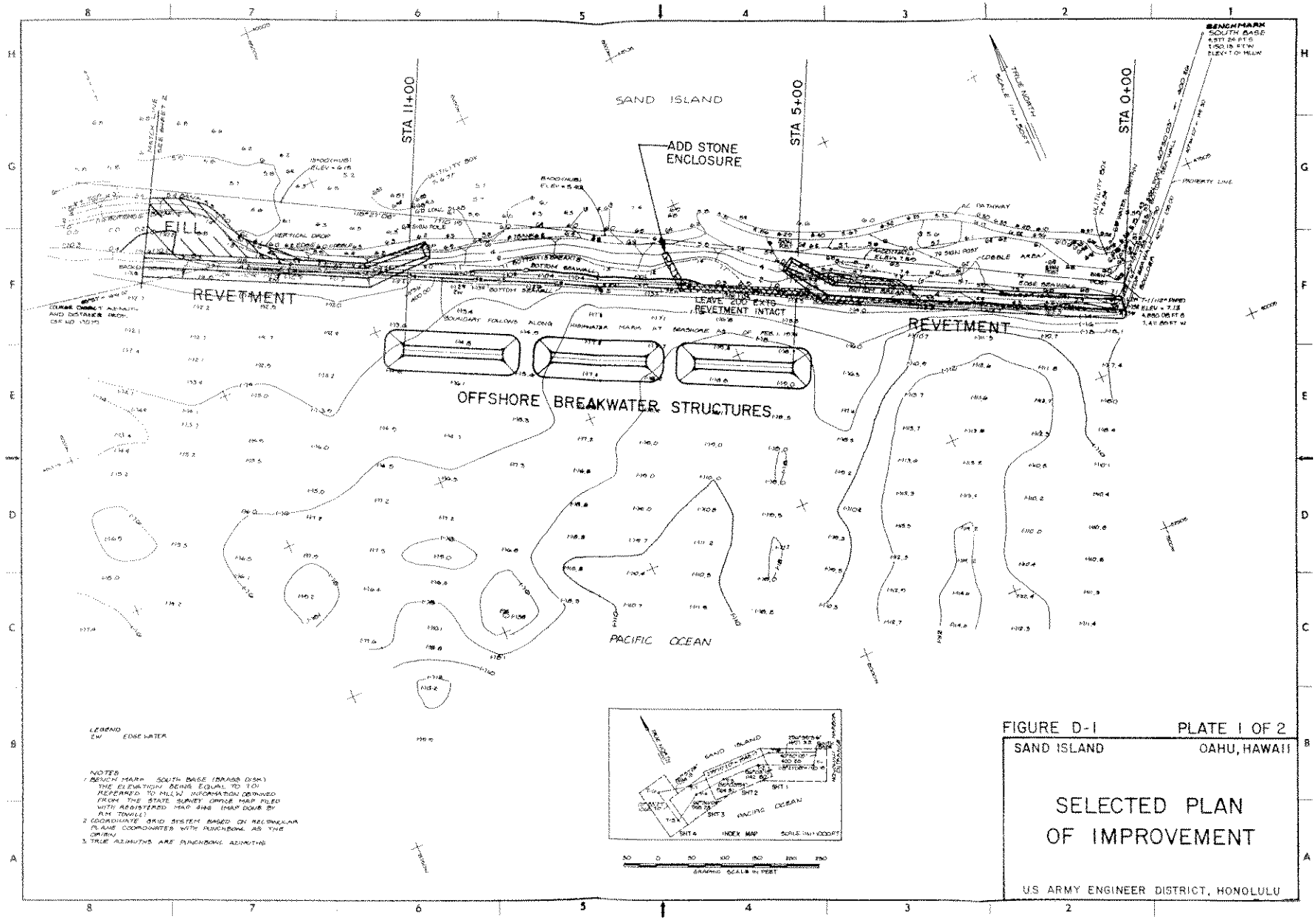


FIGURE D-1 PLATE 1 OF 2

SAND ISLAND OAHU, HAWAII

SELECTED PLAN OF IMPROVEMENT

U.S. ARMY ENGINEER DISTRICT, HONOLULU

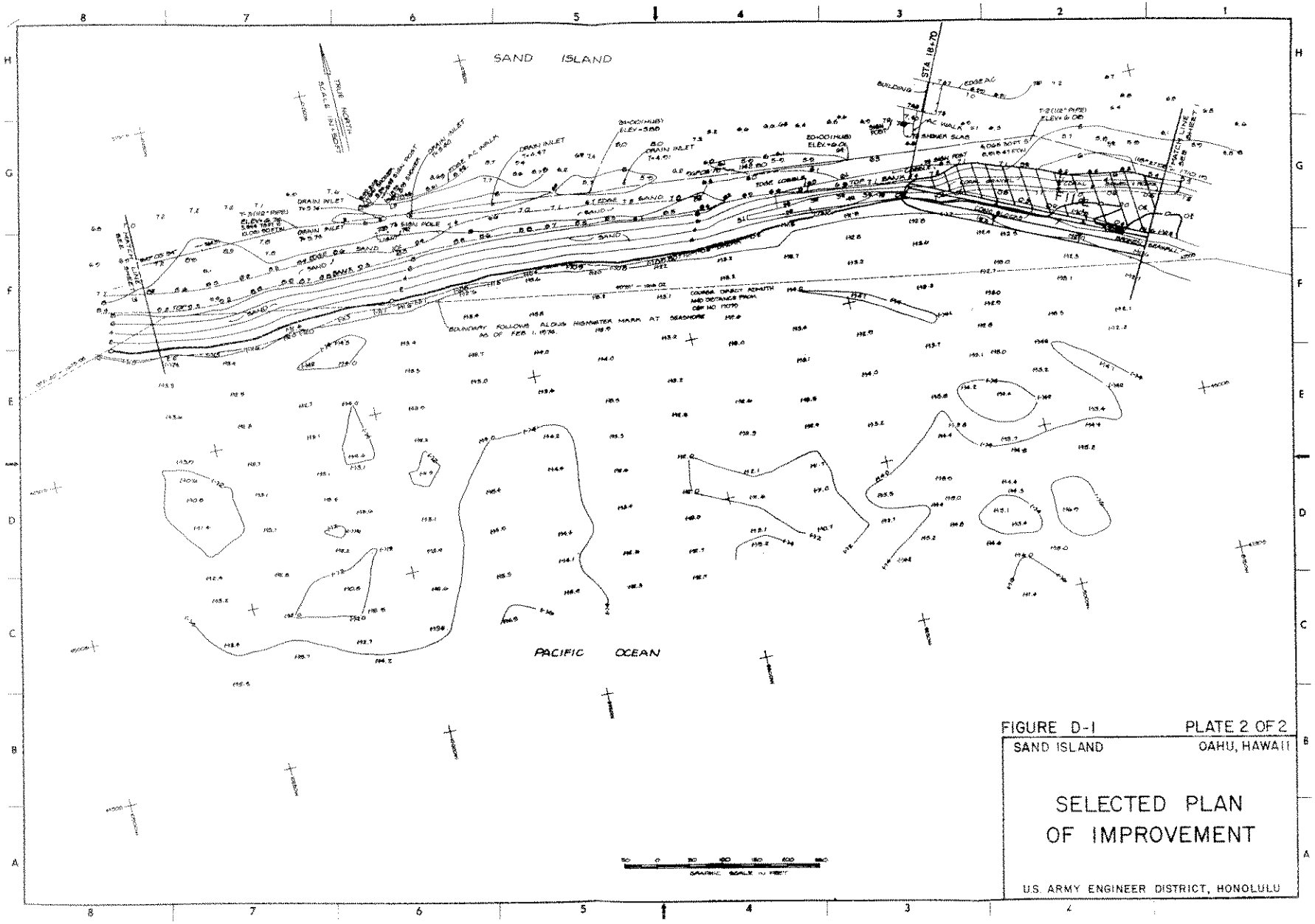


FIGURE D-1 PLATE 2 OF 2

SAND ISLAND OAHU, HAWAII

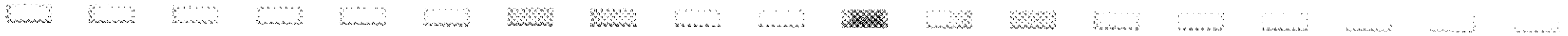
SELECTED PLAN OF IMPROVEMENT

U.S. ARMY ENGINEER DISTRICT, HONOLULU

SAND ISLAND
SHORE PROTECTION

APPENDIX A

PLAN FORMULATION CRITERIA AND COMPLIANCE REPORTS



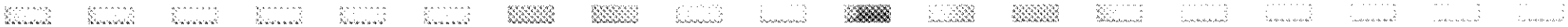
APPENDIX A

SAND ISLAND
SHORE PROTECTION

PLAN FORMULATION CRITERIA AND
COMPLIANCE REPORTS APPENDIX

TABLE OF CONTENTS

SECTION	ITEM	PAGE
I	Plan Formulation Criteria	
	A. Study (Legislative) Authority	A-1
	B. Assurance of Local Cooperation	A-1
	C. Planning Criteria & Constraints Institutional Policy Design/Benefit Criteria Regulatory/Environmental Requirements	A-2
II	Compliance Reports	
	A. Presidential Executive Order 11988 on Floodplain Management Evaluation Report	A-5
	B. Evaluation of the Effect of the Discharge of Dredged Materials Into Waters of the U.S., Using U.S. Environmental Protection Agency (EPA) Section 404(b) Guidelines	A-5
	C. Other Compliance and Coordination Requirements	A-6



I. PLAN FORMULATION CRITERIA

A. STUDY (LEGISLATURE) AUTHORITY

This study and report were accomplished under the authority provided by Section 103a of the River and Harbor Act of 1962, as amended, which states:

> "The Secretary of the Army is hereby authorized to undertake construction of small shore and beach restoration and protection projects not specifically authorized by Congress, which otherwise comply with Section 1 of this Act, when he finds that such work is advisable, and he is futher authorized to allot from any appropriations hereafter made for civil works, not to exceed $25,000,000 for any one fiscal year for the Federal share of the costs of construction of such projects: Provided, That not more than $1,000,000 shall be allotted for this purpose for any single project and the total amount allotted shall be sufficient to complete the Federal participation in the project under this section including periodic nourishment as provided for under Section 1(c) of this Act: Provided further, That the provisions of local cooperation specified in Section 1 of this Act shall apply: And provided further, That the work shall be complete in itself and shall not commit the United States to any additional improvement to insure its successful operation, except for particpation in periodic beach nourishment in accordance with Section 1(c) of this Act, and as may result from the normal procedure applying to projects authorized after submission of survey reports."

B. ASSURANCE OF LOCAL COOPERATION

1. As specified in Section 221 of the River and Harbor Act of 1970 (P.L. 91-611), the local sponsor shall enter into a written agreement to furnish the required cooperation conditions prior to commencement of construction. Under legislation and administrative policy of Section 103a of the River and Harbor Act of 1962, as amended, these conditions are:

a. Provide without cost to the United States all lands, easements, and rights-of-way necessary for construction of the project.

b. Hold and save the United States free from claims for damages due to the construction work and subsequent maintenance of the project, excluding damages due to the fault or negligence of the United States or its contractors.

c. Maintain and operate all works in accordance with regulations prescribed by the Secretary of the Army.

d. Subject to the Federal limitation of $1,000,000, provide a cash contribution equivalent to 30 percent of the total construction costs of the project, the final amount to be estimated after final plan selection.

e. Assure continued ownership of the shore upon which the amount of Federal participation is based, and its administration for public use during the economic life of the project.

f. Comply with Title VI of the Civil Rights Act of 1964 (P.L. 88-352).

C. PLANNING CRITERIA AND CONSTRAINTS

1. Institutional Policies. Several insitutional policies of the Federal Government affect the design and decisions for local and Federal participation. Executive policies are issued through the Office of Management and Budget (OMB), the Water Resources Council (WRC) and the Council of Environmental Quality (CEQ). Legislative policies are expressed by various legislative enactments of Congress which has developed a body of laws establishing national concerns regarding the nation's natural resources.

The draft Principles and Guidelines (P&G) provide the basic framework for Federal agencies in formulation and evaluating alternative plans for water and related land resources implementation studies.

The Corps of Engineers regulations (ER) are specific guidelines to implement the Principles and Guidelines as well as other legislative laws and executive orders within the Corps' civil works programs.

2. Design/Benefit Criteria. In developing justification for Federal participation, technical and economic evaluation policies, standards, principles, and procedures are established in determining a benefit to cost comparison. All projects must have a benefit to cost comparison. The Principles and Guidelines further state that a plan must be formulated which reasonably maximizes net NED benefits, consistent with the Federal objective. That is, this plan must have combined benefits that optimally outweigh combined cost.

3. Regulatory/Environmental Requirements. A number of statutory and regulatory requirements of the Federal government must be complied with during the planning process. These requirements largely relate to the assessment and evaluation of possible impacts on the environmental resources of the project area. The major requirements include:

Clean Air Act, as amended (42 USC 7401 et seq.). As it applies to Corps Studies and construction projects, this act requires that all Federal projects must conform to EPA-approved or promulgated state implementation plans.

National Environmental Policy Act of 1969 (Public Law 91-190). The National Environmental Policy Act (NEPA) requires an environmental statement in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment.

Clean Water Act of 1977 (Public Law 95-217). (Formerly the Federal Water Pollution Control Act Amendments of 1972.) The requirement for Corps projects is to evaluate discharge effects of dredged or fill materials into waters of the United States and to comply.

Coastal Zone Management Act of 1972 (Public Law 92-583). This act requires that Corps projects comply with the objectives of Federal law as well as be consistent with the Coastal Management Program for the State of Hawai.

Endangered Species Act of 1973 (Public Law 92-583. The implementing agency shall coordinate with the appropriate Federal wildlife agency to determine the presence of listed endangered or threatened species or their critical habitat which may be present in the area of proposed action. The results of the assessment shall be contained in the EIS.

Fish and Wildlife Coordination Act of 1958 (Public Law 85-624). This act requires any Federal agency proposing a water-resource project to consult with the Department of Interior, US Fish and Wildlife Service (USFWS) and the head of the state or territorial agency exercising control over fish and wildlife resources, concerning the impacts of such action. The USFWS shall recommned, in a 2(b) report, methods to mitigate impacts of the proposed action and to conserve fish and wildlife resources.

Marine Protection, Research, and Sanctuaries Act of 1972 (Public Law 92-532. This act requires the evaluation of the need and transportation of dredged material for the purpose of dumping in ocean waters. In the case of this project, there is no specific need to provide an ocean dump site for excess construction materials.

National Historic Preservation Act of 1966 (Public Law 89-635). This act requires that Federal agencies, when it proposes a construction project, to take into account the effect of the undertaking on any property included in, or eligible for inclusion in the National Register and shall afford the Advisory Council on Historic Preservation a reasonable opportunity to comment with regard to such undertaking. Coordination is also required with the SHPO.

Executive Order on Flood Plain Management (EO 11988). This order requires that agencies avoid occupancy and modification of the base floodplain unless it is the only practicable alternative. For potential action in the floodplain, an evaluation of effects on floodplain values, a description of other practicable alternative actions outside the floodplain, and adequate dissemination of the action to the public must be undertaken.

Executive Order on Protection of Wetland, (EO 11990). This order requires the agency to analyze potential impacts of a project to existing wetlands and associated values and to give the public opportunity to comment.

Wild and Scenic Rivers Act of 1968 (Public Law 90-542). This act requires agencies to identify potential impacts to designated wild and scenic rivers and to coordinate action and obtain concurrence with the US Department of the Interior. There are no such designated rivers on Sand Island.

Federal Water Project Recreation Act (Public Law 89-72, as amended). This act requires that full consideration be given to project opportunities for outdoor recreation and fish and wildlife enhancement; that planning based on coordination for use with existing and planned Federal and local public recreation developments and that the views of governmental agencies concerned with recreation and wildlife be included in the report.

II. COMPLIANCE REPORTS

A. PRESIDENTIAL EXECUTIVE ORDER 11988 ON FLOOD PLAIN MANAGEMENT EVALUATION REPORT

The purpose of this supplemental report is to present the results of additional studies in accordance with 33 CFR 239 which implements Executive order (EO) 11988, Floodplain Management, dated 24 May 1977. The objective of EO 11988 is to avoid to the maximum extent possible the long and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. The Order requires Federal agencies to:

a. Avoid development in the base floodplain unless it is the only practicable alternative;

b. Reduce the hazard and risk of flood loss;

c. Minimize the impact of floods on human safety, health, and welfare; and

d. Restore and preserve the natural and beneficial floodplain values.

The proposed action at Sand Island is not located within or near any base floodplain.

However, the seaward most portion of the study area is susceptible to tsunami inundation. According to Federal Flood Insurance Administration maps, the runup of a one percent frequency tsunami would extend about 150 feet inland from the shore, along the seaward most 1,000 feet of the project area.

The affected area is part of the existing Sand Island State Park which is being developed incrementally by the State of Hawaii in accordance with the park's Master Plan. The implementation of the proposed shore protection project would not induce any additional development but would provide long-term protection for the existing park facilities. The shore protection improvements are not being designed to protect against tsunami inundation, and therefore will not change the existing or future use or development of the shore. The site is expected to remain in public ownership and park usage for the foreseeable future, with or without implementation of the proposed shore protection work.

B. EVALUATION OF THE EFFECTS OF THE DISCHARGE OF DREDGED OR FILL MATERIAL INTO THE WATERS OF THE U.S. USING THE U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA) SECTION 404(b) GUIDELINES.

The evaluation and finding of compliance with these guidelines are included in Appendix A of the Environmental Impact Statement.

C. OTHER COMPLIANCE AND COORDINATION REQUIREMENTS.

1. A public meeting was held on 26 July 1983 at the Susannah Wesley Community Center, Honolulu, Hawaii. Public notices were distributed to the general public and media as well as to Federal, State and County agencies. The draft report was made available to the public for review prior to the meeting at the State Libraries' main branch and Kalihi branch, the Division of State Parks and at the Corps of Engineers office. The meeting gave the public the opportunity to express their views concerning the proposed alternatives as well as on the effects of "discharge of fill material in the navigable waters of the US" and the "development of Federal activities within the base floodplain" under Section 404 of the Clean Water Act of 1977 and Executive Order 11988 (Floodplain Management, dated 24 May 1977), respectively. A transcript of the public meeting is provided in Appendix B.

2. The Draft Environmental Impact Statement (DEIS) was filed with the US Environmental Protection Agency (EPA). The EPA classified the DEIS as LO-1 indicating lack of objections.

3. In accordance with the Fish and Wildlife Coordination Act of 1946, as amended, the US Fish and Wildlife Service provided a Final Coordination Act Report dated 23 August 1983. A copy of this report is provided in Appendix F.

4. The State Historic Preservation Officer (SHPO), the Interagency Archaeological Service, the Council on Historic Preservation were afforded the opportunity to review the adequacy of our cultural resources studies and findings under the National Historic Preservation Act of 1966. No adverse comments on the cultural resources studies and findings were received by SHPO.

5. The State Department of Health was requested to evaluate the effects of the discharge of dredged or fill material into the stream to determine its impacts on water quality and health in accordance with the Clean Water Act. The State Department of Health concurred..."that the discharge impacts on water quality are acceptable and have been mitigated to the extent practicable..." as indicated in their letter of 7 September 1983.

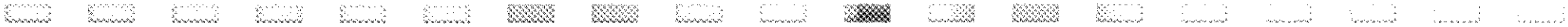
6. The State Coastal Zone Management (CZM) program coordinator will be requested to review the Final DPR for consistency with their CZM program under the CZM Act of 1972 (PL 92-583).

7. To fulfill the requirements of Section 7 of the Endangered Species Act of 1973, as amended, an assessment of the effects of the proposed project on the threatened Green Sea Turtle was prepared by the Corps. The National Marine Fisheries Service concurred in the findings of this assessment that the project is not likely to adversely impact the green turtle or its habitat.

SAND ISLAND
SHORE PROTECTION

APPENDIX B

PUBLIC INVOLVEMENT



APPENDIX B

SAND ISLAND
SHORE PROTECTION STUDY

PUBLIC INVOLVEMENT PROGRAM APPENDIX

Section	Title	Page
I	PUBLIC INVOLVEMENT PROGRAM	B-2
	Objectives	B-2
	Techniques	B-2
II	ACTIVITIES CONDUCTED	B-3
	Kalihi-Palama Council Meeting (October 4, 1982)	B-3
	Public Workshop (November 22, 1982)	B-3
	Meeting with Local Sponsors (April 14, 1983)	B-3
III	PUBLIC MEETING	B-4
IV	PERTINENT CORRESPONDENCE	B-4
V	PUBLIC MEETING TRANSCRIPT	B-44
VI	MAILING LIST	B-51

I. PUBLIC INVOLVEMENT PROGRAM

OBJECTIVES

The US Army Corps of Engineers broadly defines the "public" as any non-Corps entity, other Federal and State Government entities and officials, public and private organizations, and individuals who are interested in or would be affected by Corps activities. The objectives of the public involvement program are to:

a. Inform the public of the current Corps planning process and direction.

b. Surface key planning issues and concerns so that they are given full consideration.

c. Help formulate and review potential plans of improvement.

d. Offer technical, historical and localized information important to the study.

e. Provide communication between the Corps, local agencies, advocacy groups and interested parties on the subject plan and problems.

In this study, the public participation program was directed in maintaining information flow, achieving a mutual understanding and acceptance of the problems and opportunities, and attaining a level of interest for proper decision-making. Without this program, a well-formulated and socially-acceptable solution cannot be achieved.

TECHNIQUES

The types of public participation forums in this study are small meetings, workshops and formal meetings.

a. Informal Meetings. These meetings usually consist of less than 10 people including specific invited agency personnel, group representatives or citizens. These meeting will be undertaken at various intervals throughout the study to help the planners obtain information and address certain issues.

b. Workshops. These meetings are informal exchange sessions numbering approximately 10 to 50 people. The purpose is to promote a complete range of views that recognize current Corps' planning efforts.

c. Public Meeting. A public meeting is normally held during the study effort after distribution of the draft DPR and EIS. Its purpose is to notify all interested parties of the planning effort to date and to obtain public input and comments on any item in the DPR or EIS. The District Engineer presides over the meeting, which includes a summary of findings to date, an informal question and answer period, a presentation of formal statements of others and tentative conclusions. Public notices of any such meetings are issued to the media and the general public is invited.

II. ACTIVITIES CONDUCTED

On July 20, 1982 the Corps notified government officials and agencies and the general public about the initiation of detailed studies for possible shore protection improvements at Sand Island.

The following were held as part of the public participation program:

a. Kalihi-Palama Community Council Meeting (October 4, 1982). The purpose of this meeting was to brief the members on the status of the study, get their views and opinions, and arrange for a public workshop. Emphasis was placed on the main study purpose - determining the feasibility for shoreline protection. In addition, the following were discussed/concluded:

(1) The Council leaned towards supporting ungrouted rock structures.

(2) They also stated that if the project would restore the existing revetment, environmental impacts could be minimal; if a structure was placed offshore, impacts could be more significant.

(3) Members indicated concerns in preserving the tide pools along the shoreline.

b. Public Workshop (November 22, 1982). This workshop was held to obtain public input on the desires and needs of providing shore protection improvements. About 20 people attended including government and community representatives. The Corps gave a brief presentation on the history of the study, its environmental aspects, current status, and the direction the study is heading. Emphasis was placed on two preliminary alternatives - shoreline revetment and offshore breakwaters. Workshop participants expressed their desires to see the tide pools left undisturbed. Another area of concern was the effect the offshore breakwater would have on surfers that use the area. The Corps replied that the structures would be laid out to avoid any impacts on the surfing area. The general feeling of the participants was positive and supportive.

c. Meeting with Local Sponsors (April 14, 1983). The purpose of this meeting was to present the status of the study and solicit comments, suggestions, and questions regarding the study. The following representatives from the Department of Land and Natural Resources attended: Mssrs. Clyde Hosokawa (Division of State Parks), Richard Yoshimura (Division of State Parks), and George Morimoto (Division of Water and Land Development). The Corps presented a brief description of the three alternatives, explaining the advantages and disadvantages and the costs involved for each one. Plan 3 drew favorable comments from the group because the offshore structures would not impact the tide pools and surf zone. The group was receptive to the plan and gave the following suggestions:

(1) Since the offshore breakwater would be attractive to fishermen to cast from, would the Crops consider connecting at least one of them to the shore for easier access. The Corps explained that because of the added costs, the B/C ratio and project feasibility would be adversely affected. However, the possibility would be considered.

(2) Could the gaps between the breakwaters be replaced by pipes, for maintenance purposes and fishermen access? The Corps replied that pipes would dissipate the water circulation and the costs would be prohibitive.

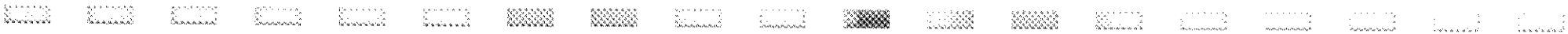
d. A Notice of Intent to prepare a Draft Environmental Impact Statement for this study was published in the Federal Register to notify those interested in contributing to the preparation of the DEIS.

III. PUBLIC MEETING

A public meeting presided by the District Engineer was held on 26 July 1983 at the Susannah Wesley Community Center. Public Notices were mailed to the general public, the media, and Federal, State and County agencies. The draft report was also made available to the public for review prior to the meeting at the main branch and the Kalihi branch of the Library of Hawaii, the Division of State Parks, and at the Corps office. The list of attendees at this meeting and the transcript of its proceedings are provided in this appendix.

IV. PERTINENT CORRESPONDENCE

Pages B-4 through B-10 contain letters and comments received throughout the preparation of the draft report, and Pages B-11 through B-43 contain letters and comments received during its review period.



United States Department of the Interior

FISH AND WILDLIFE SERVICE
300 ALA MOANA BOULEVARD
P O BOX 50167
HONOLULU, HAWAII 96850

IN REPLY REFER TO:
ES
Room 6307
1-2-82-INF-111

AUG 11 1982

Mr. Kisuk Cheung
Chief, Engineering Division
U.S. Army Engineering District, Honolulu
Fort Shafter, Hawaii 96858

Dear Mr. Cheung:

This replies to your letter of July 20, 1982 concerning proposed shore protection and beach erosion control measures at Sand Island, Oahu.

There are no species of plants or animals that are listed or proposed for listing as endangered or threatened species which would be affected by your action.

Thank you for your concern.

Sincerely yours,

Ernest Kosaka
Project Leader
Office of Environmental Services

R-5

CONSERVE AMERICA'S ENERGY

Save Energy and You Serve America!

BUILDING DEPARTMENT
CITY AND COUNTY OF HONOLULU
HONOLULU MUNICIPAL BUILDING
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

EILEEN A. ANDERSON
MAYOR

ROY H. TANJI
DIRECTOR AND BUILDING SUPERINTENDENT

WILLIAM F. REMOLAR
DEPUTY DIRECTOR

PB 82-872

August 13, 1982

Mr. Kisuk Cheung, Chief
Engineering Division
Department of the Army
Ft. Shafter, Hawaii 96858

Dear Mr. Cheung:

This is in response to your letter dated July 20, 1982 regarding shore protection studies at the Sand Island Park.

We are not involved with related activities within that area. We, therefore, do not have information or comments to offer.

Very truly yours,

ROY H. TANJI
Director and Building Superintendent

cc: J. Harada

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
1151 PUNCHBOWL STREET
HONOLULU, HAWAII 96813

DIVISIONS
CONSERVATION AND ENFORCEMENT
CONVEYANCES
FISH AND GAME
FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

August 13, 1982

Mr. Kisuk Cheung
Chief, Engineering Division
Department of the Army
U.S. Army Engineer District
Ft. Shafter, Hawaii 96858

Dear Mr. Cheung:

Thank you for your letter informing us of your studies for possible shore protection beach erosion measures for Sand Island Park on Oahu. If you are considering the supplementing of mechanical measures with vegetation, we would be happy to provide the technical assistance in this area.

If you are interested in our offer, please contact Service Forester Carl T. Masaki of my office. He can be reached at 548-2861.

Very truly yours,

LIBERT K. LANDGRAF
Administrator

B-6

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
550 HALEKAUWILA ST.
ROOM 301
HONOLULU, HAWAII 96813

Jacqueline Parnell
DIRECTOR
TELEPHONE NO.
548-6915

August 19, 1982

Mr. Kisuk Cheung, Chief
Engineering Division
Department of the Army
U.S. Army Engineer District
Fort Shafter, Honolulu 96858

Dear Mr. Cheung:

Thank you for consulting us on your intention to initiate studies on beach erosion protection for Sand Island Park. We believe this to be a worthwhile project and do not believe any adverse environmental effects will result from this project.

Sincerely,

Jacqueline Parnell
Director

DEPARTMENT OF GENERAL PLANNING

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET
HONOLULU, HAWAII 96813

EILEEN R. ANDERSON
MAYOR

WILLARD T. CHOW
CHIEF PLANNING OFFICER

RALPH PORTMORE
DEPUTY CHIEF PLANNING OFFICER

DGP8/82-2790

August 25, 1982

Mr. Kisuk Cheung, Chief
Engineering Division
Department of Army
U.S. Army Engineer District, Honolulu
Ft. Shafter, Hawaii 96858

Dear Mr. Cheung:

Thank you for informing us that studies of possible shore protection beach erosion measures for Sand Island Park is being undertaken by your agency.

Though we have no comments on the study, we have concern for the preservation of Oahu's shoreline and in particular sand erosion as it relates to a major park facility.

We would appreciate being kept informed on the extent of the problems and the control measures proposed.

Sincerely,

Ralph Kawamoto

RALPH KAWAMOTO
Planner

APPROVED:

Ralph Portmore
for WILLARD T. CHOW

5-7

GEORGE R. ARIYOSHI
GOVERNOR

FRANKLIN Y. K. SUNN
DIRECTOR

RICHARD K. PAGLINAWAN
DEPUTY DIRECTOR

ALFRED K. SUGA
DEPUTY DIRECTOR

STATE OF HAWAII
DEPARTMENT OF SOCIAL SERVICES AND HOUSING

August 25, 1982

Mr. Kisuk Cheung
Chief, Engineering Division
Department of the Army
U.S. Army Engineer District
Ft. Shafter, Hawaii 96858

Dear Mr. Cheung:

We have reviewed your letter of July 20, 1982 informing us that you have initiated studies for possible shore protection beach erosion measures. We have no comments to offer relative to the proposed action.

Thank you for the opportunity to comment on this matter.

Sincerely,

Franklin Y.K. Sunn
Director

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA
HONOLULU, HAWAII 96843

August 25, 1982

Mr. Kisuk Cheung
Chief, Engineering Division
U. S. Army Engineer District, Honolulu
Department of the Army
Fort Shafter, Hawaii 96858

Dear Mr. Cheung:

Subject: Your Letter of July 20, 1982, on Shore Protection Studies for Sand Island Park

We have no comments on the proposed studies for possible shore protection at Sand Island Park.

If you have any questions, please contact Lawrence Whang at 548-5221.

Very truly yours

K. E. Carlson

For KAZU HAYASHIDA
Manager and Chief Engineer

p-9

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
Western Pacific Program Office
P. O. Box 3830
Honolulu, Hawaii 96812

August 30, 1982 F/SWR1:ETN

Mr. Kisuk Cheung
Chief, Engineering Division
U. S. Army Engineer District,
Honolulu
Ft. Shafter, Hawaii 96858

Dear Mr. Cheung:

In response to your letter of August 24, 1982, the following is provided for your information.

The only listed species known to regularly occur in waters adjacent to the Sand Island Shore Protection Project Study Area is the threatened green turtle (Chelonia mydas). These waters are a likely foraging area for juvenile green turtles and any potential impacts to this area from any proposed construction activities should be carefully evaluated prior to initiating the project.

Should you have any further questions please contact Mr. Eugene Nitta, Marine Mammal & Endangered Species Program Coordinator, at 955-8831.

Sincerely yours,

John J. Naughton

for Doyle E. Gates
Administrator

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES

EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

DIVISIONS:
AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

AUG 31 1982

REF. NO.: CPO-400

Mr. Kisuk Cheung, Chief
Engineering Division
U.S. Army Engineer District,
Honolulu
Department of the Army
Fort Shafter, Hawaii 96858

Dear Mr. Cheung:

This responds to your letter ("PODED-PJ") of July 20, 1982, which was received in our office on August 11, inviting expression of our concerns regarding possible shore protection beach erosion measures for Sand Island State Park.

We understand from staff members of the Department's State Parks Division that the problem area is between the eastern, Honolulu Channel entrance into Honolulu Harbor and the sand beach approximately 0.4 miles to the west; that about two acres of the State's Sand Island Beach Park have been lost to erosion; that the former breakwater has collapsed; and that wave-tossed rocks, coral rubble, and other debris are creating maintenance problems in the Park.

The subject area is located conveniently to residents of Honolulu's urban core and thus supports significant use for shoreline fishing. Our agency would therefore have concerns with any shoreline protection project proposed insofar as the sitework may have short-term (construction-related) and long-term effects on coastal marine organisms and on public fishing access.

We appreciate your consideration for our interests in this matter.

Very truly yours,

SUSUMU ONO, Chairman
Board of Land and Natural Resources

GEORGE R. ARIYOSHI
GOVERNOR

JACK K. SUWA
CHAIRMAN, BOARD OF AGRICULTURE

SUZANNE D. PETERSON
DEPUTY TO THE CHAIRMAN

State of Hawaii
DEPARTMENT OF AGRICULTURE
1428 So. King Street
Honolulu, Hawaii 96814

Mailing Address:
P. O. Box 22159
Honolulu, Hawaii 96822

August 30, 1982

Mr. Kisuk Cheung
Chief, Engineering Division
Department of the Army
U.S. Army Engineer District, Honolulu
Ft. Shafter, Hawaii 96658

Dear Mr. Cheung:

Re: Possible Shore Protection Beach Erosion
Measures for Sand Island Park, Oahu, Hawaii

The Department of Agriculture does not have any comments to offer regarding the possible protection measures.

Thank you for the opportunity to comment.

Sincerely,

JACK K. SUWA
Chairman, Board of Agriculture

"Support Hawaiian Agricultural Products"

DEPARTMENT OF PARKS AND RECREATION

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET
HONOLULU, HAWAII 96813

EEN R. ANDERSON
MAYOR

EMIKO I. KUDO
DIRECTOR

SAM L. CARL
DEPUTY DIRECTOR

OSCAR K. ASANINA
EXECUTIVE ASSISTANT

September 15, 1982

Mr. Kisuk Cheung, Chief
Engineering Division
Department of the Army
U. S. Army Engineer District, Honolulu
Fort Shafter, Hawaii 96858

Dear Mr. Cheung:

SUBJECT: SAND ISLAND SHORE PROTECTION PROJECT

Sand Island Park is State-owned and managed so our comments in this case are related to our interest in the shoreline treatment of this area and not to our direct responsibility.

We would prefer to see this portion of the Honolulu Harbor entrance protected with a sloping stone revetment rather than a concrete seawall. It is more aesthetically pleasing and probably safer for fishermen and park users.

Thank you for allowing us to comment on this project.

Sincerely yours,

Emiko I. Kudo

(Mrs.) EMIKO I. KUDO, Director

EIK:vc

cc: Dept. of Transportation,
Harbors Division

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF STATE PARKS
P. O. BOX 621
HONOLULU, HAWAII 96809

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES

SUSAN A. HAKARU
DEPUTY TO THE CHAIRMAN

DIVISIONS:
AGRICULTURE DEVELOPMENT
FORESTRY
AQUATIC RESOURCES
CONSERVATION AND
RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

Sep 13 1982

Mr. Kisuk Cheung, Chief
Engineering Division
U.S. Army Corps of Engineers
Building 230 (PODED-PV)
Fort Shafter, Hawaii 96858

Dear Mr. Cheung:

SUBJECT: Studies for Shore Protection Beach Erosion
Measures for Sand Island Park, Oahu, Hawaii

Thank you for the opportunity to review the subject undertaking.

A review of our records indicates that this project does not occur on historic properties that are listed on the Hawaii Register or the National Register of Historic Places, or that have been determined eligible for inclusion on the National Register of Historic Places.

Due to the lack of archaeological surveys in the vicinity, we are not aware that significant resources exist in the project area; this does not confirm the absence of historical, cultural, architectural and/or archaeological resources on the property. In the event that any previously unidentified sites or remains such as artifacts, shell, bone, or charcoal deposits; human burials; rock or coral alignments, pavings, or walls are encountered, please inform the applicant to stop work and contact our office at 548-7460 immediately.

Sincerely yours,

Susumu Ono
Chairman and
State Historic Preservation
Officer

The table below lists the agencies and individuals from whom written comments on the Draft DPR and EIS were received. Verbal testimony on the Draft Report is documented in the transcript of the Public Meeting starting on page B-43.

	Page	Remarks
Governor George R. Ariyoshi	B-12	
Mayor Eileen R. Anderson	B-12	
Senator Spark M. Matsunaga	B-13	
Senator Daniel K. Inouye	B-14	
Federal		
US Department of Transportation Federal Highway Administration, Region 9	B-14	
US Department of Agriculture		
Forest Service	B-15	
Soil Conservation Service	B-16	
US Coast Guard	B-15	
Environmental Protection Agency	B-17	Classified LO-1
US Department of the Interior		
Geological Survey	B-16	
Office of the Secretary	B-22	
Fish and Wildlife Service	Appendix F	Coordination Act Report
Department of Health and Human Services	B-18	
US Department of Commerce - NOAA		
National Ocean Service	B-19	Response provided
National Marine Fisheries Service	B-20	Response provided
	Appendix F	Section 7 Consultation
Department of the Army, Waterways Experiment Station	B-21	
State		
Department of Land and Natural Resources	B-23, B-24, B-26	Response provided
State Historic Preservation Officer	B-24	Response provided
Department of Health	B-26, B-27	Meets State requirements on water quality
Hawaii Housing Authority	B-28	
Department of Accounting & Gen Services	B-28	
University of Hawaii		
Water Resources Research Center	B-29	
Sea Grant College Program	B-33	Response provided
Office of Environmental Quality Control	B-29, B-30	
Department of Defense, Office of the Adjutant General	B-30	
Department of Planning & Economic Development	B-32	
Department of Transportation	B-32	
Office of the Governor	B-43	Letter of Intent
City & County		
Department of Public Works	B-34	Response provided
Oahu Civil Defense Agency	B-36	
Department of Housing and Community Development	B-36	
Department of Parks and Recreation	B-37	Response provided
Board of Water Supply	B-38	
Department of General Planning	B-39	Response provided
Department of Land Utilization	B-41	Response provided
Department of Transportation Services	B-42	
Private		
Hawaiian Electric Company	B-31	

EXECUTIVE CHAMBERS

HONOLULU

GEORGE R. ARIYOSHI
GOVERNOR

July 22, 1983

Colonel Alfred J. Thiede
U.S. Army Corps of Engineers
Honolulu District
Fort Shafter, Hawaii 96858

Dear Colonel Thiede:

Thank you for the report on the Sand Island shoreline.

We are grateful for your assistance in this endeavor and look forward to being apprised of your progress.

With warm personal regards, I remain,

Yours very truly,

George R. Ariyoshi

OFFICE OF THE MAYOR

CITY AND COUNTY OF HONOLULU

HONOLULU, HAWAII 96813 • AREA CODE 808 • 523-4141

EILEEN R. ANDERSON
MAYOR

July 28, 1983

Colonel Alfred J. Thiede
District Engineer
Corps of Engineers
Department of the Army
U.S. Army Engineer District, Honolulu
Fort Shafter, Hawaii 96858

Dear Colonel Thiede:

Sand Island Shore Protection
Detailed Project Report and
Draft Environmental Impact Statement

Thank you for forwarding the subject draft EIS.

I understand that affected City agencies which have previously indicated their interest in the proposed project are also receiving copies of the report. The agencies will be submitting their respective comments to you separately.

Thank you for including us in the review process.

Very truly yours,

Eileen R. Anderson

EILEEN R. ANDERSON

SPARK M. MATSUNAGA
HAWAII

WASHINGTON OFFICE
109 HART BUILDING
WASHINGTON, D.C. 20510

HONOLULU OFFICE
3104 PRINCE KUHIO BUILDING
HONOLULU, HAWAII 96850

United States Senate

WASHINGTON, D.C. 20510

July 11, 1983

CHIEF DEPUTY
DEMOCRATIC WHIP

MEMBER
COMMITTEE ON FINANCE
COMMITTEE ON ENERGY AND NATURAL RESOURCES
COMMITTEE ON LABOR AND HUMAN RESOURCES
COMMITTEE ON VETERANS' AFFAIRS

Colonel Alfred J. Thiede
U. S. Army Engineer District, Honolulu
Ft. Shafter, Hawaii 96858

Dear Alfred:

This is just to acknowledge receipt of your recent communication addressed to Senator Spark Matsunaga.

Please be assured that the Senator will be responding to you at the earliest possible moment.

Yours truly,

Cherry Matano

Cherry Matano (Ms.)
Administrative Assistant
to Senator Matsunaga

SPARK M. MATSUNAGA
HAWAII

WASHINGTON OFFICE:
109 HART BUILDING
WASHINGTON, D.C. 20510

HONOLULU OFFICE:
3104 PRINCE KUHIO BUILDING
HONOLULU, HAWAII 96850

United States Senate

WASHINGTON, D.C. 20510

July 14, 1983

CHIEF DEPUTY
DEMOCRATIC WHIP

MEMBER:
COMMITTEE ON FINANCE
COMMITTEE ON ENERGY AND NATURAL RESOURCES
COMMITTEE ON LABOR AND HUMAN RESOURCES
COMMITTEE ON VETERANS' AFFAIRS

Colonel Alfred J. Thiede
U. S. Army Engineer District, Honolulu
Fort Shafter
Honolulu, Hawaii 96858

Dear Alfred:

Thank you for sending me a copy of the draft Detailed Project Report and Environmental Assessment for the Sand Island Shore Protection Study.

Although I have no comments to make for the public review, I do appreciate your keeping me apprised of the status of this project.

Aloha and best wishes.

Sincerely,

Spark

Spark Matsunaga
U. S. Senator

DANIEL K. INOUYE
HAWAII

PRINCE KUHIO FEDERAL BUILDING
ROOM 6104, 300 ALA MOANA BOULEVARD
HONOLULU, HAWAII 96850
(808) 546-7550

United States Senate
ROOM 722, HART SENATE BUILDING
WASHINGTON, D.C. 20510
(202) 224-3934

July 13, 1983

Colonel Alfred J. Thiede
District Engineer
Corps of Engineers
Department of the Army
U.S. Army Engineer District,
Honolulu
Fort Shafter, Hawaii 96858

Dear Colonel Thiede:

I wish to thank you for sharing with me a copy of the Draft Detailed Project Report and Environmental Assessment for the Sand Island Shore Protection Study. You can be assured that I shall thoroughly review this material.

Your thoughtfulness in providing me with this information is most appreciated.

Aloha,

DANIEL K. INOUYE
United States Senator

DKI:bhm

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
REGION NINE
Hawaii Division
Box 50206
Honolulu, Hawaii 96850

ARIZONA
CALIFORNIA
NEVADA
HAWAII
GUAM
AMERICAN SAMOA

July 12, 1983

IN REPLY REFER TO
HEC-HI

Col. Alfred J. Thiede
District Engineer
U.S. Army Corps of Engineers
Pacific Ocean Division, Bldg. 230
Fort Shafter, HI 96858

Dear Col. Thiede:

Subject: Sand Island Shore Protection Study

We have reviewed the Draft Detailed Project Report and the Environmental Impact Study for the subject project submitted by your letter dated June 28, 1983. We do not have any comments on the study.

Sincerely yours,

for H. Kusumoto
Division Administrator

United States Department of Agriculture
Forest Service
Pacific Southwest Region
1151 Punchbowl Street, Room 323
Honolulu, Hawaii 96813

Reply to 2100 (PIP)

Date July 19, 1983

Kisuk Cheung, Chief
Engineering Division
Pacific Ocean Division
Corps of Engineers
Ft. Shafter, HI 96858

Dear Mr. Cheung:

The USDA Forest Service has reviewed the Sand Island Shore Protection Detailed Project Report and Environmental Impact Statement dated June, 1983.

We do not have any comments to make on this document. Thank you for providing the above referenced document.

Sincerely,

Robert V. Clayton

ROBERT V. CLAYTON
Pacific Islands Forester

U.S. Department of Transportation
United States Coast Guard

Commander (dpl)
Fourteenth Coast Guard District

Prince Kalanianaole Federal Building
300 Ala Moana Blvd.
Honolulu, Hawaii 96850
Phone: 546-2861

11000
Serial 565
21 July 1983

Mr. Kisuk Cheung
Chief, Engineering Division
Department of the Army
Pacific Ocean Division
Corps of Engineers
Fort Shafter, Hawaii 96858

Dear Mr. Cheung:

The Fourteenth Coast Guard District has reviewed the Draft Detailed Project Report and Environmental Impact Statement for the Sand Island Shore Protection Study and has no objection or constructive comments to offer at the present time.

Sincerely,

J. E. SCHWARTZ
Commander, U. S. Coast Guard
District Planning Officer
By direction of
Commander, Fourteenth Coast Guard District

United States Department of Agriculture

Soil Conservation Service

P.O. Box 50004
Honolulu, Hawaii
96850

August 5, 1983

Mr. Kisuk Cheung
Chief, Engineering Division
Pacific Ocean Division
U.S. Army Corps of Engineers
Fort Shafter, Hawaii 96858

Dear Mr. Cheung:

Subject: Draft Detailed Project Report and Environmental Impact Statement for Sand Island Shore Protection, Oahu, Hawaii

We have reviewed the subject report and environmental impact statement and have no comments to make.

Thank you for the opportunity to review this document.

Sincerely,

FRANCIS C.H. LUM
State Conservationist

The Soil Conservation Service is an agency of the Department of Agriculture

United States Department of the Interior

GEOLOGICAL SURVEY
Water Resources Division
P.O. Box 50166
Honolulu, Hawaii 96850

August 19, 1983

Mr. Kisuk Cheung, Chief
Engineering Division
Department of the Army
Pacific Ocean Division
Corps of Engineers
Ft. Shafter, Hawaii 96858

Dear Mr. Cheung:

The Hawaii District of the U.S. Geological Survey has reviewed the Sand Island Shore Protection Study, but has no comments to make at this time.

We appreciate you giving us the opportunity to review this report.

Sincerely,

Stanley P. Kapuśka
District Chief

Enclosure

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
215 Fremont Street
San Francisco, Ca. 94105

AUG 25 1983

Colonel Alfred J. Thiede
District Engineer
U.S. Army Engineer District - Honolulu
Building T-1
Fort Shafter, Hawaii 96858

Dear Colonel Thiede:

The Environmental Protection Agency (EPA) has reviewed the Draft Environmental Impact Statement (DEIS) titled SAND ISLAND SHORE PROTECTION STUDY, OAHU, HAWAII. We have no comments on this DEIS.

We have classified this DEIS as category LO-1. Definitions of the categories are provided by the enclosure. The classification and date of EPA's comments will be published in the Federal Register in accordance with our public disclosure responsibilities under Section 309 of the Clean Air Act.

We appreciate the opportunity to review this DEIS. Please send two copies of the Final Environmental Impact Statement (FEIS) to this office at the same time it is officially filed with our Washington, D.C. office. If you have any questions, please contact Loretta Kahn Barsamian, Chief, EIS Review Section, at (415) 974-8188 or FTS 454-8188.

Sincerely yours,

Charles W. Murray, Jr.
Assistant Regional Administrator
for Policy, Technical and
Resources Management

Enclosure (1)

EIS CATEGORY CODES

Environmental Impact of the Action

LO—Lack of Objections

EPA has no objection to the proposed action as described in the draft impact statement; or suggests only minor changes in the proposed action.

ER—Environmental Reservations

EPA has reservations concerning the environmental effects of certain aspects of the proposed action. EPA believes that further study of suggested alternatives or modifications is required and has asked the originating Federal agency to reassess these aspects.

EU—Environmentally Unsatisfactory

EPA believes that the proposed action is unsatisfactory because of its potentially harmful effect on the environment. Furthermore, the Agency believes that the potential safeguards which might be utilized may not adequately protect the environment from hazards arising from this action. The Agency recommends that alternatives to the action be analyzed further (including the possibility of no action at all).

Adequacy of the Impact Statement

Category 1—Adequate

The draft impact statement adequately sets forth the environmental impact of the proposed project or action as well as alternatives reasonably available to the project or action.

Category 2—Insufficient Information

EPA believes that the draft impact statement does not contain sufficient information to assess fully the environmental impact of the proposed project or action. However, from the information submitted, the Agency is able to make a preliminary determination of the impact on the environment. EPA has requested that the originator provide the information that was not included in the draft statement.

Category 3—Inadequate

EPA believes that the draft impact statement does not adequately assess the environmental impact of the proposed project or action, or that the statement inadequately analyzes reasonably available alternatives. The Agency has requested more information and analysis concerning the potential environmental hazards and has asked that substantial revision be made to the impact statement.

If a draft impact statement is assigned a Category 3, no rating will be made of the project or action, since a basis does not generally exist on which to make such a determination.

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Centers for Disease Control
Atlanta GA 30333
(404) 452-4257
August 25, 1983

Mr. Kisuk Cheung
Chief, Engineering Division
Pacific Ocean Division, Corps of Engineers
Department of the Army
Ft. Shafter, Hawaii 96858

Dear Mr. Cheung:

We have reviewed the Draft Detailed Project Report and Environmental Impact Statement (EIS) for Sand Island Shore Protection, Honolulu, Hawaii. We are responding on behalf of the U.S. Public Health Service.

We have reviewed this document for possible health effects and have no comments to offer. We believe the proposed alternatives have been adequately addressed.

Thank you for the opportunity to review this EIS. Please send us a copy of the final document when it becomes available.

Sincerely yours,

Frank S. Lisella, Ph.D.
Chief, Environmental Affairs Group
Environmental Health Services Division
Center for Environmental Health

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Washington, D.C. 20230

OFFICE OF THE ADMINISTRATOR

August 29, 1983

Colonel Alfred J. Thiede
District Engineer
U.S. Army Engineer Division
Pacific Ocean
Bldg 230
Fort Shafter, HI 96858

Dear Colonel Thiede:

Enclosed are comments from the National Oceanic and Atmospheric Administration on your draft environmental impact statement for Sand Island Shore Protection, Honolulu, Hawaii.

Thank you for giving us an opportunity to provide these comments, which we hope will be of assistance to you. We would appreciate receiving four copies of the final environmental impact statement.

Sincerely,

Joyce M. Wood
Chief
Ecology and Conservation Division

Enclosures

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
Washington, D.C. 20030

August 25, 1983 N/MB2x5:VLS

TO: PP2 - Joyce Wood

FROM: N - K. E. Taggart

SUBJECT: DEIS 8307.05 - Sand Island Shore Protection Study, Oahu, Hawaii
(Department of the Army - Honolulu District, Corps of Engineers)

The subject DEIS has been reviewed within the areas of the National Ocean Service's (NOS) responsibility and expertise, and in terms of the impact of the proposed action on NOS activities and projects.

Geodetic control survey monuments may be located in the proposed project area. If there is any planned activity which will disturb or destroy these monuments, NOS requires not less than 90 days' notification in advance of such activity in order to plan for their relocation. We recommend that funding for this project include the cost of any relocation required for NOS monuments. For further information about these monuments, please contact Mr. John Spencer, Chief, National Geodetic Information Branch (N/CG17), or Mr. Charles Novak, Chief, Network Maintenance Section (N/CG162), at 6001 Executive Boulevard, Rockville, Maryland 20852.

DEPARTMENT OF THE ARMY
PACIFIC OCEAN DIVISION, CORPS OF ENGINEERS
FT. SHAFTER, HAWAII 96858

September 13, 1983

Ms. Joyce M. Wood, Chief
Ecology and Conservation Division
NOAA, Department of Commerce
Room 5813
14th and Constitution Ave., NW
Washington, DC 20230

Dear Ms. Wood:

Thank you for your letter of August 29, 1983 providing us with the comments of your agency on the Sand Island Shore Protection Draft Detailed Project Report and Environmental Impact Statement.

The comment provided by the National Ocean Service regarding possible damage to geodetic control survey monuments by our proposed project is taken under advisement. We understand, however, from information provided to us by our locally contracted surveyors, that no such monument will be affected. The benchmark, "South Base," Station No. 1108, is the closest monument to the project site, 400 feet away from the project limits.

Sincerely,

Kisuk Cheung
Chief, Engineering Division

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
Western Pacific Program Office
P. O. Box 3830
Honolulu, Hawaii 96812

August 18, 1983 F/SWR1:JJN

Colonel Alfred J. Thiede
District Engineer
U.S. Army Engineer Division
Pacific Ocean
Fort Shafter, HI 96858

Dear Colonel Thiede:

The National Marine Fisheries Service (NMFS) has received and reviewed the Draft Environmental Impact Statement (DEIS) for Sand Island Shore Protection, Honolulu, Hawaii. The following comments are offered for your consideration.

General Comments

The proposed action described in the DEIS is not likely to adversely affect resources for which NMFS bears a responsibility. We feel that Alternative 3 will minimize environmental impacts and will provide effective shore protection. This alternative will enhance the shallow "tide pools" now available to children during field trips and will provide recreational shore fishing sites in the popular Reach A area. Site inspections have confirmed heavy usage of these sites.

NMFS recommends the implementation of Alternative 3. This should include leaving intact the existing stone breakwater in the center portion of the project in order to preserve the tide pool complex and provide rocky nearshore habitat.

Possible impacts to threatened and endangered species are currently being evaluated by the Corps and NMFS through informal Section 7 consultation pursuant to the Endangered Species Act of 1973, as amended.

Sincerely yours,

Doyle E. Gates
Administrator

cc: F/SWR, Terminal Is., CA
F/M4, Washington, D.C.

DEPARTMENT OF THE ARMY
PACIFIC OCEAN DIVISION, CORPS OF ENGINEERS
FT SHAFTER, HAWAII 96858

September 12, 1983

Mr. Doyle E. Gates, Administrator
Western Pacific Program Office
Southwest Region
National Marine Fisheries Service
P. O. Box 3830
Honolulu, Hawaii 96812

Dear Mr. Gates:

Thank you for your letter of August 18, 1983, commenting on the Sand Island Shore Protection Study Draft Detailed Project Report and Environmental Impact Statement. We acknowledge your support of Alternative 3, and we share your concern for the preservation of the shallow "tide pools". Every effort will be made to preserve as much of that area as possible.

Thank you for your continued interest in our projects.

Sincerely,

Kisuk Cheung
Chief, Engineering Division

DEPARTMENT OF THE ARMY
WATERWAYS EXPERIMENT STATION, CORPS OF ENGINEERS
P.O. BOX 631
VICKSBURG, MISSISSIPPI 39180

REPLY TO ATTENTION OF

WESCD-S

September 8, 1983

Mr. Howard Kobayashi
Chief, Technical Engineering Branch
PODED-T
Building 230
Ft. Shafter, Hawaii 96858

Dear Howard:

We have reviewed your draft report on the proposed Sand Island shore protection schemes. I thought you might be interested in the enclosed Memorandum for Record giving unofficial comments. Please use them as you see fit; they are furnished solely for your convenience.

Sincerely,

Robert W. Whalin, Ph.D., P.E.
Chief
Coastal Engineering Research Center

Enclosure

DEPARTMENT OF THE ARMY
WATERWAYS EXPERIMENT STATION, CORPS OF ENGINEERS
P.O. BOX 631
VICKSBURG, MISSISSIPPI 39180

REPLY TO ATTENTION OF

WESCD-S

8 September 1983

MEMORANDUM FOR RECORD

SUBJECT: Draft Project Report and EIS, Sand Island Shore Protection, Honolulu, Hawaii

1. A brief review of the subject draft report raised the following points relative to the proposed design:

a. In alternative plan 1, would it be possible to follow original revetment alignment and fill where needed? Proposed sinuous revetment may cause wave reflection and interference problems.

b. Tidal pools along reach 2 may be fed partially by wave overtopping (see photo 5). Breakwaters will eliminate this effect and may have some negative impact on maintaining pools behind the existing revetment. If the existing revetment is removed as implied in alternative plan 3, the pools may fill in with littoral material and cease to exist altogether. Either way, alternative 3 may not preserve the tidal pools in the manner implied on page 47.

c. Offshore breakwaters are so close to shore and in such shallow water that the difference between them and a revetment may be mainly philosophical.

2. The points listed above are posed solely for consideration, not as criticisms of the report.

THOMAS W. RICHARDSON
Chief, Coastal Structures
and Evaluation Branch

HYDRAULICS LABORATORY | GEOTECHNICAL LABORATORY | STRUCTURES LABORATORY | ENVIRONMENTAL LABORATORY | COASTAL ENGINEERING RESEARCH CENTER

UNITED STATES
DEPARTMENT OF THE INTERIOR
OFFICE OF THE SECRETARY
PACIFIC SOUTHWEST REGION
BOX 36098 • 450 GOLDEN GATE AVENUE
SAN FRANCISCO, CALIFORNIA 94102
(415) 556-8200

ER 83/848

Brigadier General Robert Bunker
Division Engineer
U.S. Army Corps of Engineers
Building 230
Fort Shafter, Hawaii 96858

SEP 9 1983

Dear General Bunker:

The Department of the Interior has reviewed the draft Environmental Statement and draft Detailed Project Report (combined) for Sand Island Shore Protection, Honolulu, Hawaii, and offer the following comments.

General Comments

The U.S. Fish and Wildlife Service (FWS) has prepared a Coordination Act Report on the erosion control measures at Sand Island and this report reviews the various impacts of the three alternate plans being considered. A copy of the FWS Coordination Act Report should be included as part of the final detailed project report.

The FWS report will recommend the following six measures be incorporated in project plans to minimize impacts on important fish and wildlife resources:

1. Turbidity control devices should be employed (whenever necessary) to confine plumes of suspended material.

2. Dredging associated with the action should be minimized.

3. Quarried stones should be cleaned of all terrigenous soils.

4. A filter bed of sand or permeable synthetic fabric should be used in the revetment to prevent movement of topsoil or backfill through the armor stone blanket.

5. Tidepools should be preserved whenever practicable.

6. Section 7 Consultation with the National Marine Fisheries Service should be initiated if blasting is used during construction.

Specific comments

The National Park Service (NPS) reports that three recreation development projects have been funded on Sand Island State Park, through the Land and Water Conservation Fund. This park is administered by the Hawaii Department of Land and Natural Resources, Division of State Parks. From review of the draft report and statement, it appears that no adverse effects would occur to the park. NPS notes that Mr. Susumu Ono, Chairman of the Department of Land and Natural Resources has been consulted on the project. Since Mr. Ono is the liaison officer for the L&WCF in Hawaii, NPS recommends that his office be kept apprised of developments on and progress of the proposed project as that office will be able to determine and ensure locally, that no negative impacts to the park and its facilities will occur.

Your consideration of these comments is appreciated.

Sincerely,

Patricia Sanderson Port
Regional Environmental Officer

cc: OEPR (w/incoming copy)
EC, FWS, Washington, D.C.
Reg. Dir., FWS
Reg. Dir., NPS

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES
EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

DIVISIONS:
AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

July 18, 1983

Department of the Army
Pacific Ocean Division
Corps of Engineers
Ft. Shafter, Hawaii 96858

Attention: Mr. Kisuk Cheung
Chief, Engineering Division

Gentlemen:

Thank you for sending me a copy of the Draft Detailed Project Report and Environmental Impact Statement for the Sand Island Shore Protection Study. As requested, my staff will be happy to participate and assist at the public meeting for discussion of the above document.

We certainly appreciate your moving expeditiously on this study.

Very truly yours,

SUSUMU ONO
Chairperson of the Board

GEORGE R. ARIYOSHI
GOVERNOR

JACK K. SUWA
CHAIRMAN, BOARD OF AGRICULTURE

SUZANNE D. PETERSON
DEPUTY TO THE CHAIRMAN

State of Hawaii
DEPARTMENT OF AGRICULTURE
1428 So. King Street
Honolulu, Hawaii 96814

Mailing Address:
P. O. Box 22159
Honolulu, Hawaii 96822

July 18, 1983

MEMORANDUM

To: Mr. Kisuk Cheung
Chief, Engineering Division
Pacific Ocean Division, Corps of Engineers

Subject: Draft Environmental Impact Statement
Sand Island Shore Protection

The Department of Agriculture has reviewed the subject statement and has no comments to offer. The report is returned herewith for your further use.

Thank you for the opportunity to comment.

JACK K. SUWA
Chairman, Board of Agriculture

Attachment

"Support Hawaiian Agricultural Products"

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES
EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

DIVISIONS:
AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

AUG 1 1 1983

Mr. Kisuk Cheung
U. S. Army Corps of Engineers
Pacific Division
Fort Shafter, Hawaii 96858

Dear Mr. Cheung:

Thank you for the opportunity to review your report on the shore protection project for Sand Island. We are pleased that you have made so much progress on the request by our State Parks Division.

We concur that Alternative Plan #3 is the best of the three considered. We like the idea of retaining the tide pools and the surfing area at the west end of the project. We expect several beneficial outcomes:

1) Erosion would be curbed;

2) The proposed structures may cause fish to aggregate, and may also enhance standing crops;

3) Access may be enhanced for such activities as crabbing, diving, and swimming; and

4) By preserving tidepool areas, the project would maintain educational resources and wading areas safe for infants and toddlers.

However, while these benefits seem likely to result in long-range enhancement of aquatic resources and their use, there are no provisions for specific sitework methods (e.g., for dredging), nor assessment of sediment impact beyond one statement that "some turbidity will occur during construction periods."

The environmental impact statement should discuss methods which would be used in construction. If dredging is required to construct the breakwaters (as implied in the plans), turbidity would result, possibly destroying marine benthic communities and creating unsafe water conditions for swimmers and divers. Water clarity should be measured prior to construction, to ensure maintenance of turbidity levels that are now existent, and to minimize impact to existing flora and fauna during construction.

If the project is initiated, of concern would be the inconvenience to the public during construction as portions of the park are closed. Upon completion of construction, our concerns would be the hazards to the public on the revetment and off shore islands as well as the responsibility for proper maintenance.

Sincerely,

SUSUMU ONO
Chairperson
Board of Land and Natural Resources
and
State Historic Preservation Officer

DEPARTMENT OF THE ARMY
PACIFIC OCEAN DIVISION, CORPS OF ENGINEERS
FT SHAFTER, HAWAII 96858

September 6, 1983

Mr. Susumu Ono, Chairman
Board of Land and Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Ono:

Thank you for your letter of August 11, 1983 providing us with your comments and concerns on the Sand Island Shore Protection Study Draft Detailed Project Report and Environmental Impact Statement. Your endorsement of Alternative Plan 3 as the Selected Plan is also acknowledged.

Your concern regarding the increased turbidity of the ocean waters during construction and its impacts on the surrounding biota has been given careful consideration. It should be recognized, however, that water quality during construction cannot be equivalent to preconstruction levels. We also offer the following information which will be included in the final EIS:

a. Dredging, or more appropriately, minor excavation along the shoreline, will probably be by clamshell or dragline equipment.

b. We have refined our plans based on cost and constructibility considerations whereby minimal, if any, underwater excavation will be required for placement of the offshore breakwaters and a reduced amount will be required for the revetment.

c. Turbidity will also result from the placement of temporary causeways to construct the offshore structures. These causeways may also be required for the periodic maintenance of the structures.

d. Unless otherwise specified, the Corps of Engineers will require in the contract plans and specifications that the contractor monitor the turbidity prior and during excavation. Appropriate measures to mitigate turbidity will be specified in the preconstruction planning stage. These may include material specifications governing aggregate size and type, hosing and scrubbing, construction techniques, etc. In addition, the Corps of Engineers is coordinating this issue with the State Department of Health with a request for a Water Quality Certification. Their response will help guide us in the selection of specific mitigation measures to include in the specifications.

e. The benthic communities in the offshore areas are relatively depauperate. Therefore, any practicable effort to mitigate turbidity should be commensurate with the degree of degradation that may result.

f. Revetment structures alongside the Phase I area of Sand Island State Park were completed in September 1980 and resulted in no evident water quality problems or damage to the ecosystem. On the contrary, the completed works now provide a safer park area and access to the water, and eliminate shore erosion, thus improving the water quality of the harbor.

Your concern regarding the inconvenience and impacts imposed upon park-users during the construction period is addressed in the draft EIS and will be reaffirmed in the final EIS. As part of the construction specifications we propose to include a requirement that the contractor shall provide safe public access to the shoreline in all areas not under construction. Details on phasing and public access will be developed during the pre-construction planning stage.

We feel that the proposed project will be an improvement in safety over the existing revetment with its loose rocks and susceptibility to frequent overtopping waves. The offshore breakwaters are protective structures and should not be used for fishing or any other purpose. Warning signs should be posted by the State of Hawaii indicating the hazards and risks associated with any other uses of these structures.

As the local sponsor for this project, the Department of Land and Natural Resources will be responsible for the maintenance of the structures. A formal agreement in accordance with Section 221 of the River and Harbor Act of 1970, which will have to be executed prior to award of the construction contract, will help to clarify the maintenance responsibilities required of your Department.

Sincerely,

Kisuk Cheung
Chief, Engineering Division

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES
EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

DIVISIONS:
AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

October 3, 1983

Mr. Kisuk Cheung
U.S. Army Corps of Engineers
Pacific Division
Fort Shafter, Hawaii 96858

Dear Mr. Cheung:

Thank you for your letter dated September 6, 1983, responding to our list of concerns in preparation of the final EIS for the Sand Island Shore Protection Project.

With reference to construction-generated turbidity, we concur with your statement that water quality during construction periods cannot be equivalent to preconstruction levels. It is certainly gratifying to learn that your agency is already coordinating this issue with the State Department of Health and that their response will help guide you in selecting mitigating measures to include in the contract plans and specifications.

Thank you again for the opportunity to comment on this project.

Very truly yours,

SUSUMU ONO, Chairperson
Board of Land and Natural Resources

cc: DOH

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

CHARLES G. CLARK
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HAWAII 96801

In reply, please refer to
File: EPHS-SS

July 27, 1983

MEMORANDUM

To: Mr. Kisuk Cheung, Chief, Engineering Division
Corps of Engineers, Department of the Army

From: Deputy Director for Environmental Health

Subject: Environmental Impact Statement (EIS) for Sand Island Shore Protection, Honolulu, Hawaii

Thank you for allowing us to review and comment on the subject EIS. On the basis that the project will comply with all applicable Public Health Regulations, please be informed that we do not have any objections to this project.

We realize that the statements are general in nature due to preliminary plans being the sole source of discussion. We, therefore, reserve the right to impose future environmental restrictions on the project at the time final plans are submitted to this office for review.

MELVIN K. KOIZUMI

cc: OEQC

DEPARTMENT OF THE ARMY
PACIFIC OCEAN DIVISION, CORPS OF ENGINEERS
FT SHAFTER HAWAII 96858

August 18, 1983

Mr. Charles Clark, Director
Department of Health
State of Hawaii
1250 Punchbowl Street
Honolulu, Hawaii 96813

Dear Mr. Clark:

As part of the procedure for implementing the Sand Island Shore Protection Project, Oahu, Hawaii, it is necessary to obtain a State quality certification for the discharge of dredged or fill material in accordance with Section 404 of the Clear Water Act.

If a formal certification process is not in effect in Hawaii, a letter from the State Department of Health is required which evaluates the effects of the discharge of dredged or fill material on water quality, and provides recommendations, if any, to minimize the impacts of the discharge on water quality. If appropriate, the letter should indicate that the State Department of Health concurs that the discharge impacts on water quality are acceptable and have been mitigated to the extent practicable and that the discharge will conform to State water quality standards.

We have enclosed for your review a copy of the draft environmental impact statement (DEIS) for the project which contains an evaluation of the effects of the discharge of dredged or fill material into waters of the U.S. under the Section 404 (b)(1) Guidelines promulgated by the U.S. Environmental Protection Agency.

We would appreciate a response on this matter by September 20, 1983 so that it may be incorporated in the Final environmental impact statement for the project. If you have any questions on the DEIS, please contact Mr. Bill Lennan, Environmental Resources Section at 438-2264.

Sincerely,

Kisuk Cheung
Chief, Engineering Division

Enclosure

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

CHARLES G. CLARK
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HAWAII 96801

September 7, 1983

In reply, please refer to:
EPHSO SS

Mr. Kisuk Cheung
Chief, Engineering Division
Pacific Ocean Division, Corps of Engineers
Department of the Army
Ft. Shafter, Hawaii 96858

Dear Mr. Cheung:

Subject: Draft EIS for the Sand Island Shore Protection Project

Thank you for allowing us to comment on the subject draft EIS.

The State Department of Health concurs that the discharge impacts on water quality are acceptable and have been mitigated to the extent practicable and that the discharge will conform to State water quality standards.

On page EIS-10, Section 4.4, reference is made to State Public Health Regulations, Chapter 37-A. This, and all other similar references, should be changed to Chapter 54 of Title 11, Administrative Rules on Water Quality Standards.

Sincerely,

MELVIN K. KOIZUMI
Deputy Director for
Environmental Health

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF SOCIAL SERVICES AND HOUSING
HAWAII HOUSING AUTHORITY
P. O. BOX 17907
HONOLULU, HAWAII 96817

PAUL A. TOM
EXECUTIVE DIRECTOR

IN REPLY REFER

TO: 83:DEV/3214

July 12, 1983

Department of the Army
Pacific Ocean Division, Corps
of Engineers
Fort Shafter, Hawaii 96858

Attention Kisuk Cheung
Chief, Engineering Division

Gentlemen:

Subject: Draft Detail Project Report and Environmental Impact Statement - Sand Island Shore Protection, Honolulu, Hawaii

We have reviewed the subject matter and have no comments to offer at this time relative to the proposed action.

Thank you for the opportunity to comment on this matter.

Sincerely,

PAUL A. TOM
Executive Director

B-28

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P. O. BOX 119 HONOLULU, HAWAII 96810

HIDEO MURAKAMI
COMPTROLLER

MIKE M. TOKUNAGA
DEPUTY COMPTROLLER

LETTER NO (P)1627.3

JUL 26 1983

Mr. Kisuk Cheung, Chief
Engineering Division
Department of the Army
Pacific Ocean Division
Corps of Engineers
Fort Shafter, Hawaii 96858

Dear Mr. Cheung:

Subject: Sand Island Shore Protection Study
Draft Detailed Project Report and
Environmental Impact Statement

Thank you for forwarding us a copy of the subject document for our review. We have no comments to offer.

Very truly yours,

HIDEO MURAKAMI
State Comptroller

University of Hawaii at Manoa

Water Resources Research Center
Holmes Hall 283 • 2540 Dole Street
Honolulu, Hawaii 96822

29 July 1983

Mr. Kisuk Cheung, Chief
Engineering Division
Pacific Ocean Division
Corps of Engineers
Ft. Shafter, Hawaii 96858

Dear Mr. Cheung:

SUBJECT: Sand Island Shore Protection, Draft Project Report and Environmental Impact Statement, Honolulu, Hawaii, June 1983

We have reviewed the subject material and have no comment to offer. Thank you for the opportunity to comment. This material was reviewed by WRRC personnel.

Sincerely,

Edwin T. Murabayashi
EIS Coordinator

ETM:jm

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
550 HALEKAUWILA STREET
ROOM 301
HONOLULU, HAWAII 96813

Melvin K. Koizumi
Acting Director
TELEPHONE NO.
548-6915

July 22, 1983

Mr. Kisuk Cheung
U.S. Army Corps of Engineers
Pacific Ocean Division
Building 230
Fort Shafter, Hawaii 96858

Dear Mr. Cheung:

Subject: Draft Environmental Impact Statement Sand Island Shore Protection, Oahu, Hawaii

We prefer alternative Plan 1 or Plan 3 of your proposed project because these alternatives will have no effect on the surfing site of Sand Island.

Sincerely,

Melvin Koizumi
Acting Director

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
550 HALEKAUWILA ST.
ROOM 301
HONOLULU, HAWAII 96813

Letitia N. Uyehara
Interim Director
TELEPHONE NO.
548-6915

August 31, 1983

Mr. Kisuk Cheung, Chief
Engineering Division
U.S. Army Corps of Engineers
Building 230
Fort Shafter, Hawaii 96858

Dear Mr. Cheung:

Subject: Draft Environmental Impact Statement for Sand Island Shore Protection

Pursuant to the Governor's memorandum of January 8, 1979 designating OEQC as the focal point for review and dissemination of state agency comments, the attached comments are being forwarded.

Sincerely,

Letitia N. Uyehara
Interim Director

B-30

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF DEFENSE
OFFICE OF THE ADJUTANT GENERAL
3949 DIAMOND HEAD ROAD, HONOLULU, HAWAII 96816

ALEXIS T. LUM
MAJOR GENERAL
ADJUTANT GENERAL

DANIEL K. C. AU
COLONEL
DEPUTY ADJUTANT GENERAL

16 JUL 1983

HIENG

Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Gentlemen:

Sand Island Shore Protection

Thank you for providing us the opportunity to review the Draft Detailed Project Report with Draft Environmental Impact Statement for the above subject project.

We have completed our review and have no comments to offer at this time.

Yours truly,

JERRY M. MATSUDA
Major, HANG
Contr & Engr Officer

Enclosure

HAWAIIAN ELECTRIC COMPANY, INC.
Box 2750 / Honolulu, Hawaii / 96840

August 18, 1983

ENV 2-1
NV/R

RICHARD L. O'CONNELL, P.E.
MANAGER, ENVIRONMENTAL DEPARTMENT
(808) 548-6890

Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Sir:

Subject: Draft Detailed Project Report and Draft Environmental Impact Statement, Sand Island Shore Protection, Honolulu, Hawaii

We have reviewed the subject Project Report and Draft Environmental Impact Statement and find that there will be no effect on existing or planned company facilities.

Thank you for the opportunity to comment on this document.

Sincerely,

Richard E. O'Connell
Manager, Environmental Department

JMP:cm

E-54

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

CHARLES G. CLARK
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HAWAII 96801

July 27, 1983

In reply, please refer to:
File: EPHS-SS

MEMORANDUM

To: Mr. Kisuk Cheung, Chief, Engineering Division
Corps of Engineers, Department of the Army

From: Deputy Director for Environmental Health

Subject: Environmental Impact Statement (EIS) for Sand Island Shore Protection, Honolulu, Hawaii

Thank you for allowing us to review and comment on the subject EIS. On the basis that the project will comply with all applicable Public Health Regulations, please be informed that we do not have any objections to this project.

We realize that the statements are general in nature due to preliminary plans being the sole source of discussion. We, therefore, reserve the right to impose future environmental restrictions on the project at the time final plans are submitted to this office for review.

MELVIN K. KOIZUMI

cc: OEQC ✓

DEPARTMENT OF PLANNING AND ECONOMIC DEVELOPMENT

KAMAMALU BUILDING, 250 SOUTH KING ST, HONOLULU, HAWAII • MAILING ADDRESS: P.O. BOX [illegible], HONOLULU, HAWAII 96804

GEORGE R. ARIYOSHI
GOVERNOR

KENT M. KEITH
DIRECTOR

FRANK SKRIVANEK
DEPUTY DIRECTOR

August 29, 1983

Ref. No. 8025

Mr. Kisuk Cheung
Chief, Engineering Division
Corps of Engineers
Fort Shafter, Hawaii 96858

Dear Mr. Cheung:

Subject: Sand Island Shore Protection Study and Draft EIS, Oahu

We have reviewed the subject study and draft environmental impact statement and find that the EIS adequately addresses the probable impacts resulting from the shore erosion control measures at Sand Island.

Table 2 (Pg. EIS-2) of the EIS, Relationship of the Plans to Environment Protection Statutes and Other Environmental Requirements, should include reference to The Hawaii State Plan. The EIS should cite the appropriate objectives and policies of The Hawaii State Plan and indicate the manner in which the project addresses these.

Also, the table incorrectly refers to a State Land Use Plan. This should be titled the State Land Use Law.

Thank you for the opportunity to review the report.

Very truly yours,

Kent M. Keith

Kent M. Keith

cc: Office of Environmental Quality Control

B-32

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813

RYOKICHI HIGASHIONNA, Ph.D.
DIRECTOR

DEPUTY DIRECTORS
WAYNE J. YAMASAKI
JAMES B. McCORMICK
JONATHAN K. SHIMADA, Ph.D.
CHERYL D. SOON

IN REPLY REFER TO:
STP 8.9346

September 1, 1983

Mr. Kisuk Cheung
Chief, Engineering Division
Department of the Army
Pacific Ocean Division,
Corps of Engineers
Ft. Shafter, Hawaii 96858

Dear Mr. Cheung:

Sand Island Shore Protection

Thank you for the opportunity to comment on the Detailed Project Report and Environmental Impact Statement for the subject action.

While we have no objections to the proposal to protect the "makai" shoreline of Sand Island, close coordination with our Oahu Harbor District Office is imperative if any construction activity is expected to affect navigation in the harbor entrance channel or if any harbor facilities are to be used.

We advise observance of the weight limitation of the Sand Island bascule bridge and other bridges on the island by construction vehicles transporting equipment, materials, etc. to and from the project site. We refer you to our Rules and Regulations Governing the Movement of Oversize and Overweight Vehicles on State Highways, May 1981.

Very truly yours,

Ryokichi Higashionna

Ryokichi Higashionna
Director of Transportation

UNIVERSITY OF HAWAII

Sea Grant College Program

September 8, 1983

Mr. Kisuk Cheung
Chief, Engineering Division
US Army Corps of Engineers
Pacific Ocean Division
Fort Shafter, Hawaii 96858

Dear Mr. Cheung:

My staff has reviewed the Draft Detailed Project Report and EIS for the Sand Island Shore Protection Study. They suggest further discussion of the littoral drift along the southern shoreline and possible effects of shoreline and offshore structures, as proposed, upon presently stable reaches (e.g., Reach 4 which has 1,200 feet of relatively stable sand beach) or other sections of the southern shoreline. We note that although the report and EIS address shoreline erosion problems, there is no discussion of sediment transport processes along the shoreline. The UH Environmental Center could possibly assist in reviewing this aspect of the EIS.

Thank you for the opportunity to comment on the study.

Sincerely,

Jack R. Davidson
Director

cc: Doak Cox, Director, UH Environmental Center
Raymond Tabata, SGES, Oahu Agent

1000 Pope Road, Room 220 · Telephone (808) 948-7031 · Honolulu, Hawaii 96822 / Cable Address: UNIHAW

DEPARTMENT OF THE ARMY
PACIFIC OCEAN DIVISION, CORPS OF ENGINEERS
FT SHAFTER, HAWAII 96858

September 29, 1983

Mr. Jack R. Davidson, Director
University of Hawaii
Sea Grant College Program
1000 Pope Road
Honolulu, Hawaii 96822

Dear Mr. Davidson:

Thank you very much for your letter of September 8, 1983 providing us with your comments on our Sand Island Shore Protection Study Draft Detailed Project Report and Environmental Impact Statement.

We share your concerns on the possible effects of the project on the stable reaches of the shoreline, especially the sand beach. In the course of our study,however, our staff conducted a series of reconnaissance dives in the offshore waters of the study area and discovered very little evidence of longshore littoral movement. In addition the entrance channels for Honolulu Harbor and Keehi Lagoon Boat Harbor prevent sediment drift from either end of Sand Island. The accretion of sand on the beach is more likely the result of onshore-offshore transport processes and would not be affected by any of our proposed structures. Furthermore, the sand beach is located in the mid-reach area of the concave southern shoreline of Sand Island and could therefore be classified as a "pocket" beach which generally exhibits extremely stable characteristics.

Your offer to lend us your expertise in evaluating sediment transport processes along this shoreline is greatly appreciated nonetheless.

Sincerely,

Kisuk Cheung
Chief, Engineering Division

DEPARTMENT OF PUBLIC WORKS

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET
HONOLULU, HAWAII 96813

EILEEN R. ANDERSON
MAYOR

MICHAEL J. CHUN, PH.D.
DIRECTOR AND CHIEF ENGINEER

MAURICE H. KAYA
DEPUTY DIRECTOR

ENV 83-168

July 12, 1983

District Engineer
U. S. Army Engineer District, Honolulu
Building 230
Fort Shafter, Hawaii 96858

Gentlemen:

Re: Draft EIS for Sand Island Shore Protection
Honolulu, Hawaii

We have reviewed the Detailed Project Report and the Draft EIS for the subject project and have the following comments.

1. We have several major sewer lines near and within the project area. They include the new 84-inch ocean outfall sewer, the old 78-inch outfall sewer, and the new 66-inch Ala Moana force main (see attached maps). In addition, there is an old 36-inch army outfall sewer which will be abandoned.

2. If construction is restricted to Reaches 1, 2 and 3, the ocean outfall sewers will not be affected. The new 66-inch force main from Ala Moana Pump Station will be in the impact area if Alternative Plan 1 or 3 is selected. Under these alternatives, construction plans for the project should be coordinated with the Division of Wastewater Management of this department.

Me ke aloha pumehana,

MICHAEL J. CHUN
Director and Chief Engineer

Attach.

cc: WWM

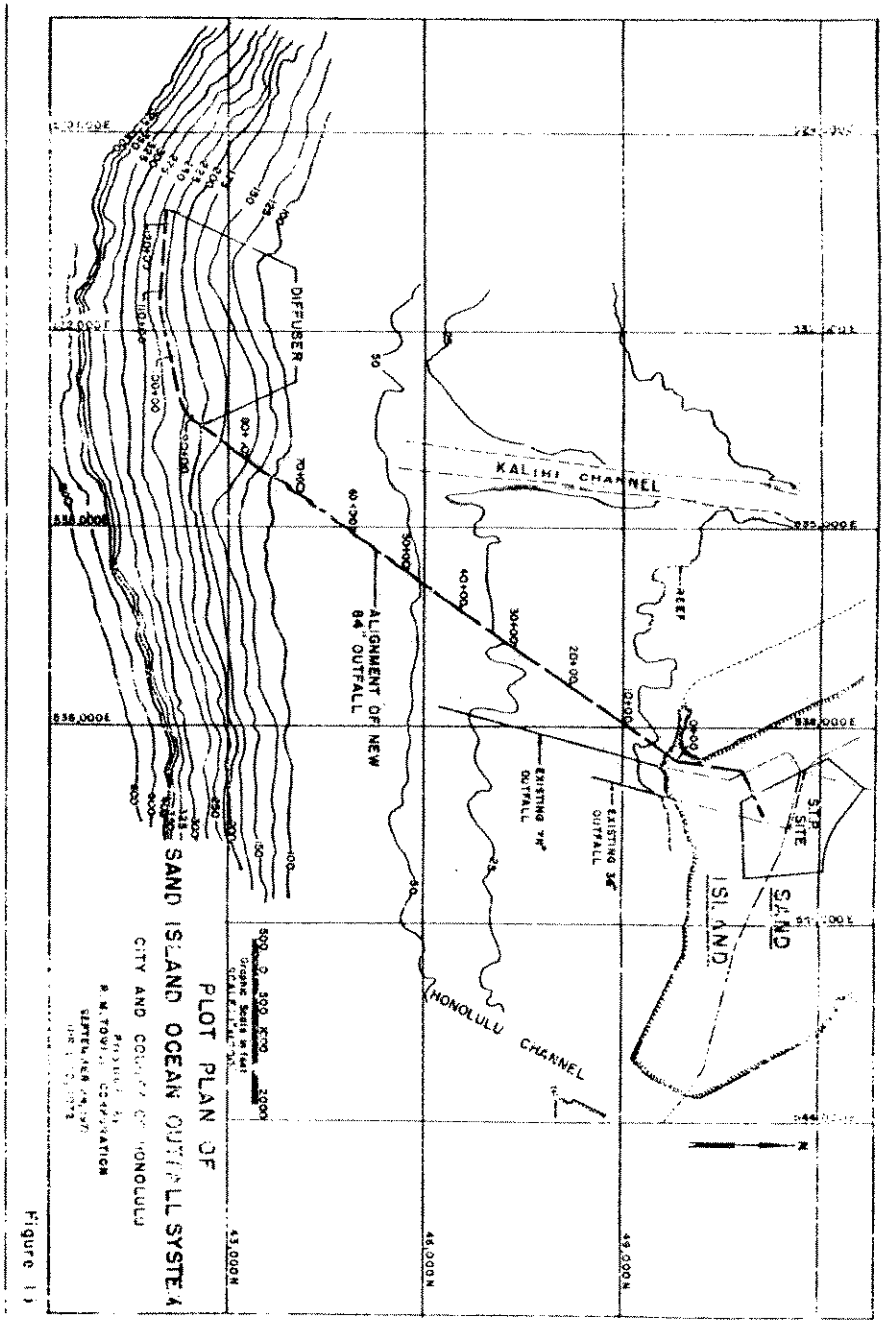
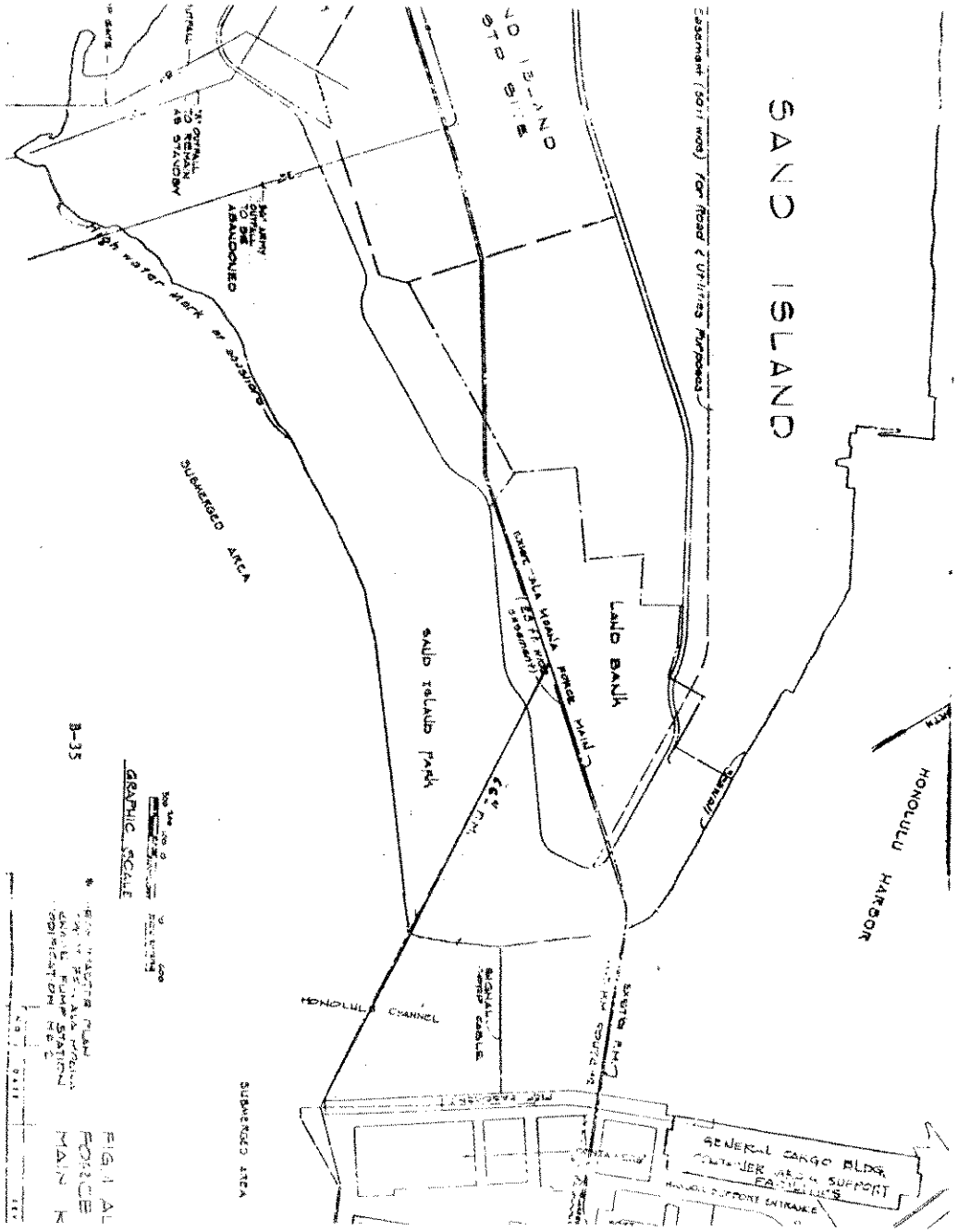


Figure 1



DEPARTMENT OF THE ARMY
PACIFIC OCEAN DIVISION, CORPS OF ENGINEERS
FT SHAFTER, HAWAII 96858

August 17, 1983

Mr. Michael J. Chun
Director and Chief of Engineer
Department of Public Works
City and County of Honolulu
650 S. King Street
Honolulu, HI 96813

Dear Mr. Chun:

Thank you for your letter of July 12, 1983 providing us with your comments on our Draft Detailed Project Report and Environmental Impact Statement for the Sand Island Shore Protection Study.

As you pointed out, the new 66-inch force main from the Ala Moana Pump Station traverses directly under the eastern edge of our study limits. After discussion with your staff at the Wastewater Management Division, we understand that this force main lies approximately 28 feet below sea level at this location, and as such, will not be directly affected by the proposed construction near the surface of Sand Island. In the Final Report and EIS for this study, we will define the location of this line as an existing utility and indicate that it is just beyond the direct impact area of our project. However, we will reflect this utility in the plans and specifications for construction and advise the contractor to exercise caution in this area.

Thank you again for alerting us to this situation.

Sincerely,

Kisuk Cheung
Chief, Engineering Division

OAHU CIVIL DEFENSE AGENCY

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET
HONOLULU, HAWAII 96813
PHONE 523-4121

EILEEN R. ANDERSON
MAYOR

MALCOLM A. SUSSEL
ADMINISTRATOR

July 19, 1983

Department of the Army
Pacific Ocean Division
Corps of Engineers
Building 230
Fort Shafter, Hawaii 96858

Attention: Kisuk Cheung, Chief
Engineering Division

Gentlemen:

Review of the Draft Detailed Project Report and Environmental Impact Statement has revealed no adverse impact relating to civil defense concerns or planning.

Thank you for the opportunity to review this document.

Sincerely,

MALCOLM A. SUSSEL
Administrator

DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET
HONOLULU, HAWAII 96813
PHONE 523 4191

EILEEN R. ANDERSON
MAYOR

JOSEPH K. CONANT
DIRECTOR

CHARLES P. TORIGOE
DEPUTY DIRECTOR

August 16, 1983

Mr. Kisuk Cheung, Chief
Engineering Division
Department of the Army
Pacific Ocean Division
Corps of Engineers
Ft. Shafter, Hawaii 96858

Dear Mr. Cheung:

Subject: Draft Environmental Impact Statement
Sand Island Shore Protection

Thank you for forwarding the subject EIS for our review and comments.

Your proposed plan to substantially reduce shoreline erosion and to protect recreational activities and educational opportunities along the seashore will ensure the continuance of coastal recreational activities at the Sand Island State Park.

We will be retaining this EIS for our files.

Sincerely,

JOSEPH K. CONANT

DEPARTMENT OF PARKS AND RECREATION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

EILEEN R. ANDERSON
MAYOR

EMIKO I. KUDO
DIRECTOR

SAM L. CARL
DEPUTY DIRECTOR

OSCAR P. ASAHINA
EXECUTIVE ASSISTANT

August 9, 1983

Mr. Kisuk Cheung, Chief
Engineering Division
Pacific Ocean Division,
Corps of Engineers
Department of the Army
Fort Shafter, Hawaii 96858

Dear Mr. Cheung:

SUBJECT: COMMENTS ON SAND ISLAND SHORE PROTECTION DRAFT PROJECT REPORT AND ENVIRONMENTAL IMPACT STATEMENT

It is noted that the Sand Island Shore Protection Project Report favors Alternate Plan 3 which uses a combination of breakwater sections and revetments to protect Sand Island's 2,000 feet of south shoreline.

We agree with the concept in general, but suggest a modification of Alternative Plan 3 extending the breakwater sections to replace the 820-foot stone revetment now shown along Reach B (Reach 3 on Figure 8).

Reach 3 faces the offshore surfing zone and the reactive impulse is to assume that the breakwater sections would interfere with the primary surfing area. This is not the case because the near-shore area here is very shallow and has emerging rocks and boulders at low tide. During summer surf, it can be particularly dangerous to launch or recover a surfboard along the present shoreline. It would continue to be dangerous to enter or leave the water with the proposed stone revetment.

Breakwater sections in Reach B would permit surfboard launch and emergence from the ocean in relatively calm waters and would also encourage the formation of a natural sand or pebble beach behind it. A small beach now forms seasonally among the loose rock, but without protection, the large surf tends to scour it out. In other words, it would be a shame to lose this

stretch of shoreline to a revetment when a protected beach is possible. The increased cost would be small in comparison to the added recreational benefits.

Thank you for allowing us to comment on this project.

Sincerely yours,

Emiko Kudo

(Mrs.) EMIKO I. KUDO, Director

EIK:vc

cc: DLNR
DOT

DEPARTMENT OF THE ARMY
PACIFIC OCEAN DIVISION, CORPS OF ENGINEERS
FT. SHAFTER, HAWAII 96858

August 19, 1983

Mrs. Emiko I. Kudo, Director
Department of Parks & Recreation
City & County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mrs. Kudo:

Thank you for your letter of August 9, 1983 providing us with your comments on our Draft Detailed Project Report and Environmental Impact Statement for the Sand Island Shore Protection Study.

Your suggestion of extending the offshore breakwater sections to replace the 820-foot stone revetment was in fact one of the alternatives formulated in the earlier stages of this study. At our Public Workshop in November 1982, however, one participant voiced objections to the encroachment of these offshore structures into the surf zone, thereby increasing the chances of surfboard damage and bodily injury. The Corps of Engineers and the Division of State Parks feel that these adverse impacts are best mitigated by an onshore revetment structure in this area. Access to the ocean by surfers would not be any more impeded or hazardous with the proposed revetment than with the existing structure. Entry and exit locations will continue to be dictated by the size of the waves and swells on any particular day and will require an exercise in judgment and caution by the surfers.

The secondary effect of your suggestion - the formation of a natural beach behind the breakwaters is a desirable one. The accretion of sand in this area however, will be a very slow process and therefore the planning trade-offs favored the preservation of the surfing resource.

Sincerely,

Kisuk Cheung
Chief, Engineering Division

Copy Furnished:

Mr. Susumu Ono, Chairman
Board of Land and Natural
Resources
P. O. Box 621
Honolulu, Hawaii 96809

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA
HONOLULU, HAWAII 96843

EILEEN R. ANDERSON, Mayor

YOSHIE H. FUJINAKA, Chairman
DONNA M. HOWARD, Vice-Chairman
MILTON J. AGADER
MICHAEL J. CHUN
WALTER A. DODS, JR.
RYOKICHI HIGASHIONNA
ERNEST A. WATARI

KAZU HAYASHIDA
Manager and Chief Engineer

August 16, 1983

Mr. Kisuk Cheung
Chief, Engineering Division
Pacific Ocean Division
Corps of Engineers
Department of the Army
Fort Shafter, Hawaii 96858

Dear Mr. Cheung:

Subject: Your Letter of July 28, 1983, on the Detailed Project Report and Draft Environmental Impact Statement for Sand Island Shore Protection

We have no objections to the proposed project or its alternatives for controlling shoreline erosion at Sand Island. The project is not anticipated to have adverse impacts on potable groundwater resources or our water system facilities in the area.

If you have any questions, please call Lawrence Whang at 527-6138.

Very truly yours,

KAZU HAYASHIDA
Manager and Chief Engineer

DEPARTMENT OF GENERAL PLANNING
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

EILEEN R. ANDERSON
MAYOR

WILLARD T. CHOW
CHIEF PLANNING OFFICER

RALPH PORTMORE
DEPUTY CHIEF PLANNING OFFICER

DGP7/83-7435

August 17, 1983

Mr. Kisuk Cheung, Chief
Engineering Division
Corps of Engineers
Pacific Ocean Division
Department of the Army
Fort Shafter, Hawaii 96858

Dear Mr. Cheung:

Sand Island Shore Protection
Draft Detailed Project Report and
Environmental Impact Statement

We have reviewed the draft report and feel that discussion on the following should be included in the final EIS.

From the description of the erosion control measures being proposed, it can be assumed that substantial amount of trucking activity will be carried on. Stones and fill material for the construction of the shoreline revetment and/or the offshore structure must be brought to the work site from elsewhere. Also, existing concrete rubble and exposed iron along the shoreline must be cleared and hauled away.

Unless separate construction roadways are provided, internal service streets of Sand Island Park will have to be used for the trucking operations. This heavy usage of park roads is likely to result in excessive generation of dust and noise, severe traffic conflicts and other problems. The extent of these nuisances, inconveniences and hazards likely to be faced by the public during the construction period or the potential loss of open space recreational opportunities which might result may need to be identified and addressed.

Other pertinent discussions might include the truck routes to reach work sites, the number of trucks involved in the transport operations, the projected number of daily truck trips, hours of construction, etc. Proposals to reduce identified environmental problems and safety measures for vehicles and pedestrians should also be made part of the EIS.

Sincerely,

Ralph Kawamoto

RALPH KAWAMOTO
Planner

APPROVED:

Ralph Portmore
for WILLARD T. CHOW

DEPARTMENT OF THE ARMY
PACIFIC OCEAN DIVISION, CORPS OF ENGINEERS
FT. SHAFTER, HAWAII 96858

August 30, 1983

Mr. Willard T. Chow
Chief Planning Officer
Department of General Planning
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Chow:

This is in response to your letter of August 17, 1983 commenting on the Sand Island Shore Protection Draft Detailed Project Report and Environmental Impact Statement.

The concrete rubble and exposed iron along the shoreline do detract from the quality of the park. However, unless the existing debris directly interferes with the installation of the plan of improvement, they are considered maintenance problems outside the scope of this project.

We agree that a substantial amount of trucking activity will be required for the construction of the project. The resulting temporary impacts of noise, dust and loss of open space have been considered in the draft EIS (pages EIS-10, EIS-16, and Table 3, EIS) and will be reaffirmed in the final EIS.

In addition, the contractor will be required to provide an Environmental Control Plan to include appropriate dust and noise pollution control and traffic safety measures. The contractor's construction activities will be confined to a designated easement area with provisions to provide for safe, public access to the shoreline in all areas not under construction.

The contractor will be required to comply with all the local regulations pertinent to use of public roads and highways. Locations for temporary truck routes within the Park will be coordinated with the State Parks Division during the preconstruction planning stage. Our estimates indicate that 2-3 trucks making 4-5 trips each will be required, generating 10-15 trips daily, and we do not anticipate construction activity during weekends. Based on our past experience in constructing the previous revetment structure on Sand Island, we do not expect the truck traffic to significantly interfere with normal traffic to the Park.

We recognize these disruptions and incoveniences which will be imposed upon the park users during construction, but these are temporary impacts that will be minimized through proper control.

Sincerely,

Kisuk Cheung
Chief, Engineering Division

Copy Furnished:

Mr. Susumu Ono, Chairman
Board of Land and Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809

DEPARTMENT OF LAND UTILIZATION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813 ☎ (808) 523-4432

EILEEN R. ANDERSON
MAYOR

MICHAEL M. McELROY
DIRECTOR

ROBERT B. JONES
DEPUTY DIRECTOR

August 30, 1983

LU7/83-4032(JDN)

Mr. Kisuk Cheung, Chief
Engineering Division
Department of the Army
Corps of Engineers
Honolulu District
Building 230
Ft. Shafter, Hawaii 96858

Dear Mr. Cheung:

Draft Detailed Project Report and Environmental Impact Statement (EIS) for Sand Island Shore Protection
Honolulu, Oahu; Tax Map Key 1-5-41: Portion of 2 & 3

We have reviewed the subject document and have the following comments.

The onshore rip rap revetments proposed in Alternative No. 3 (the recommended alternative) and Alternative No. 2 may be subject to review under the provisions of the Special Management Area (SMA) Ordinance No. 4529, as amended, and the Shoreline Setback Rules and Regulations pursuant to Chapter 205, Part II. The revetments are subject to this review only if they are to be constructed mauka (landward) of the shoreline.

The shoreline is defined as, "the upper reaches of the wash of waves, other than storm and tidal waves." Chapter 205-31 (2), HRS and Shoreline Setback Rules and Regulations, Rule 7, j. The shoreline is officially determined by an instrument survey conducted by a registered land surveyor and certified by the State Land Surveyor. This determination is valid for one year.

The exact position of the proposed revetments relative to the shoreline is not determinable from the Draft Project Report and EIS. Therefore, we cannot confirm at this time whether construction of the revetments will require SMA and Shoreline Setback Area review.

For your information, an SMA Permit (DLU File No. 79/SMA-50) was granted on July 10, 1979 by Committee Report No. 791 for a new shore protection revetment on the Diamond Head-Honolulu Harbor side of Sand Island.

Finally, we concur that Alternative No. 3 is the most desirable of the three alternatives proposed.

If there are any questions, please contact John Nakagawa of our staff at 527-5038.

Very truly yours,

for MICHAEL M. McELROY
Director of Land Utilization

MMM:sl

DEPARTMENT OF THE ARMY
PACIFIC OCEAN DIVISION, CORPS OF ENGINEERS
FT SHAFTER, HAWAII 96858

September 8, 1983

Mr. Michael M. McElroy, Director
Department of Land Utilization
City and County of Honolulu
650 S. King Street
Honolulu, HI 96813

Dear Mr. McElroy:

Thank you for your letter of August 30, 1983, informing us of the Special Management Area (SMA) and Shoreline Setback requirements for our Sand Island Shore Protection Project.

The stone revetments proposed in Alternative Nos. 1 and 3 will encroach landward of the official shoreline of Sand Island, and as such, will necessitate an application for an SMA permit. Securing this and any other required permit will be the responsibility of the local sponsor of this project, the State Department of Land and Natural Resources.

Sincerely,

Kisuk Cheung
Chief, Engineering Division

Copy Furnished:

Mr. Susumu Ono, Chairman
Board of Land and Natural Resources
P. O. Box 621
Honolulu, HI 96809

B-42

DEPARTMENT OF TRANSPORTATION SERVICES
CITY AND COUNTY OF HONOLULU
HONOLULU MUNICIPAL BUILDING
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

EILEEN R. ANDERSON
MAYOR

ANDREW T. CHANG
MANAGING DIRECTOR

WILLIAM A. BONNET
DIRECTOR

DAIL RHEE
DEPUTY DIRECTOR

August 17, 1983 TE 7/83-2783

Mr. Kisuk Cheung, Chief
Engineering Division
Department of the Army
Pacific Ocean Division, Corps of Engineers
Fort Shafter, Hawaii 96858

Dear Mr. Cheung:

Subject: Draft EIS for the Sand Island Shore Protection Project

We have reviewed the Draft Environmental Impact Statement and have no comments.

Sincerely,

WILLIAM A. BONNET
Director

EXECUTIVE CHAMBERS

HONOLULU

GEORGE R ARIYOSHI
GOVERNOR

February 6, 1984

Colonel Michael M. Jenks
District Engineer
Corps of Engineers
U.S. Army Engineering District, Honolulu
Fort Shafter, Hawaii 96858

Dear Colonel Jenks:

It is my understanding that the Corps of Engineers requires a letter of intent from the local sponsor as an expression of its support for the Sand Island shore protection project. Therefore, this letter of intent is to assure you that the Hawaii state government, as the local sponsor, supports the Corps' selected plan for the Sand Island shore protection project.

The state intends to cooperate with the federal government by:

a. Providing without cost to the United States all lands, easements, and rights-of-way necessary for the construction of this project;

b. Holding and saving the United States free from claims for damages due to the construction work and subsequent maintenance of the project, except where such damages are due to the fault or negligence of the United States or its contractors;

c. Maintaining and operating the project after its completion in accordance with regulations prescribed by the Secretary of the Army;

d. Providing the balance of funds for the project subject to federal participation of $1,000,000 or greater;

e. Maintaining continued ownership of the shore, on which the amount of federal participation is based, and its administration for public use during the economic life of the project; and

f. Complying with Title VI of the Civil Rights Act of 1964 (P.L. 88-352).

This letter of intent, which I understand does not legally bind the state, supersedes my previous letter of October 19, 1983. The state will make a diligent effort to obtain the resources and approvals to enter into a legal agreement (Sec. 221, Rivers and Harbors Act, 1920) with the Corps to fulfill this letter of intent, pending the completion of final designs and cost estimates and prior to construction. Questions on this project may be directed to the Department of Land and Natural Resources.

With warm personal regards, I remain,

Yours very truly,

George R. Ariyoshi

ATTENDANCE
AT
PUBLIC MEETING
26 July 1983

Federal - Corps of Engineers
COL Alfred J. Thiede, District Engineer
LTC Byron E. Byerley, Deputy District Engineer
Warren Kanai, Study Manager
Elsie Smith, Acting Public Affairs Officer
Bill Lennan, Environmental Resources Section
Stan Boc, Hydraulics Section
David Dang, Evaluation Section
Richard Yamamoto, Ch, Planning Branch
Harvey Young, Ch, Project Formulation Section
James Ligh, Project Formulation Section
Patrick Tom, Hydraulics Section
Lyndee Sato, Recorder

Elected Officials
Anthony K. U. Chang, Hawaii State Senate
Reynaldo Graulty, Hawaii State House of Representatives
Pat Martin, Neighborhood Board 16
Christina Meller, Neighborhood Board 15
Robert Kumichika, Neighborhood Board 16

State of Hawaii
Takeo Fujii, State Dept. of Land and Natural Resources
Clyde Hosokawa, State Dept. of Land and Natural Resources

Special Interest Groups
Carl Carlmark, Kalihi-Palama Community Association
Mary Lis Carlmark, Kalihi-Palama Community Association
John G. White, Kalihi-Palama Community Association
Francis Okita, Kalihi-Palama Community Association
Jory Watland, Kalihi-Palama Community Association
Elsie Ito, Kalihi-Palama Community Association
Ricke Fujino, Kalihi Business Association
Virginia Keys, Waimomi Outdoor Circle
Mark Stendal, KHON TV

Individuals
Takeshi Uyesugi, 1711 Day Place, Honolulu, HI 96819
Sherrie Samuels, 3118 Waialae Ave., #403, Honolulu, HI 96816
Martha Marie Patrick, P. O. Box 19035, Honolulu, HI 96817

SAND ISLAND SHORE PROTECTION STUDY
PUBLIC MEETING
26 July 1983

COL Thiede: I'm COL Al Thiede, the Honolulu District Engineer. On behalf of the Honolulu District, all the folks in the District, and the Pacific Ocean Division of the Corps of Engineers, I'd like to welcome you to this meeting, this public meeting on the Sand Island Shore Protection project where we're going to discuss the detailed project report and the environmental impact statement. I hope most of you folks here had a chance to look at this or at the very least had a chance to look at the synopsis that announced the meeting tonight. It gave a brief overview of what the project is all about. We have some additional copies, particularly of these blue handouts over here on the table, so if you want a quick overview on the project or any other information on the Corps, you can either pick it up right now or pick it up at the end of the meeting. The purpose of this type of meeting is two-fold. First of all, we want to tell you where we're coming from and where we're at with regards to the project. We're going to present what we've done thus far, what we've concluded, what our various alternatives, courses of action, conclusions and recommendations are as far as we are now. Of course, the second part and the most important part of the meeting from our standpoint is to get feedback from you, the concerned public, as to your concerns, your frustrations, your recommendations for improvement and your ideas regarding the projects so we can fine tune this job and hopefully get it built in the not too distant future. Depending upon your perspective, because we're so close to the District Headquarters, I've got a lot of helpers tonight, more than I normally have. First of all Warren Kanai the project manager, raise your hand there Warren. Warren will give an overview of the project. After he gets through giving some historical and putting things in proper perspective, Stan Boc will discuss the specific alternatives that we think are practical and feasible so that you know where we are today. If any of you have any environmental questions, we've got Bill Lennan from our environmental shop who'll help you in that regard. Another very important member of our staff is standing right outside the door, I think most of you met her when you came in, Elsie Smith. Elsie Smith is our Acting Public Affairs Officer. If you haven't met Elsie yet and you haven't had an opportunity to fill out one of these cards, please raise your hand and Elsie is ready to give you a card and pencil. We like to keep track of all the folks who participate in our public meetings and also give you a chance to speak at the meeting. This is your way of indicating whether or not you want to say anything at the meeting. We'd like people to step up right away and indicate that they want to speak. However, if you don't want to speak now that doesn't mean you can't speak later. Based on what you hear us tell you, that might trigger some response from you and you may decide you want to speak and of course then we'll recognize you from the floor in the order that you want to speak. If you do speak, we ask that you come up relatively close because of our recording facilities here. We've got a microphone on the table. We'd like you to come up and stand up front here where everyone can see you, speak loudly and clearly. Because we're transcribing this entire process verbatim we would like you to speak loudly and clearly and distinctly, state your name and if you're representing some special organization also indicate that. There will be a verbatim transcript made of tonight's proceedings and you'll be able to get that when it's completed. That will be a matter of public record, and of course to that end,

another very important member of my staff that's assisting me today is Lyndee Sato, who is handling the transcription of the proceedings and will be responsible for making the verbatim transcription. Also, for whatever reason if you don't want to speak at the meeting tonight but you still desire to provide some input, you've got plenty of time to do that. You can do that in writing and we'll take input from the public up until the 20th of August. So, if between now and then you decide you'd like to say something or submit anything, feel free to do so and submit it to me, Colonel Al Thiede, Honolulu District Engineer. Question?

Audience: Yes. I wanted to know in what period time are we allowed to speak?

COL Thiede: I'm glad you mentioned that because I was going to make a comment on that. In the interest of keeping the meeting moving along, thus far we haven't had anyone indicate they want to speak so time's not going to be a problem. Sometimes we have to really keep things popping along, but I would ask that initially if you have something to say you keep your comments down to five minutes. That doesn't mean if you have more than that to say you can't get up and say it again but if other people want to speak we want to get most of the key ideas out on the table as early as possible so try and say whatever you're going to say in five minutes. That's really a lot of time.

Audience: Are you going to call us up there?

COL Thiede: Yes. I'll control the meeting as far as indicating who gets an opportunity to speak.

Audience: It's already on cards.

COL Thiede: Yes. Good. Okay, does anyone have any questions as to what I've said thus far? I forgot to mention that we also have a number of other folks from the Honolulu District here tonight, most of whom wish to remain anonymous at this time. They are also available to provide support. A couple of other individuals, although they're not participating directly, that I do want to recognize, however, is LTC Mick Byerley who recently arrived from Washington, DC area who was in the Pentagon and he's the Deputy of the Honolulu District Engineer, and then Mr. Dick Yamamoto who's our Chief of Planning and is really the brains behind our whole civil works operation. If nobody has any questions, then without further ado, I'll turn the meeting over to Warren Kanai to give you some background on the project.

Warren Kanai: Thank you COL Thiede. I'd also want to thank the Kalihi-Palama Community Association, represented by Mr. Fujino and Mr. Sakima. They've provided us with lots of continued support and interest in the study. Mr. Clyde Hosokawa, with the Division of State Parks, has provided us with a lot of data which has helped us assess our benefits, because without the benefits we have no project and the benefits basically are towards recreational enhancement. Besides the purposes of the meeting which Colonel Thiede announced earlier, just for the record, there's two aspects of the study which everyone here will have an opportunity to comment on if you wish to do so. One is the Executive Order 11988 which has to do with the occupation or modification of the flood plain, or in this case tsunami inundation zone; and the other aspect is Section 404 of the Clean Water Act. Both of these are discussed in the report so if you wish to read about them you may, and that has to do with the dumping or disposal of dredged materials in the navigable waters of the United States. At this time, I would like to just run briefly

through the study, how it got started, where we are today and what we hope to accomplish in the future. This is a flow diagram I prepared which gives a line diagram of our study, initiated in September 1981 with a letter of request from Sus Ono, Chairman of the Board of Land and Natural Resources. They are the sponsors of the study. The sponsors serve an important function in the Corps projects in that they have to initiate it. They provide us with a lot of planning and coordination assistance through Clyde, point of contact, and possibly most important they give us some money for the local share. Federal projects in shore protection usually do not pay 100% by Federal participation. We initiated a reconnaissance report which was completed and authorized by our Headquarters in Washington, DC for further detailed studies. This was done in May 1982. The reconnaissance report was written to OCE with the District Engineer's recommendation that we do go into detailed studies. This is what we have completed just now. This activity here was basically the bread and butter of the report. This is where we pushed alot of pencil, elbow grease, to get the product out, the draft report. It involved Stan Boc doing hydraulics; Bill Lennan studying the environmental aspects of the study. We had help from the fish and wildlife service, foundation people, surveyors and other disciplines. The report is dated June 1983 which we circulated to everyone on our mailing list which generally were other Federal agencies, State agencies and local level agencies and selected special interest groups. We are in the review period right now, that's where we are today at the public meeting, to provide a forum for input from the public. Let me digress with this chart for a few minutes while I go into the details of what we've developed. Here's a table which pretty well summarizes the justification for the study. It lists in thousands of dollars the 3 alternatives that we developed which are on the wall here, a plan view which Stan will get into more detail later. Figures are roughly ranging from 2.2 million, to a high of 2.8 million and alternative 3 in the middle of those at about 2.4 million. These are project costs for the project construction as opposed to project study. In order for us to get a handle on; whether this money well spent or not, we break it down into annual charges. Like your house payments, we break it down into amortization costs over fifty years using the federal rate of 7-7/8%. With maintenance it gives a total annual cost of $184,000 to $260,000. The benefits were computed by our economist in the branch. Like I said earlier, they were basically recreational enhancement benefits and they were determined to be $300,000 to $384,000 with a high of $422,000. The difference between costs and benefits, obviously, are our net benefits. We're required by Principles and Guidelines, which guides our water resource projects, to develop a plan that reasonably maximizes these net benefits. We call them NED Benefits or National Economic Development Benefits. That's the bottom line of our study. Is the project worthwhile for Federal money to go into it? The ratio of these numbers, the benefits and costs, will be put into a factor, we call it a BC ratio which gives us a fast determination of what kind of dollar return we get for our investment, two dollars in benefits for a dollar in investment, for example.

Audience: I don't understand why you estimate any benefits where alternative 3 is greater than alternative 2.

Warren Kanai: Well, it'll probably get cleared up when Stan gets into our plans here that we developed. There's trade offs involved. We lose some dollars and gain benefits for savings and cost of construction and in other ways. Here's a chart that I should have posted earlier. It gives a profile view and puts into perspective the size of the structures that we propose.

Those three plans are basically comprised of two different types of structures, shoreline revetments and offshore breakwater structures. Earlier I said that the sponsor would provide local funding to install this project and this table summarizes what those cost apportionments are. For the total project investment of these three projects, Alternative 3 is our tentatively preferred plan which Stan will get into later. We take out the local share, the second line, to come up with $1 million Federal share. Normally on shore protection projects, with recreational benefits and a beach in the study area we cost share 70% Federal and 30% local. In this case, we are limited to the $1 million Federal maximum input. We further reduced the Federal share by $87,500 which was the cost of our study efforts and planning.

Audience: It's not a false intelligence report, sir?

Warren Kanai: False intelligence?

Audience: Yes.

Warren: I'm sorry, I don't understand what you mean.

Audience: I'm saying that that's the honest stated facts of the Federal sum?

Warren Kanai: Yes, Federal and local.

Audiene: However, it's not a false intelligence report?

Warren Kanai: No.

Audience: Thank you sir.

Warren Kanai: Non-Federal cost were the cash contributions of the amount that were deducted from the total project cost in addition to indirect cost which we just gave a nominal sum since most of the lands are state owned. The sum of these two numbers, the Federal share and total non-Federal share amounts to the total project investment. Let me go back to the line diagram. So we are at this stage, and we plan to have the review period officially end August 31. I know Colonel Thiede said August 20, I believe, just to give us a little more leeway to prepare rewriting the report for submission to our Headquarters in October. When we resubmit this report, Colonel Thiede will again, in the conclusion section, recommend to Washington, DC that this looks like a good project or doesn't look like a good project and recommend either we go ahead with the implementation or we stop it. OCE will then review it, you notice I had no time schedule here because it would be hard for us to approximate what those dates might be. They may have a dozen projects go to them for review at once. Upon approval, they will authorize us to go into plans and specs preparation which are the blueprint drawings. Stan will probably work on those which are the basis from which the contractor would install the project. Again, that goes into OCE for review. Upon approval, they will release the funds, we advertise for bids, award the contract and have a contractor put it on the ground. That looks like a real simple diagram but there's more steps involved. One of the important ones which Clyde will be responsible for is to get local assurances, in other words, get local money before we get to this phase, and hopefully we can get to this project completion date pretty quick. Stan will now talk about the alternatives that we've developed in a little more detail.

Stan Boc: My name is Stan Boc. I'm one of the coastal engineers for the Division and my job is to go out to the site, first of all, to see what the problem is. Go out on this site, there are erosion problems as you see these lighter areas on these bluelines here. Next thing I also look at is what is the area being used for. It's being used for a park area, there are a lot of fishing going on, a lot of wading going on, a lot of children playing in these tidal pool areas over in here. The next thing I do is try to design structures using the recreational capabilities of the area. I came up with three designs. The third one being the hybrid of the top two. One of the natural ways of protecting the shoreline is to armor it with stone. Naturally, if there is a lot of stone in an embankment or a bluff and erosion happens the stones fall down to the bottom of the bluff and onward or protected from the oncoming waves. In this particular area we don't have the natural stone in the material itself so we're going to put it there, and then we're going to build a thing called a revetment. Here's a cross-section of what a revetment looks like. You have a land fill over here, and water out through here and we'll then put layers of stone similar to what is on the channel side of the island now. These stones break the water and dissipate the wave energy so it cannot get to the soft material behind it and erode it away. This type of use is good for fishing and I noticed on the existing revetment that that was still in pretty good shape before Hurricane Iwa hit it, that there was a lot of people using that particular area, down here by the channel area, for fishing. Not too good for swimming because you notice there was no beach area out in front of that area over here, and usually when you put a revetment in you tend to lose your beach. The other alternative that I looked at was a thing called offshore breakwaters. What these are are piles of rock offshore that break the waves, dissipating the energy before it reaches the shoreline thereby creating quiet water inshore. These are used on all coasts. I've seen them used on the east coast and Great Lakes effectively, and I've also seen similar type structures in Hawaii and they are working. So, what I did was I took it and I ran a whole shoreline of these offshore breakwaters. Now that's great for swimmers, or for children who just want to wade in the water because it creates a very quiet water behind the structure. It would also remove the existing structures in here so we neaten up the beach a little bit, but that doesn't help the fishermen. The fishermen now usually have to walk out or climb up on these offshore breakwaters or they're going to have to cast over them or fish someplace else. So, I said to myself, why not look at a combination of the two to satisfy the people. What we have here, in the area where most of the fishing is going on, I left a revetment. In the area where the existing tidal pools are, I put the offshore breakwaters and at the last meeting we had here, the workshop, some of the people that were at the meeting suggested that if we could leave a little piece of the existing revetment in here so we'll have extremely quiet water in here. I said fine it's no problem, so it looks like we might be leaving a piece of the existing structure in here and then removing the rest and making it a little more open. It's similar, if you never seen an offshore breakwater, to what we have at Ala Moana beach park. Piles of rock offshore, the spacing between is not as close as they are out there at Ala Moana Beach. It's a little wider and I'm not quite sure of the height out there, but I think they're a little bit lower than they are at Ala Moana. So, in this particular area where it's now being used as a place for little children to come down and maybe look at small fish and small shells that accumulate in that area and keep a place where they can just wade in the pool, it's a very quiet water area by looking at this. Then, over through here, which again was used for fishing, it was also pointed out to me that it was a popular surf spot over in here, I took the offshore breakwaters out

because the offshore breakwaters get in the way of surfing, backed them up and put a revetment in here along the land. By moving to this third alternative here, it took care of fishermen, because now they still can fish from shore very easily off the revetment. We took care of the people who wanted to bring their little children down there or even, I understand, that there are some school groups that go down there to look at the marine biology in the area. They could do that in this particular area, and also try to take care of the surfers. Now we're not going to have the problem over here these offshore breakwaters being in their way, this is up against land and from what I've noticed most of the surfers are a little offshore from here. We've used rocks in the revetment, and in the offshore breakwater because they're very natural. They also have a low reflectivity. Some of you may be asking why don't we just put a seawall out there, which is a vertical wall. Well, a vertical wall has a few problems. One, they're not very nice to look at; and two, it has high relectivity, which means say you have two foot surf out here, you would have a two foot wave coming in hitting this wall, and you would have a two foot wave bouncing back out. So, you now have a swinging hurricane going out just outside the wall. It also causes a deepening of the water in front, not a really good situation especially where there's a lot of boating and there is a lot of surfing going on. Do you have any questions on the things we've looked at?

Audience: Some are built with a vertical surface so that if there's waves that come and smash this way and go back out, instead of a horizontal wall?

Stan Boc: No. What we have is a combination of two which is on an angle. That reduces the reflection of the wave bouncing off. It also allows more area to dissipate the wave energy. So, the best combination is not vertical and not horizontal, but at a slant.

Audience: Can I come up and take a closer look?

Stan Boc: Anybody else have any questions?

Audience: I like the alternative 3 but I'm concerned about the areas filled in. Is this right next to the existing comfort station?

Stan Boc: Okay, here's those concrete blocks on the beach. Beyond that over here is that nice big sand beach. Is that where you're talking about? This is the area up in here, this is an older photo, so it doesn't show it that well, but it is eroded into this position where we have the revetment now; out here it's very cobbly, a lot of chunks of coral, not a very nice sandy beach area. The reason we've straightened it out was to increase the park area. We tried to get as much park land as possible and that also answers your question as to why one particular one had a higher benefit than one of the other ones because we are gaining benefits from filling in this area here and getting more park land to be used. You people know better than I do. I've gone down there a few Saturdays and Sundays and I swear every square foot of that place is used by somebody picnicking or partying or just having a recreational time out there. Any other questions? If you have any other questions, I'll be around, you can ask me at the end of the meeting.

Audience: According to the cost of development planning, it's not to exceed $25,000 in your budget?

Stan Boc: I'll let Warren handle that one.

Warren Kanai: To install the project?

Audience: Yes.

Warren Kanai: It would exceed that by a great deal.

Audience: Thank you sir.

Stan Boc: Any other questions or comments I can help you with?

Audience: Well, you talked about the tidal pool. You talk about calm waters. What are you talking about, how calm is calm waters?

Stan Boc: You go to Ala Moana Beach park behind the breakwaters? Very flat water.

Audience: Were you talking about a young parent can go with a two year old baby or a three year old baby and can sit in the water without no problem at all?

Stan Boc: Yes, very flat. Not during a storm day, but under normal wave conditions out there, yes. It's less than 1 foot waves we predict over in through here.

Audience: You mean on schematic 3 with the breakwall right out here? Doesn't the current pull from our right to the left here that could create some problem?

Stan Boc: What current we've noticed out there is strictly a wave-induced current. I've gone out here with scuba when we were doing the bottom reconnaissance to see where the reef ended and where the sand pockets were, so we could maximize our use of rocks out here. The day we were out there the surf was probably 3 to 4 feet and there was a fairly strong current, but the strong current was out in here. We've found very little current over here, and that was on a fairly decent southerly swell like I said 3 to 4 feet. What current there is appears to be very minimal and what there is is wave induced. Therefore, these things are breaking the wave energy, so what current there is should be very minimal here. We're also leaving this one particular section in here for the people who want to bring 2 or 3 year olds out. This will be left in here so this water in here is probably less than a foot deep. How long is the section?

Warren Kanai: It's estimated at 200 feet.

Stan Boc: A 200-foot section, I guess we'll leave in here of the one that is there now. If you go take a look at it, you'll see that it's only 6 inches to a foot deep and very, very calm. That would be the ideal location for parents to bring their small children, let them sit and play in the water, where this area over here will probably be used for maybe little older children. Even the adults do sit out there and float on a raft.

Audience: Do you have pictures of the old wall and the condition of the wall at that time when it was functional at that time? You had a wall there. You

have a certain amount of leakage in the back of that wall to form a tide pool, right? Under those kinds of conditions, is it safe where there's an opening there, where a kid can get out of the tide pool. I think you're going to have to look at that kind of situation where a mama or papa just turn away, kids just move out through cracks. At one time you had a complete wall where children could not get out into the dangerous waters. Under those conditions you may not have a problem. When you look at it, your drawing there, although you tell me don't worry about it it's only 1 foot of water, it doesn't look too safe.

Stan Boc: Over here you mean?

Audience: Yes.

Stan Boc: This is one inch equals 40 feet so from the old wall right to the toe of the breakwater now looks like it's about a 100 feet over here. You want to push it a little bit offshore so that older children could use it. And the reason we left it in here at all was because at the last meeting someone said why don't we leave it in here, it would be a great spot for little children like you're talking about. I see what you're saying but I don't know how we can handle it. We couldn't really cut it off on this side and make like a little swimming pool area because then you'd have very little outlet for the water to circulate and you may create a stagnant situation. That would be the situation at any beach, anywhere. I know what you're saying.

Audience: I appreciate your engineers, but you've got to figure out someway to get the water moving out, that's no problem with that. The whole tidal pool business is to get the kids in there. My concern is really is with the kids out of there in those conditions. (Garbled) I think mama would get a hard time if one is in the park and the other is in the pool kind of situation, and it's going to be difficult. What I'm worried about is it's too easy to get out in rough waters. Somewhere along the way you have to protect those kids from being able to get out of there. Parents can't watch the kids all the time. Way back then when we had these tidal pools, there a complete blockage. You have pools in the back of the walls and someway or the other the waves breaking over the walls or the water seeping through the riprap, water circulated well-enough.

Stan Boc: Yes. Because the water is breaking over the wall right now is the main source of circulation. With these in place, the water is not going to break over those walls. Now, I'll look at tying them back into shore in creating a little bit of an enclosed tidal pool area that may be sufficient to keep the circulation in the pools. We can look at that, that's no problem, just a matter of moving a few rocks that we're already taking out of here anyway and bringing them into shore. Anybody else has any questions?

Audience: Have you made a study of a tsunumi in that area?

Stan Boc: We look at tsunamis, but in a situation like this we do not design for tsunami, because instead of the structures being at +8 feet it is +20; it's going to be about 20 times the size. If we were protecting a nuclear plant or something like that, then we would design for tsunami.

Audience: Is it a sponsor agency that asked you to put in this project? Does this detract from the development for the rest of the park? Your sponsor

agency is DLNR, who is also handling the appropriations for the development of the rest of the park for Sand Island. If the money is taken for this, then what?

Warren Kanai: I think they will ask for added appropriations but do you want to clarify that, Clyde? Did you get the question? The question was will the monies used for local share for the development of this project be deducted from what has been appropriated for the current development of the park?

Clyde Hosokawa: I can't speak for the Government or Department head but in terms of planning for State Parks, we would have to utilize the existing resources we have. We would be increasing the appropriations which we direct towards the project.

Audience: In that regard, given a current situation, if nothing is done what are we going to look at say next five to ten years on that particular portion of the park?

Warren Kanai: We cannot say for sure. We think that the critical portions Stan has indicated will probably be the first to go. It'll keep expanding in its erosion rate. I think State Parks have determined that we have lost something in the order of 30,000 square feet the past two years.

Audience: Past two years?

Warren Kanai: Yes.

Stan Boc, Okay, I think we would like to move on to the next section and you'll be able to ask questions at the end. Colonel Thiede?

COL Thiede: Bill, I'd like you to give a little overview on the environmental aspects of the project, relatively minimal, I realize, but just give a quick synopsis.

Bill Lennan: In analyzing the environmental effects of the project, we feel that overall it will be a benefit, for several reasons. Number 1 of course, we're adding a little land in that fill area which benefits the passive uses of the park, the picnickers and the campers and that sort of thing but really more importantly we're eliminating the erosion, and the silt that is eroding into the area all along here creates a very poor environment for benthic organisms and coral in particular. Coral doesn't do very well in silty environments. If we have coral, we have fish and other critters. If you don't have coral, you don't have nearly as productive an area. So, we feel that overall, the project will be beneficial from an environmental standpoint.

Audience: What about the water pollution?

Bill Lennan: This project will certainly not increase the water pollution. It should decrease the turbidity of the water because what's causing that in that area now is the erosion. So from the standpoint of water turbidity, the water quality will increase, it will get better.

Audience: Sir, are you connected with R. M. Towill?

Bill Lennan: No.

Audience: Thank you sir.

Warren Kanai: Okay, shall we move on to the formal testimony section of this meeting?

COL Thiede: Yes, Warren. That concludes what we had to say about the project, our prepared statements. Since we started the public meeting, we've had a couple of State elected officials arrive on the scene. I'd like to recognize Senator Chang, from the State Senate. Senator, nice to have you with us, and also Representative Graulty, from the State. We also have a couple of representatives from the Dept. of Land and Natural Resources, Mr. Hosokawa and Mr. Fujii, glad to have you with us. Now we're ready, since we presentea our brief synopsis of the project, to get into the formal statement period and also give you an opportunity based on the statements that are made to also make some further statements or ask some questions. Our first speaker, and so far the only one who's indicated that he has a desire to make a statement, is Senator Chang. Senator, you weren't here at the kick-off of the meeting but we asked everybody to come up here and get close to the microphone.

Senator Chang: I just had one question and I'm not sure that the participants will be able to answer that question at this time. The background of the question is that I was approached this past year by a fisherman who complained that the fishermen on Oahu were having a difficult time catching fish in the nearshore waters because we just have too little fish and too many fishermen on Oahu. He proposed that the State provide for this situation by building recreational fishing piers as provided in California for their fishermen and he further suggested that this be on the south shore. In the course of the 1983 session, the Senate was able to inject money for planning and design of a recreational fishing pier into the executive budget and this proposal was ultimately accepted in the Conference Committee by the Senate Ways and Means Committee and the House Finance Committee. This recreational fishing pier was inserted into the Sand Island monies, the planning and design money, planning, and design and construction money. My question is will this project affect in anyway the planning, design or construction of this recreational fishing pier?

COL Thiede: You know anything about that Warren?

Warren Kanai: I haven't heard; State Parks hasn't mentioned anything about that but the south shoreline of this island is about three times longer than what our study site encompasses. I'm not sure if your pier works are involved directly in this site or further down.

Senator Chang: The money was inserted into the park extension money so I presume that it has to be connected with this shoreline.

Stan Boc: From the technical point of view, it doesn't really matter whether you put a pier there or not. Because most piers are connected to shoreline and all we are affording there is shore protection. I think you'd want to stay away from the offshore breakwater area but other than that area, it appears to be connected to the shoreline whether there are piling type of structures or whether it's a solid fill type structure. It's not going to affect our planning that much.

Senator Chang: Thank you. I had one question that arose in the course of your presentation and that is I think related to Take Uyesugis, whether the filling, backfill and extension of the structure into the existing waters would affect the wave breaking area. If I understood your presentation correctly, this certain activity takes place on the Ewa side.

Stan Boc: Well, it's makai, almost off the picture, the areas of surfing. You see a few of the waves breaking but they've already broken.

COL Thiede: Thanks a lot Senator. Is there anyone else who would like to speak, anyone who would like to make a statement or do any of you have any questions?

Audience: My name is Martha Marie Patrick. Can you define what a revetment is?

COL Thiede: Revetment?

Audience: Yes, sir.

COL Thiede: Revetment, as Stan Boc indicated, that's the structure that we put here; the stone armor structure that we place on the natural embankment to protect it further from the wave action. Otherwise, if you leave the shoreline unprotected, it would just erode much more quickly, so we put these large boulders along the, linearly along the shoreline, paralleling the shoreline to protect it. That's a revetment.

Stan Boc: It's exactly like what is lining the channel going out on the Harbor side.

COL Thiede: Any other comments or statements?

Audience: My name is John White. Getting back to the previous question. What would happen if we didn't do anything? Is this a long term problem that's been developing for many many years or is this something that just happened because of Hurricane Iwa? Is this something we're trying to even out over the years or is this a very serious problem?

Warren Kanai: I guess the erosion has theoretically started the day that they started dumping dredged material there to build the harbor. It's hard to predict when, how soon or how far inland it will be before it does become stabilized, perhaps never. Because it is a man-made island rather than a naturally shaped island.

Audience: So the worst case scenario is that we lose the whole island right?

COL Thiede: It makes us feel bad because we started putting it there in 1905, that's what started the Honolulu District in the first place. No, it really provides a tremendous amount of protection to the Honolulu Harbor. It's part of the grand scheme that we developed originally. Anybody have any other questions or comments?

Audience: I wonder what kind of assurances do you have to come this far that this project will be approved.

COL Thiede: Well, you know that's at the whim of Congress so depending on what the other national priorities are, we don't basically have any real assurances. It depends like everything else, we live from year-to-year based on the Federal appropriations, and of course there are some significant State monies coming into the thing too so we need those assurances. We never, even if the Federal monies are available, we also have to have the local share and the local assurances to make sure that the lands, easements and rights-of-way

are provided. Sometimes, some of the local areas we deal with, we go ahead and get the Federal money and the local money never materializes and therefore the project goes back on the shelf. We don't like to see that happen, naturally.

Audience: You must have local funds too or can it be all Federal money?

COL Thiede: Well, as was pointed out here, the limit on revetment work is a million dollars Federal input under the authorities that we're doing this job. So, if you have a very small job you can be very lucky and get total Federal participation but that's not the case in this project.

Audience: Can't you make several small jobs then?

COL Thiede: No, Congress doesn't look kindly on that.

Audience: But the preceding project. (Garbled)

Warren Kanai: The park was only developed on the harbor side so benefits accrued to that project was from that area.

Audience: That was part of the Coast Guard area?

Warren Kanai: I think the first revetment was put in up to that Anuenue fish station.

Audience: My name is Pat Martin. On page B3, it states you had a meeting with local sponsors in April 83. "The group was receptive to the plan and gave the following suggestions. One: Since the offshore breakwater would be attractive to fishermen to cast from, would the Corps consider connecting at least one of them to the shore is easy access. The Corps explained that because of the added costs, the BC ratio would be adversely affected. However, the possibility would be considered. Two: Could the gaps between the breakwaters be replaced by pipes. . . . . Corps replied that the costs would be prohibitive." I don't know if it addressed it to anyway.

COL Thiede: Warren, you want to elaborate on what all that means because I wasn't a participant in that workshop.

Warren Kanai: Your question sort of ties into Mr. Uyesugis'. We will take this comment under serious consideration, look into the possibilities of tying it into the shoreline. Maybe there are others ways, perhaps leave the existing revetment in entirely. We'll have to study it in hydraulicly. As far as these suggestions from the sponsors goes, like I said earlier, we are limited to a million dollars, so whatever added costs there are to the projects, BC ratio aside, will be largely a State cost. So, we wanted to minimize local cost and suggested that perhaps it may be cost prohibitive, and on the Engineering point of view it would be definitely diminish water circulation in the area behind the offshore breakwater.

COL Thiede: Would anybody like to add anything else?

Audience: Last question, when you talk about million dollars, that doesn't include the study here whatever you did till now?

COL Thiede: Yes, it does. As Warren pointed out that all the work that we've done up to now, not necessarily that package, has cost $87,500.

Warren Kanai: That does seem like a lot of money but like I said it involved a lot of disciplines - environmental, hydraulics, foundations, fish and wildlife people.

COL Thiede: How many meetings have we had in total leading up to this one?

Warren Kanai: We had the public workshop meeting back in November of last year and we've had a few meetings with the local sponsor on a one-to-one basis.

Audience: We hope you people would come on in on the plans basis on one area at a time.

COL Thiede: You mean piece-meal the construction?

Audience: It's right in the back of that rock wall that island, there's nothing but big boulders underneath that 5 inches of dirt, and the park is built on boulders.

COL Thiede: So, what you are maintaining that because of the park, there were all these boulders existing and then they came and filled on top of that.

Audience: No, they were boulders but I think the Parks people utilize most of the rock in that park.

COL Thiede: So, you're saying there's a lot of rock material there and it's not easily erodable.?

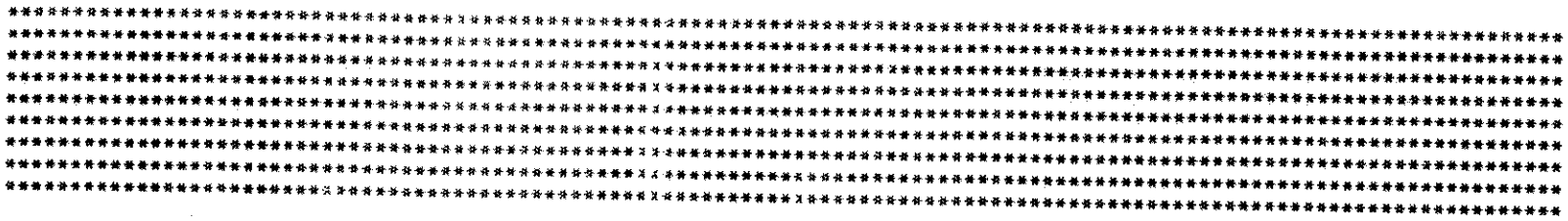
Audience: It's all filled. You people did all that.

Audience: I think you did a good study.

COL Thiede: Thank you very much; we appreciate that. We have to get something good for $87,000. Any other comments?

Audience: A book like that would cost that much?

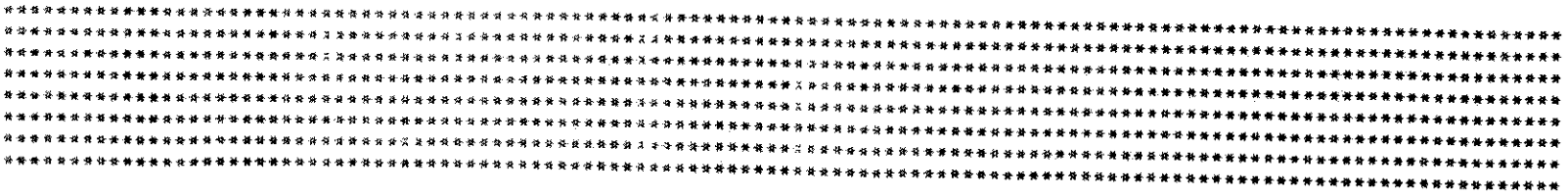
COL Thiede: Oh, I don't know how much is the total cost of the book. It's not the book itself, it's not printing, it's all the research work that goes into it, it's all the field work, the studies, the site exploration, the testing, that's what runs the cost up. Anybody have any other comments? Great. Well, thanks a lot, everyone for coming out tonight. We really appreciate your turning out and showing that interest and we hope all of this is going to be beneficial and pay off with an excellent project. That concludes the meeting.



```
M    M     AAAA     IIIII   L        IIIII   N    N    GGGG          L       IIIII    SSSS     TTTTT
MM  MM    A    A      I     L          I     NN   N   G    G         L         I     S           T
M MM M    A    A      I     L          I     N N  N   G              L         I      SSSS       T
M    M    AAAAAA      I     L          I     N  N N   G  GGG         L         I          S      T
M    M    A    A      I     L          I     N   NN   G    G         L         I     S    S      T
M    M    A    A    IIIII   LLLLLL   IIIII   N    N    GGGG         LLLLLL  IIIII    SSSS       T
```

MAILING LIST 2 JUN 83 12:21 07

PROG. SYS BOOT



SANE00300XXXXD01F01

HONORABLE DANIEL K. INOUYE
UNITED STATES SENATE
105 RUSSELL SENATE OFFICE BLDG
WASHINGTON, DC 20510

SANE00302XXXXD01F01

HONORABLE SPARK M. MATSUNAGA
UNITED STATES SENATE
5121 DIRKSEN BLDG
WASHINGTON, DC 20510

SANE00306XXXXD01F01

HONORABLE CEC HEFTEL
HOUSE OF REPRESENTATIVES
1030 LONGWORTH HOUSE OFC BLDG
WASHINGTON, DC 20515

SANE00304XXXXD01F01

HONORABLE DANIEL K. AKAKA
HOUSE OF REPRESENTATIVES
1510 LONGWORTH HOUSE OFC BLDG
WASHINGTON, DC 20515

SANE00387XXXXD01F01

MS MARILYN R. BORNHORST
COUNCILWOMAN
CITY & COUNTY OF HONOLULU
HONOLULU, HI 96813

SANE00396XXXXD01F01

MRS. PATSY MINK
CHAIRMAN, CITY COUNCIL
CITY & COUNTY OF HONOLULU
HONOLULU, HI 96813

SANE00386XXXXD01F01

COUNCILMAN GEORGE Q. AKAHANE
CITY & COUNTY OF HONOLULU
HONOLULU, HI 96813

SANE00392XXXXD01F01

COUNCILMAN LEIGH-WAI DOO
CITY & COUNTY OF HONOLULU
HONOLULU, HI 96813

SANE00388XXXXD01F01

COUNCILMAN RUDOLPH PACARRO
CITY & COUNTY OF HONOLULU
HONOLULU, HI 96813

SANE00385XXXXD01F01

HONORABLE EILEEN ANDERSON
MAYOR OF THE CITY & COUNTY
OF HONOLULU
HONOLULU, HI 96813

SANE00394XXXXD01F01

COUNCILMAN TORAKI MATSUMOTO
CITY & COUNTY OF HONOLULU
HONOLULU, HI 96813

SANE00311XXXXD01F01

HONORABLE A. L. SOLOMON
HAWAII SENATE
HONOLULU, HI 96813

SANE00308XXXXD01F01

HONORABLE GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII
HONOLULU, HI 96813

SANE00395XXXXD01F01

COUNCILWOMAN WELCOME FAWCETT
CITY & COUNTY OF HONOLULU
HONOLULU, HI 96813

SANE00397XXXXD01F01

COUNCILMAN DAVID KAHANU
CITY & COUNTY OF HONOLULU
HONOLULU, HI 96813

SANE00332XXXXD01F01

HONORABLE TONY CHANG
HAWAII SENATE
HONOLULU, HI 96813

SANE00335XXXXD01F01

HONORABLE GENE ALBANO
HAWAII HOUSE OF REPRESENTATIVE
HONOLULU, HI 96813

SANE00367XXXXD01F01

HONORABLE DENNIS NAKASATO
HAWAII HOUSE OF REPRESENTATIVE
HONOLULU, HI 96813

SANE00365XXXXD01F01

HONORABLE DWIGHT L. YOSHIMURA
HAWAII HOUSE OF REPRESENTATIVE
HONOLULU, HI 96813

SANE00318XXXXD01F01

HONORABLE MILTON HOLT
HAWAII SENATE
HONOLULU, HI 96813

SANE00319XXXXD01F01

HONORABLE DUKE KAWASAKI
HAWAII SENATE
HONOLULU, HI 96813

SAND ISLAND

ELECT OFF 2 JUN 83

SANE00362XXXXD01F01

HONORABLE RICHARD MATSUURA
HAWAII HOUSE OF REPRESENTATIVE
HONOLULU, HI 96813

SANE00301XXXXD01F01

HONORABLE DANIEL K INOUYE
UNITED STATES SENATOR
300 ALA MOANA BLVD, ROOM 6104
HONOLULU, HI 96850

DEPT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
CENTERS FOR DISEASE CONTROL
ENVIRON. HEALTH SERVICES DIV.
ATLANTA, GA 30333

SEN. ANTHONY K.U. CHANG
HAWAII STATE SENATE
HONOLULU, HAWAII 96813

SANE00130XXXXD01F01

ATTORNEY GENERAL
STATE OF HAWAII
HONOLULU, HI 96813

SANE00303XXXXD01F01

HONORABLE SPARK M. MATSUNAGA
UNITED STATES SENATOR
P.O. BOX 50124
HONOLULU, HI 96850

NEIGHBORHOOD BOARD NO. 15
1405 N. KING ST. SUITE 200
HONOLULU, HAWAII 96817

REP. REYNALDO GRAULTY
HAWAII HOUSE OF REPRESENTATIVES
HONOLULU, HAWAII 96813

SANE00305XXXXD01F01

HONORABLE DANIEL K. AKAKA
REPRESENTATIVE IN CONGRESS
300 ALA MOANA BLVD, ROOM 5104
HONOLULU, HI 96850

SANE00307XXXXD01F01

HONORABLE CEC HEFTEL
REPRESENTATIVE IN CONGRESS
300 ALA MOANA BLVD, ROOM 4104
HONOLULU, HI 96850

NEIGHBORHOOD BOARD NO. 16
2760 KALIHI ST.
HONOLULU, HAWAII 96819

SANG00218X XXDO1FO1
COL GERALD E. GALLOWAY, JR
DEPT OF GEOG & COMP SCI
DEPARTMENT OF THE ARMY
US MILITARY ACADEMY
WEST POINT, NY 10996

SANG00201X XXDO2FO8
DIR, OFC OF ECOL & CONSERV
NOAA, DEPT OF COMMERCE
ROOM 5813
14TH & CONSTITUTION AVE, NW
WASHINGTON, DC 20230

SANG00203X XXD20F05
DIRECTOR
OFC OF ENVIR RVW
US DEPT OF THE INTERIOR
RM 424-1, 18TH & C ST, NW
WASHINGTON, DC 20240

SANG00226X XXDO1FO1
ASST SECRETARY FOR COMMUNITY
PLANNING & MANAGEMENT
DEPT OF HOUSING & URBAN DEV
ATTN: ENV CLEARANCE OFF
WASHINGTON, DC 20410

SANG00229XXXXDO1FO1

DIRECTOR
COASTAL ENGRG RESEARCH CTR
KINGMAN BLDG
FT BELVOIR, VA 22060

SANG00209X XXDO1FO1
REGIONAL DIRECTOR, SW REGION
NAT MARINE FISHERIES SVC, NOAA
US DEPARTMENT OF COMMERCE
300 SOUTH FERRY STREET
TERMINAL ISLAND, CA 90731

SANG00211X XXDO1FO1
REGIONAL ADMINISTRATOR
US DEPT OF HEALTH
AND HUMAN SERVICES
50 FULTON ST
SAN FRANCISCO, CA 94102

SANG00200X XXDO1FO1
EXECUTIVE DIRECTOR
ADVISORY COUNCIL ON HISTORIC
PRESERVATION
1522 K ST, NW
WASHINGTON, DC 20005

SANG00202XXXXDO1FO1
PACIFIC REG MGR
NOAA, OFC OF CZM
US DEPT OF COMMERCE
3300 WHITEHAVEN ST, NW
WASHINGTON, DC 20235

SANG00220X XXDO1FO1
DEPARTMENT OF AGRICULTURE
RM 412A, ADMIN BLDG
14TH & INDEPENDENCE AVE, SW

WASHINGTON, DC 20250

SANG00204X XXDO5FO5
DIRECTOR
OFC OF FED ACTIVITIES(A-104)
US ENVIRON PROTECTION AGENCY
401 M ST, SW
WASHINGTON, DC 20460

SANG00206X XXDO1FO1
CHIEF, WESTERN PROJECT REVIEW
ADV COUNCIL ON HIST PRESERV
LAKE PLAZA-SOUTH, SUITE 616
44 UNION BLVD
LAKEWOOD, CO 80228

SANG00212X XXDO1FO1
CHIEF
INTERAGENCY ARCHEOL SERVICE
NATIONAL PARK SERVICE
450 GOLDEN GATE AVE, BOX 36065
SAN FRANCISCO, CA 94102

SANG00214X XXDO1FO1

ADMINISTRATOR, REGION IX
US DEPT OF HOUSING & URBAN DEV
450 GOLDEN GATE AVE, BOX 36003
SAN FRANCISCO, CA 94102

SANG00636XXXXDO1FO1

US DEPT OF HEALTH & HUMAN SERV
ROOM 537F HUMPHREY BLDG
200 INDEPENDENCE AVE, SW
WASHINGTON, DC 20201

SANG00205X XXDO5FO5
CHIEF, OFC OF ARCHEOLOGICAL &
HISTORIC PRESERVATION
NATL PARK SERVICE
US DEPT OF THE INTERIOR
WASHINGTON, DC 20240

SANG00227X XXDO1FO1
DIRECTOR
FLOODPLAIN MANAGEMENT DIV
FED INSURANCE ADMINISTRATION
DEPT OF HOUSING & URBAN DEV
WASHINGTON, DC 20410

SANG00222XXXXDO1FO1

DIVISION OF NEPA AFFAIRS
US DEPT OF ENERGY
1000 INDEPENDENCE AVE, SW
WASHINGTON, DC 20585

SANG00216X XXDO1FO1
CHIEF, NATIONAL PARK SERVICE
ARIZONA ARCHEOLOGICAL CENTER
US DEPT OF THE INTERIOR
P O BOX 49008
TUCSON, AZ 85717

SANG00215X XXDO1FO1
DIRECTOR, PAC SW REGION
NATL PARK SERVICE
US DEPT OF THE INTERIOR
P O BOX 36063
SAN FRANCISCO, CA 94102

SANG00235X XXDO1FO1
REGIONAL DIRECTOR
US PUBLIC HEALTH SERVICE
FEDERAL OFFICE BLDG
50 FULTON STREET
SAN FRANCISCO, CA 94102

SAND ISLAND GOVT OFF 2 JUN 83

SANG00217X XXD01F01
SECRETARY'S FIELD REP
PACIFIC SOUTHWEST REGION
US DEPT OF THE INTERIOR
450 GOLDEN GATE AVE, BOX 36098
SAN FRANCISCO, CA 94102

SANG00154XXXXD01F01

DIRECTOR, STATE CLEARINGHOUSE
DEPT OF PLNG & ECON DEV
P.O. BOX 2359
HONOLULU, HI 96804

SANG00113XXXXD01F01
ADMINISTRATOR
LAND MANAGEMENT DIV
DLNR, STATE OF HAWAII
P.O. BOX 621
HONOLULU, HI 96809

SANG00110XXXXD01F01
ADMINISTRATOR
DIVISION OF STATE PARKS
DLNR, STATE OF HAWAII
P.O. BOX 621
HONOLULU, HI 96809

SANG00100XXXXD01F01
ADMINISTRATOR, SW REGION, WEST
PACIFIC PROG OFC, NAT MARINE
FISHERIES SVC, US DEPT OF COM
P.O. BOX 3830
HONOLULU, HI 96812

SANG00120XXXXD01F01
DIRECTOR
INST OF PAC ISLS FORESTRY
FOREST SVC, US DEPT OF AGRCLTR
1151 PUNCHBOWL ST, RM 323
HONOLULU, HI 96813

SANG00152XXXXD01F01
DIRECTOR & BUILDING SUPT
DEPARTMENT OF BUILDING
CITY & COUNTY OF HONOLULU
650 SOUTH KING ST
HONOLULU, HI 96813

SANG00210X XXD05F05

ADMINISTRATOR, REGION IX
US ENVIRON PROTECTION AGENCY
215 FREMONT ST
SAN FRANCISCO, CA 94105

SANG00118XXXXD01F01
DIRECTOR
DEPT OF PLANNING & ECONOMIC
DEVELOPMENT, STATE OF HAWAII
P.O. BOX 2359
HONOLULU, HI 96804

SANG00114XXXXD01F01

CHAIRMAN
STATE BD OF LAND & NAT RESRS
PO BOX 621
HONOLULU, HI 96809

SANG00267XXXXD01F01

MR. CLYDE HOSOKAWA
DIV OF STATE PARKS
PO BOX 621
HONOLULU, HI 96809

SANG00155XXXXD01F01
DIRECTOR
DEPT OF HSG & COMM SERV
CITY & COUNTY OF HONOLULU
650 SOUTH KING ST
HONOLULU, HI 96813

SANG00159XXXXD01F01
DIRECTOR & CHIEF ENGINEER
DEPARTMENT OF PUBLIC WORKS
CITY & COUNTY OF HONOLULU
650 SOUTH KING ST
HONOLULU, HI 96813

SANG00106XXXXD01F01
DIRECTOR
OFC OF ENVIRONMENTAL QUALITY
CONTROL, STATE OF HAWAII
550 HALEKAUWILA ST
HONOLULU, HI 96813

SANG00236X XXD01F02
REGIONAL ADMINISTRATOR
FED HWY ADMIN, REGION IX
US DEPT OF TRANSPORTATION
2 EMBARCADERO CTR, SUITE 530
SAN FRANCISCO, CA 94111

SANG00208X XXD06F06
CZM PROGRAM COORDINATOR
DEPT OF PLNG & ECON DEVELOP
STATE OF HAWAII
P.O. BOX 2359
HONOLULU HAWAII 96804

SANG00115XXXXD01F01
MANAGER-CHIEF ENGINEER
WATER & LAND DIV
DLNR, STATE OF HAWAII
P.O. BOX 373
HONOLULU, HI 96809

SANG00116XXXXD01F01

STATE HISTORIC PRSVN OFFICER
DLNR, STATE OF HAWAII
P.O. BOX 621
HONOLULU, HI 96809

SANG00160XXXXD01F01
DIRECTOR
DEPT OF TRANSPORT SERVICES
CITY & COUNTY OF HONOLULU
650 SOUTH KING ST
HONOLULU, HI 96813

SANG00158XXXXD01F01
DIRECTOR
DEPT OF PARKS & RECREATION
CITY & COUNTY OF HONOLULU
650 SOUTH KING ST
HONOLULU, HI 96813

SANG00111XXXXD01F01
DIRECTOR
DIV OF AQUATIC RESOURCES
DLNR, STATE OF HAWAII
1151 PUNCHBOWL ST
HONOLULU, HI 96813

SAND ISLAND GOVT OFF 2 JUN 83

SANG00153XXXXD01F01
CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING
CITY & COUNTY OF HONOLULU
650 SOUTH KING ST
HONOLULU, HI 96813

SANG00151XXXXD01F01
MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY
CITY & COUNTY OF HONOLULU
630 SOUTH BERETANIA ST
HONOLULU, HI 96813

SANG00150XXXXD01F01
DIRECTOR
DEPARTMENT OF TRANSPORTATION
STATE OF HAWAII
869 PUNCHBOWL ST
HONOLULU, HI 96813

SANG01800XXXXD01F01

HAWAII STATE LIBRARY
DOCUMENT CENTER
478 S KING ST
HONOLULU, HI 96813

SANG00117XXXXD01F01

MARINE AFFAIRS COORDINATOR
OFFICE OF THE GOVERNOR
STATE OF HAWAII
HONOLULU, HI 96813

SANG00119XXXXD01F01
CHIEF
CONSERV & RES ENF DIV
DLNR, STATE OF HAWAII
1151 PUNCHBOWL ST
HONOLULU, HI 96813

SANG00138XXXXD01F01
CHIEF, HIGHWAYS DIV
DEPT OF TRANSPORTATION
STATE OF HAWAII
869 PUNCHBOWL ST
HONOLULU, HI 96813

SANG01821XXXXD01F01
LIBRARY
DEPT OF PLANNING & ECONOMIC
DEVELOPMENT, STATE OF HAWAII
250 S KING ST
HONOLULU, HI 96813

SANG00112XXXXD01F01
STATE FORESTER
FORESTRY & WILDLIFE DIV
DLNR, STATE OF HAWAII
1151 PUNCHBOWL ST
HONOLULU, HI 96813

SANG00858XXXXD01F01

DISTRICT LAND AGENT
OAHU DISTRICT OFFICE
1151 PUNCHBOWL STREET
HONOLULU, HI 96813

SANG00136XXXXD01F01
CHIEF, HARBORS DIVISION
DEPT OF TRANSPORTATION
STATE OF HAWAII
79 S NIMITZ HWY
HONOLULU, HI 96813

SANG00148XXXXD01F01
DIRECTOR
DEPT OF SOCIAL SVCS & HSG
STATE OF HAWAII
1390 MILLER STREET
HONOLULU, HI 96813

SANG00129XXXXD01F01
CHIEF, PUBLIC WORKS DIVISION
DEPT OF ACCTG & GEN SVCS,
STATE OF HAWAII
1151 PUNCHBOWL ST
HONOLULU, HI 96813

SANG00156XXXXD01F01
DIRECTOR
OFFICE OF HUMAN RESOURCES
CITY & COUNTY OF HONOLULU
650 S KING ST, 6TH FLOOR
HONOLULU, HI 96813

SANG03020XXX
MR. RICHARD NISHIZAWA
DEPT OF PUBLIC WORKS
CITY & COUNTY OF HONOLULU
650 S. KING STREET
HONOLULU, HI 96813

SANG00859XXXXD01F01

CHAIRMAN, PLNG COMMISSION
CITY & COUNTY OF HONOLULU
650 S KING STREET
HONOLULU, HI 96813

SANG00157XXXXD01F01
DIRECTOR
DEPARTMENT OF LAND UTILIZATION
CITY & COUNTY OF HONOLULU
650 SOUTH KING ST
HONOLULU, HI 96813

SANG00860XXXXD01F01

DIRECTOR
OAHU CIVIL DEFENSE AGENCY
650 S. KING STREET
HONOLULU, HI 96813

SANG00109XXXXD01F01
DIRECTOR
DEPARTMENT OF HEALTH
STATE OF HAWAII
1250 PUNCHBOWL ST
HONOLULU, HI 96813

SANG00131XXXXD01F01
CHAIRMAN
BOARD OF AGRICULTURE
STATE OF HAWAII
1428 SOUTH KING ST
HONOLULU, HI 96814

SANG00149XXXXD01F01
EXECUTIVE DIRECTOR
HAWAII HSG AUTHORITY
STATE DEPT OF SOC SVCS & HSG
1002 NORTH SCHOOL ST
HONOLULU, HI 96817

SAND ISLAND GOVT OFF 2 JUN 83

SANG00140XXXXD01F01

DIRECTOR, ENVIRONMENTAL CTR
UNIVERSITY OF HAWAII
2550 CAMPUS RD, CRAWFORD 317
HONOLULU, HI 96822

SANG00104XXXXD01F01

MANAGER, PACIFIC ISLANDS OFC
US ENVIRON PROTECTION AGENCY
300 ALA MOANA BLVD, ROOM 1302
HONOLULU, HI 96850

SANG00106XXXXD01F01
PACIFIC ISLS ADMINISTRATOR
USFWS, ATTN: J FORD
US DEPT OF THE INTERIOR
300 ALA MOANA BLVD, BOX 50167
HONOLULU, HI 96850

SANG00124XXXXD01F01
MR. ROBERT K. FUKUDA
MANAGER, HONOLULU AREA OFFICE
US DEPT OF HOUSING & URBAN DEV
300 ALA MOANA BLVD, BOX 50007
HONOLULU, HI 96850

SANG0010XXXXD1F01
ENDANGERED SPECIES COORD
DIV OF ENDANGERED SPECIES, FWS
US DEPT OF THE INTERIOR
300 ALA MOANA BLVD, BOX 50167
HONOLULU, HI 96850

SANG01822XXXXD01F01

UNIVERSITY OF HAWAII LIBRARY
SERIAL RECORDS
2550 THE MALL
HONOLULU, HI 96822

SANG00121XXXXD01F01
STATE CONSERVATIONIST
SOIL CONSERVATION SERVICE
US DEPT OF AGRICULTURE
300 ALA MOANA BLVD, BOX 50004
HONOLULU, HI 96850

SANG00102XXXXD01F01

DIRECTOR, INT TSUNAMI INFO CTR
P O. BOX 50027
HONOLULU, HI 96850

SANG00123XXXXD01F01
ADMINISTRATOR, HAWAII DIVISION
FEDERAL HIGHWAY ADMINISTRATION
US DEPT OF TRANSPORTATION
300 ALA MOANA BLVD, BOX 50206
HONOLULU, HI 96850

SANG0010XXXXD1F01
DIRECTOR, PACIFIC REGION
NATIONAL WEATHER SERVICE, NOAA
US DEPARTMENT OF COMMERCE
300 ALA MOANA, BOX 50027
HONOLULU, HI 96850

SANG00141XXXXD01F01
DIRECTOR
WATER RES RESEARCH CTR
UNIVERSITY OF HAWAII
2444 DOLE ST
HONOLULU, HI 96822

SANG00127XXXXD01F01

COMMANDER
FOURTEENTH COAST GUARD DIST
300 ALA MOANA BLVD, 9TH FLR
HONOLULU, HI 96850

SANG00107XXXXD01F01
DIRECTOR, NATL PARK SERVICE
HAWAII STATE OFFICE
US DEPT OF THE INTERIOR
300 ALA MOANA BLVD, RM 6305
HONOLULU, HI 96850

SANG00125XXXXD01F01
DISTRICT CHIEF
GEOLOGICAL SURVEY
US DEPT OF THE INTERIOR
300 ALA MOANA BLVD, BOX 50166
HONOLULU, HI 96850

SANS00287XXXXD01F01
PROF H. PAUL FRIESEMA
NW UNIV,CTR FOR URBAN
AND POLICY AFFAIRS
2040 SHERIDAN RD
EVANSTON, IL 60201

SANS00857XXXXD01F01
J SANCHEZ
2615 SO. MISSION
TUCSON, AZ 85713

SANS04016XXXXD01F01
PACIFIC YACHT CLUB
HICKAM HARBOR
HICKAM AIR FORCE BASE
HONOLULU, HI 96853

SANS04000XXXXD01F01
WAIMOMI OUTDOOR CIRCLE
P.O. BOX 435
AIEA, HI 96701

SANS00406XXXXD01F01
SEA GRANT/MARINE ADVISORY PROG
UNIVERSITY OF HAWAII AT HILO
RICHARDSON OCEAN CENTER
2349 KALANIANAOLE ST
HILO, HI 96720

SANS04001XXXXD01F01
LANI-KAILUA OUTDOOR CIRCLE
P.O. BOX 261
KAILUA, HI 96734

SANS04011XXXXD01F01
HI YACHT RACING ASSN
510 N KALAHEO AVENUE
KAILUA, HI 96734

SANS00143XXXXD01F01
DIRECTOR
HI INST OF MARINE BIOLOGY
UNIVERSITY OF HAWAII
P O. BOX 1346
KANEOHE, HI 96744

SANS04013XXXXD01F01
KANEOHE YACHT CLUB
44-503 KANEOHE BAY DRIVE
KANEOHE, HI 96744

SANS04020XXXXD01F01
WAIALUA BOAT CLUB
P O BOX 179
WAIALUA, HI 96791

SANS04021XXXXD01F01
WAIANAE BIG GAME FISHING CLUB
87-124 LIOPOLO STREET
WAIANAE, HI 96792

SANS04018XXXXD01F01
POKAI BAY BOAT CLUB
85-794 FARRINGTON HWY
WAIANAE, HI 96792

SANS04129XXXXD01F01
SAVE OUR SURF
600 KAIKOO PLACE
WAILUKU, HI 96793

SANS04004XXXXD01F01
SHORELINE PROTECTION ALLIANCE
P O BOX 4247
HONOLULU, HI 96813

SANS01044XXXXD01F01
MR JUSTIN RUTKA
WEST PAC FISHERIES MNGMT COUNC
1164 BISHOP ST, SUITE 1608
HONOLULU, HI 96813

SANS03018XXXXD01F01
HI'S THOUSAND FRIENDS
1154 FORT ST MALL, #220
HONOLULU, HI 96813

SANS04022XXXXD01F01
WAIKIKI YACHT CLUB
1599 ALA MOANA BLVD
HONOLULU, HI 96814

SANS04134XXXXD01F01
GREENPEACE FOUNDATION
913 HALEKAUWILA STREET
HONOLULU, HI 96814

SANS04137XXXXD01F01
LIFE OF THE LAND
250 S HOTEL STREET
HONOLULU, HI 96814

SANS03002XXXXD01F01
PACIFIC DIVING INDUSTRIES
P.O. BOX 17328
HONOLULU, HI 96817

SANS03010XXXXD01F01
OUTDOOR CIRCLE
COMM SVCS BLDG, RM 502
200 NORTH VINEYARD BLVD
HONOLULU, HI 96817

SAND ISLAND

SPEC INT 2 JUN 83

SANS00269XXXXD01F01

KALIHI-PALAMA COMMUNITY COUNCI
1117 KAILI STREET
HONOLULU, HI 96819

SANS04014XXXXD01F01

LA MARIANA SAILING CLUB
29-A SAND ISLAND ROAD
HONOLULU, HI 96819

SANS00288XXXXD01F01
OUTDOOR REC PROG
C/O CAMPUS CTR RM 208
UNIV OF HAWAII
2465 CAMPUS RD
HONOLULU, HI 96822

KALIHI-PALAMA LIBRARY
1325 KALIHI ST.
HONOLULU, HAWAII 96819

MS. SHERRIE SAMUELS
3118 WAIALAE AVE #403
HONOLULU, HAWAII 96816

SANS00180XXXXD01F01

BISHOP MUSEUM
1355 KALIHI STREET
HONOLULU, HI 96819

SANS00165XXXXD01F01

HAWAII AUDUBON SOCIETY
P.O. BOX 22832
HONOLULU HI 96822

SANS00144XXXXD01F01

SEA GRANT-MOP
252B SPALDING HALL
UNIVERSITY OF HAWAII AT MANOA
HONOLULU, HI 96822

KALIHI BUSINESS ASSOCIATION
204 SAND ISLAND RD.
HONOLULU, HAWAII 96819

MS. MARTHA M. PATRICK
PO BOX 19035
HONOLULU, HAWAII 96817

SANS00270XXXXD01F01

MR. AKIRA SAKIMA
CHAIRMAN, SAND ISLE COMM
2124 WILSON STREET
HONOLULU, HI 96819

SANS04019XXXXD01F01

UH YACHT CLUB
C/O ATHLETIC DEPT
1337 LOWER CAMPUS ROAD
HONOLULU, HI 96822

SANS04023XXXXD01F01

HAWAII KAI FISHING CLUB
P.O. BOX 7612
HONOLULU, HI 96825

MR. TAKESHI UYESUGI
1711 DAY PL.
HONOLULU, HAWAII 96819

SAND ISLAND
SHORE PROTECTION

APPENDIX C

GEOLOGY, FOUNDATIONS AND MATERIALS

APPENDIX C

GEOLOGY, FOUNDATIONS AND MATERIALS APPENDIX

SAND ISLAND SHORE PROTECTION STUDY
OAHU, HAWAII

Table of Contents

	Page
REGIONAL GEOLOGY	C-1
SITE GEOLOGY	C-1
SEISMICITY	C-2
SUBSURFACE INVESTIGATIONS	C-3
LABORATORY TESTING	C-3
SUBSURFACE CONDITIONS	C-3
SOIL VALUES ADOPTED FOR DESIGN	C-4
DESIGN CONSIDERATIONS	C-4
SOURCES OF CONSTRUCTION MATERIALS	C-4

List of Figures

C-1	Boring Location Plan
C-2	Boring Logs
C-3	Stability Analysis-End of Construction

SAND ISLAND SHORE PROTECTION STUDY
OAHU, HAWAII

GEOLOGY, FOUNDATIONS AND MATERIALS APPENDIX

REGIONAL GEOLOGY

The Island of Oahu was formed from the coalesence of lava flows from two volcanic ranges; the Waianae and Koolau. Although the Waianae volcanic range appears to be older (the first to become extinct), both volcanoes were concurrently active from the late Tertiary Period of geologic time to the early Pleistocene Epoch (2 million to less than 1 million years before present). When volcanic activity ceased, streams carved deep, ampitheater headed canyons into the surfaces of the volcanoes' shield-shaped domes. At the same time (and over the past 600,000 years), changes in the ocean level accompanying glaciation and deglaciation of the earth during the Pleistocene Epoch were partially responsible for shifting Oahu's coastline. These ocean level changes drowned stream valleys and created wave-cut terraces and coral reef deposits at various elevations between 1,800 feet below and 1,200 feet above the present day sea level. Volcanism (the Honolulu Series) was renewed on the Koolau range between 900,000 and 100,000 years before present which created such features as Diamond Head, Salt Lake, Aliamanu, Punchbowl and the Koko craters. The project site is located within the Honolulu plain on the southern shore of Oahu. This plain is essentially a fringing coral reef left high as the sea receded to its present level. Drill holes show that lava flows of the Honolulu Series are interbedded with the reef deposits which conclude that the two must have been forming at about the same time. The lava-basalt basement is found at 400 to 1,000 feet below the Honolulu plain and is capped with a 255-foot thick layer of nearly impermeable clay and gravel.

SITE GEOLOGY

The site of the proposed shore protection project is on the east portion of the south coast of Sand Island (formerly called Anuenue Island). Sand Island was made on a shallow coral reef (2 to 6 feet below the water surface) by the deposition of reef materials dredged from adjacent Honolulu Harbor and Keehi Lagoon. The Fort Armstrong Entrance Channel to Honolulu Harbor, located east and southeast of the project site, was dredged to a design vessel draft depth of 45 feet. Sand Island is relatively flat with an average gradient of less than one percent towards the shoreline. Honolulu Harbor is located directly north of Sand Island and has been dredged to depths ranging between 35 feet and 45 feet.

The project site begins at the southeast corner of Sand Island and extends westward along the shore for a distance of approximately 2,100 feet. The initial 500 feet of shoreline at the site is revetted with basalt cobbles and boulders which range in size up to 3 feet diameter pieces (weighing up to about 3.0 tons). The revetment appears to be about 10 feet to 20 feet thick and generally slopes 1V on 1H. Several failures in the revetment slope as flat as 1V on 6H. The land surface behind this portion of the site is flat, generally at elevation 6.0 MLLW and is covered by fill comprised of coralline

gravels and sand. Offshore, the ground surface in this portion of the site, undulates between elevation (-)8.0 and elevation (-)14.0 MLLW. However, it slopes gently seaward with an averaged gradient of 2°. The ground surface in this area from the toe of the revetment to a distance of about 150 feet offshore is covered with rubble consisting of sand, gravels and cobbles. Beyond 150 feet, the ground surface consists of hard coral reef limestone with occasional depressions containing gravel and cobbles. These depressions are about 6 feet in diameter but rarely exceeds a foot in depth.

The shoreline from station 5+00 to 14+50 is protected by a narrow (6' top width), low (5-foot high), basalt boulder breakwater. The boulders of this breakwater range in size from 1.0 foot to 3.0 feet diameter and weight from 150 pounds to 2.0 tons. The breakwater from station 14+50 to 21+00 is broken and scattered. The entire breakwater (station 5+00 to 21+00) forms the toe of a beach berm and creates a tidal pool between the two features particularly at nigh tides. The materials of the beach berm and backshore areas consist of coarse coralline sand and gravel. The distance from the breakwater to the top of the beach berm varies from a few feet to as much as 100 feet. The beach berm slopes 1V on 6H uniformly seaward throughout this portion of the project site. The top of the beach berm and backshore area,like the initial portion of the site, is at elevation 6.0. The ground surface offshore of this portion of the site slopes gently (about 2°) to the southeast between elevation (-)2.0 and elevation (-)11.5. The surface is typical coral limestone reef flat consisting of hard coral limestone and limestone breccia with few living corals on the western half and sandy gravel and gravelly sand on the eastern half. Also, occasional shallow depressions are filled with gravels and cobbles.

SEISMICITY

Although Oahu's seismic regime may appear subdued, intensities from major earthquakes on or near a neighboring island can have catastrophic effects on any and all of the Hawaiian Islands. Two such significant earthquakes occurred on the East Molokai Fracture Zone in 1871 and 1938. These events registered a Richter Magnitude 7.5 and were felt in Honolulu with a Modified Mercalli (MM) Intensity VIII. The original Modified Mercalli Intensity Scale (abridged) states for MM VIII:

> "Damage slight in specially designed structures; considerable in ordinary substantial buildings with partial collapse; and great in poorly built structures. Panel walls thrown out of frame structures. Fall of chimneys, factory stacks, columns, monuments, walls, heavy furniture overturned. Sand and mud ejected in small amounts. Changes in water wells. Persons driving motorcars disturbed."

These events have been considered the "worst of credible events" and have been used in the development of seismic probability zones as well as in seismic designs for modern structures. The Uniform Building Code lists Oahu in seismic probability Zone 1. For design consideration, Army Technical Manual TM 5-809-10 places Oahu into seismic probability Zone 2 and describes damage as "moderate".

SUBSURFACE INVESTIGATIONS

An onshore boring investigation was performed to establish the presence and quality of reef rock thought to be below the island fill. Fourteen borings were drilled 60' to 250' apart to maximum depth of 35'. Sampling was limited to SPT split spoons (ASTM D-1586) and 4" corings for the purpose of classifying and grading materials encountered. Since reef rock was visually confirmed beyond the talus of the existing revetment, no offshore borings were considered. See Figures C-1 and C-2 for boring locations and boring logs respectively.

Snorkeling and scuba dives were made near the shoreline to map surface coral outcroppings. Estimated limits of coral reef rock are shown on Figure C-1.

A previous study was undertaken in 1974 by Dames and Moore for the State of Hawaii Sand Island State Park Development. This subsurface investigation consisted of 12 test pits and 2 borings further inland from the shoreline.

LABORATORY TESTING

Sixteen sieve analysis tests were performed to evaluate the gradations and filter characteristics of the fill overburden and the underlying sediments.

The previous Dames and Moore study showed results of direct shear tests, percolation tests in the field, consolidation tests, moisture content, dry density determination and a CBR test.

SUBSURFACE CONDITIONS

Contrary to expectations, no suitable coral rock formations were encountered in the borings taken along the top bank of the shoreline. The overburden fill was placed between 1907 and 1934 and consisted of silts, sands and gravels (i.e. SW, SP, SM, GM, GP, MH). Standard penetration blow counts varied between 3 and 47, but the fill's relative density was generally in the medium dense to loose range.

The sediments below the fill have similar gradations but are characterized as follows:

- Generally less coarse sand, more fine sand.
- Generally gray in color rather than tan.
- Weaker materials with relative densities generally in the loose to very loose state.

The offshore diving revealed partially covered continuous moderately hard coral reef rock with an apparent average thickness in excess of one foot. (See Figure C-1). Unfortunately, gravel and sand deposits adjacent to the existing revetment prevented exact mapping of the rock. At the west end of the project area (beyond station 18+50) sand from the adjacent beach covered the offshore area.

SOIL VALUES ADOPTED FOR DESIGN

The following design values for subgrade of the proposed revetment improvement was adopted from the boring investigation and data reported in previous Dames and Moore study dated 1974:

Unit weight dry	78-94 PCF
Unit weight saturated	103-125 PCF
Angle of internal friction	28°-30°
Conesion	0 PSF

DESIGN CONSIDERATIONS

a. Revetment Toe Protection.

Stations 0+00 to 7+00 discloses no evidence of a continuous reef structure near the shoreline for the proposed revetment toe. Scattered limestone rock or boulders may be encountered in the excavation for the structure. The revetment toe within this reach should be imbedded at least to the depth of anticipated scour in accordance with the shore protection manual. Should the revetment structure be moved seaward where some continuous coral limestone was noted, the revetment toe may be terminated at the surface of the reef rock.

Stations 7+00 to 20+00 - A continuous reef rock in close proximity to the shoreline in portions of this reach was discovered by underwater investigations. Revetment toe will be terminated on the coral limestone reef rock, or where reef rock does not exist, imbedded at least to the depth of anticipated scour in accordance with the shore protection manual.

b. Breakwater Toe Protection.

The offshore breakwater should be sited to take advantage of the offshore continuous reef rock formation for the foundation of the structure. Where other considerations preclude such siting, provisions similar to the revetment toe protection will be provided to prevent toe erosion.

c. Bedding Layer.

The bedding layer ("C" Stone), designed in accordance with EM 1110-2-2300, dated 28 January 1983, requires the following gradation when "B" stones consists of 100 lb. - 500 lb. with 50% greater than 300 lb.:

Sieve Size	% Passing
10"	100
3"	60-90
3/4"	0-55
No. 16	0-15

d. Slope of Revetment.

The predominantly loose sandy nature of the subgrade below sea water level and the continuous wave action on this material during excavation requires a slope of 1V on 2H or flatter to maintain the subgrade slope during

construction. A steeper slope of 1.5 to 1 may be considered for that portion of the proposed revetment resting on the existing rubble mound structure. Any extension of the structure below the existing rubble mound should revert back to the flatter slope. Excavation of the subgrade will be made in short increments with placement of the underlayer as soon as possible to maintain the slope for subsequent rock placement.

e. Revetment Slope Stability.

The stability of the revetment at the end of construction with a slope of 1V on 1-1/2H or flatter is acceptable. A summary of the stability analysis is shown on Figure C-3.

SOURCES OF CONSTRUCTION MATERIALS

Basalt rock for the proposed shore improvements is available from several sources on Oahu. The nearest possible source of rock is the Halawa Quarry which is 7 miles from the site. Although this quarry is capable of producing sufficient quantities of rock for this project (pieces weighing up to 5 tons), rock for revetment and armor purposes is not routinely mined at this quarry and the mining operations will require adjusting to produce the larger size rock. Rock mined from this quarry is crushed and used as aggregate in concrete and base course materials. The larger size pieces (up to 5 tons) are generally pushed into piles and sold as the demand for such rock dictates. Because of the weak and weathered nature of the formations being mined, the Halawa Quarry is not a dependable source for large quantities of revetment and armor rock.

The most commonly used source of revetment and armor rock on Oahu is Kapaa Quarry located approximately 25 miles north of the project site in the Kaneohe-Kailua area. Hard and dense lava basalt is available in sizes and quantities required for this project. In addition, bedding material and graded aggregates for filter zones are also available from the Kapaa Quarry.

A third possible source of rock is the Makakilo Quarry located at the southern end of the Waianae range near Barbers Point (15 miles from the project site). Products from the Makakilo Quarry are limited to aggregates used for for concrete products, underlayer and bedding materials. Investigations should be made of this quarry if it is to be considered as a potential source of armor rock.

Stones from the existing revetment are reusable. However, additional stone will have to be obtained to furnish the additional height of the revetment and to replace stone washed out of the damaged sections of the revetment.

The estimate of construction costs for this project is based on Kapaa Quarry as the source of armor stone. Based on past experience, stones from Kapaa Quarry can meet the specific gravity value of 2.58 (relative to sea water) assumed in the design computations for armor stone. However, if field stones or stones from other quarries are used, a specific gravity value of 2.44 (relative to sea water) should be used for armor stone design.

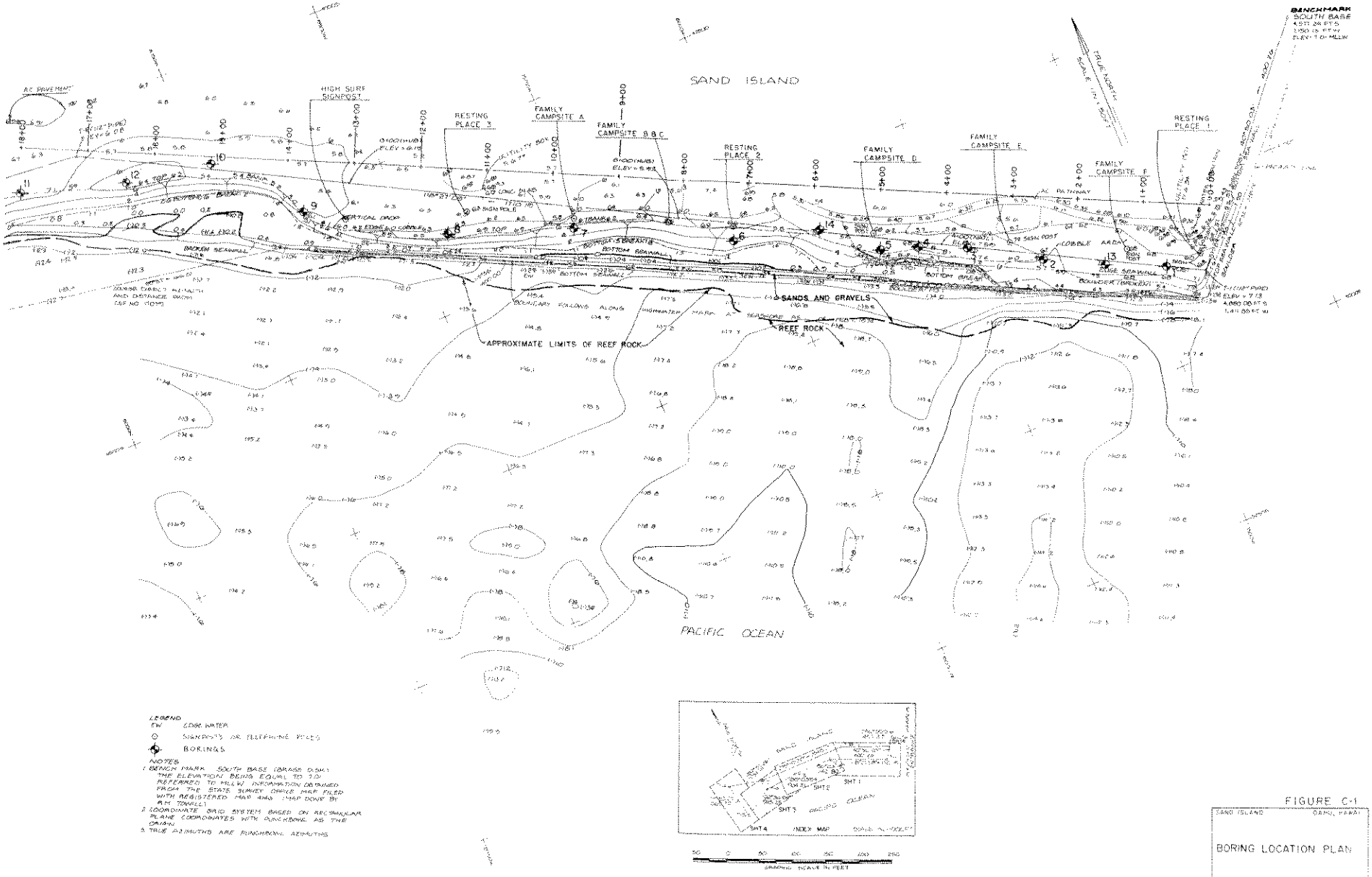


FIGURE C-1

SAND ISLAND OAHU, HAWAII

BORING LOCATION PLAN

U.S. ARMY ENGINEER DISTRICT, HONOLULU

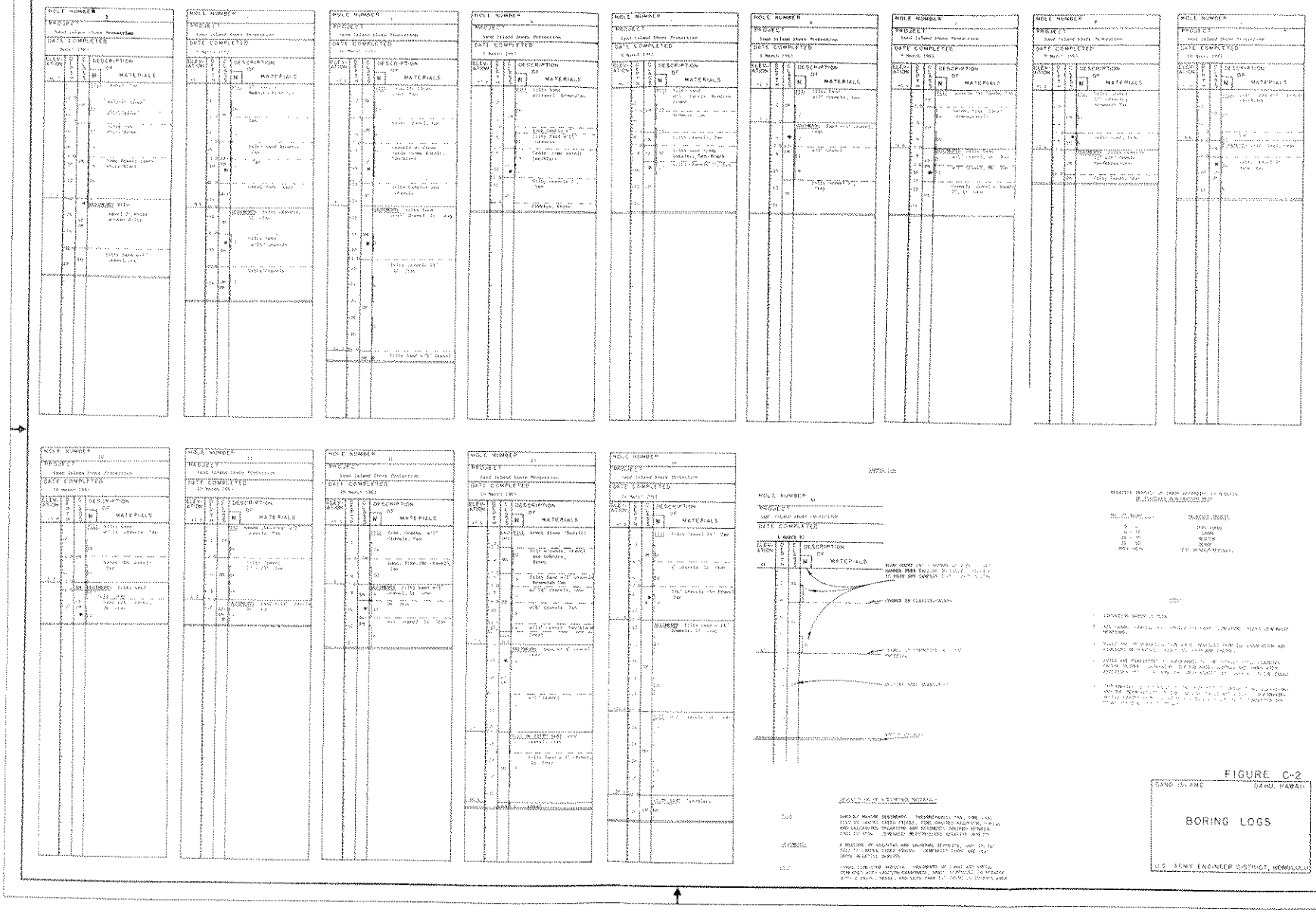
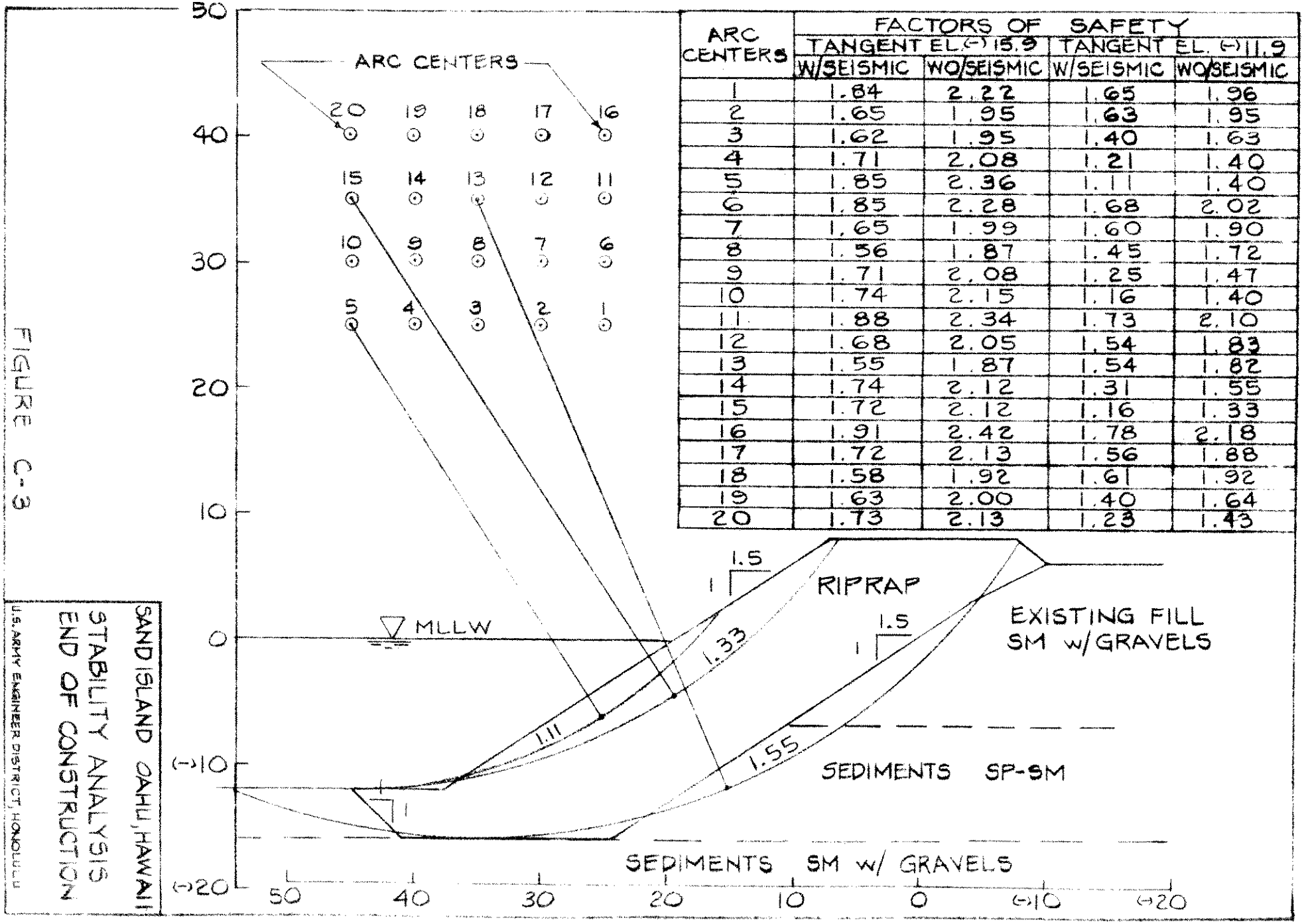


FIGURE C-2

SAND ISLAND OAHU, HAWAII

BORING LOGS

U.S. ARMY ENGINEER DISTRICT, HONOLULU



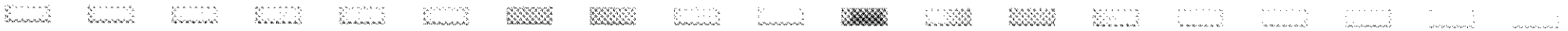
ARC CENTERS	FACTORS OF SAFETY			
	TANGENT EL. (-) 15.9		TANGENT EL. (-) 11.9	
	W/SEISMIC	WO/SEISMIC	W/SEISMIC	WO/SEISMIC
1	1.84	2.22	1.65	1.96
2	1.65	1.95	1.63	1.95
3	1.62	1.95	1.40	1.63
4	1.71	2.08	1.21	1.40
5	1.85	2.36	1.11	1.40
6	1.85	2.28	1.68	2.02
7	1.65	1.99	1.60	1.90
8	1.56	1.87	1.45	1.72
9	1.71	2.08	1.25	1.47
10	1.74	2.15	1.16	1.40
11	1.88	2.34	1.73	2.10
12	1.68	2.05	1.54	1.83
13	1.55	1.87	1.54	1.82
14	1.74	2.12	1.31	1.55
15	1.72	2.12	1.16	1.33
16	1.91	2.42	1.78	2.18
17	1.72	2.13	1.56	1.88
18	1.58	1.92	1.61	1.92
19	1.63	2.00	1.40	1.64
20	1.73	2.13	1.23	1.43

SAND ISLAND OAHU, HAWAII

STABILITY ANALYSIS
END OF CONSTRUCTION

U.S. ARMY ENGINEER DISTRICT, HONOLULU

FIGURE C-3



SAND ISLAND
SHORE PROTECTION

APPENDIX D

ENGINEERING
AND COST ESTIMATES

APPENDIX D

ENGINNEERING AND COST ESTIMATES

SAND ISLAND SHORE PROTECTION

TABLE OF CONTENTS

SECTION	TITLE	PAGE
I	Hydraulic Analyses	
	1. Purpose	1
	2. Natural Forces	1
	3. Design Analyses	2
	4. Wave Transmission	7
	5. Typical Cross-sections and Plan Views	8
	6. Offshore Breakwater Spacing	8
II	Cost Estimates	
	A. Basis of Estimates	9
	B. Alternative Plan 1	9
	C. Alternative Plan 2	11
	D. Alternative Plan 3	13
	E. Summary of Costs	15

APPENDIX D

SECTION I

HYDRAULIC ANALYSIS
SAND ISLAND

1. PURPOSE. The purpose of this hydraulic appendix is to present the physical factors and the design of protective structure alternatives which are a revetment, offshore breakwater and a combination of the two.

2. NATURAL FORCES.

a. Winds, Storms, and Hurricanes. The prevailing winds in the Hawaiian Islands are the northeasterly trade winds, which occur approximately 90-95 percent of tne time during the summer months of May through October, and 55-65 percent of the time from November through April, with speeds of 10-20 miles per hour. Storm conditions generally result from a breakdown of the trade wind circulation through tne islands, and are relatively infrequent. Three classes of disturbances produce major storms in Hawaii: cold fronts, low-pressure passages, and true tropical storms or hurricanes. Cold fronts, which occur during the winter, cause spotty rainfall and gusty winds. The low-pressure passage brings heavy rain, sometimes with strong winds. A low-pressure storm type known as the "Kona" storm usually occurs during the winter months, and is associated with strong and persistent southerly winds and intense rainfall on the south and western side of the island. Hurricanes classified as storms with wind speeds greater than 64 mph, are infrequent, but, in historic times, nine have passed within 200 miles of the island of Oahu. The latest occurred in November 1982 when Hurricane IWA passed over the Island of Kauai. All were of tropical storm intensity at their closest point of approach to Hawaii except Hurricane Nina (December 1957), Dot (August 1959), and IWA (November 1982) which remained at hurricane strength until it had passed through the island chain.

b. Waves. Sand Island is exposed to wave attack from the southerly directions. The site is somewhat protected from the predominant trade wind-generated waves by the sheltering effect of the island mass. The divergence of wave energy due to diffraction and refraction result in significant attenuation prior to reaching shore at the project site. This is also true of swell generated by North Pacific storms, which may approach from the northwest through northeast. Some of the largest waves reaching the Hawaiian Islands are of this type, however, these waves are attenuated significantly prior to reaching the study area. The two wave types which directly impact the shore are "Kona storm" waves and southern swell. "Kona storm" waves may approach from any direction between the southeast and west, but the larger waves are usually from the southwest. Commonly, periods range from 8 to 15 seconds, and heights from 10 to 15 feet. Southern swell are generated during the winter season in the southern hemisphere by strong winds blowing over long fetches in the South Pacific and Southern Indian Ocean. These waves arrive in the Hawaiian Islands as low, long-period swell, with typical deepwater heights of 1 to 4 feet and periods of 14 to 22 seconds. The direction of approach is from the southern quadrant anywhere between the southeast to southwest. The project site is also subject to potential hurricane-generated waves, though extremely rare. Hurricanes Nina, Dot, and Iwa generated estimated wave heights of approximately 20 to 24 feet.

c. Tides. Tide data at Honolulu Harbor from the US Coast and Geodetic Survey are as follows:

	Feet
Highest tide (observed)	3.5
Mean higher high water (MHHW)	1.9
Mean high water (MHW)	1.4
Mean tide level	0.8
Mean low water (MLW)	0.2
Mean lower low water (MLLW)	0.0
Lowest tide (observed)	-1.3

All elevations in this report are referenced to MLLW datum.

d. Tsunamis. During the past 35 years, eight tsunamis have affected the islands. The highest observed runup near the study site was 5 feet at Pier 8, Honolulu Harbor, resulting from the May 1960 Chilean tsunami.

3. DESIGN ANALYSIS.

a. Design Deepwater Wave: The design deepwater wave is determined to have a wave height of 27 feet and period of 14 seconds, based on analysis performed for the DPR entitled Sand Island Shore Protection, Sept 1978. Based on an offshore bottom slope of 1V on 100H, and the methodology presented in the Shore Protection Manual (SPM), it was determined that the design deepwater waves will break in water depths of 35 to 45 feet, approximately 3,500 to 4,000 feet offshore. Therefore, the maximum waves expected at the improvement site are based on controlling depth criteria.

b. Design Water Level: The design still-water level is based on the sum of several components: the astronomical tide, the water-level rise due to atmospheric pressure reduction, the storm surge due to wind setup, and wave setup. An astronomical tide of 1.9 feet was selected based on the MHHW level at Honolulu Harbor.

The rise in water level due to atmospheric pressure reduction, S_p, was determined to be 0.7 feet based on the following equation:

$$S_{\Delta p} = 1.14\,\Delta p\,(1 - e^{-R/r})$$

where Δp = 1 inch mercury,

R = radius of maximum winds = 20 nautical miles, and

r = radial distance from storm center to computation point = 20 nautical miles.

The storm surge, S_s, was determined to be 0.2 feet based on the following equation:

$$S_s = (540 \ k \ U_R^2 \ \Delta X)/\bar{d}$$

where $k = 3 \times 10^{-6}$,

U_R = maximum sustained wind speed = 62 knots,

ΔX = incremental horizontal distance in nautical miles, and

$\bar{d}$ = mean depth over the increment in feet.

The water-level rise due to wave setup was determined to be 2 feet based on an offshore bottom slope of 1V on 100H, the given deepwater design wave parameters, a nearshore water depths of 5 ft for the revetment and 7 ft for the breakwater, and parameters presented in the Coastal Engineering Research Center (CERC) publication TP 80-3.

The total rise in water level is estimated to be 4.6 feet, and is considered reasonable based on a maximum observed tide in Honolulu Harbor of 3.5 feet. This calculates to design depths of 10 and 12 ft for the revetment and breakwater, respectively.

c. Design Wave at Structure: The design wave height at the shore is dependent on the maximum water depth at the structure toe and the nearshore bottom slope. From the publication by Goda (Irregular Wave Deformation in the Surf Zone Coastal Engineering in Japan, Vol 18, 1975) the significant nearshore wave heights are calculated.

REVETMENT	OFFSHORE BW
$T = 14$ Sec	$T = 14$ Sec
$L_o = 5.12T^2 = 1003.52$	$L_o = 1003.52$
$m = .01$	$m = .01$
$d_{toe} = d = 10$ft	$d_{toe} = d = 12$ ft
$\frac{d}{L_o} = .00996$ (SPM Table C-1)	$\frac{d}{L_o} = \frac{12}{1003.52} = .0119$
$\frac{H}{H_o'} = 1.438$	$\frac{H}{H_o'} = 1.375$ from SPM Table C-1

REVETEMENT		OFFSHORE BW	
H_o'	= 18.7 say 19 ft	H_o'	= 19.6 say 20 ft
$\frac{H_o'}{L_o}$	= $\frac{19}{5.12(14)^2} = \frac{19}{1003.52}$ = .019	$\frac{H_o'}{L_o}$	= .0199
$\frac{d}{H_o'}$	= .53	$\frac{d}{H_o'}$	= $\frac{12}{20}$ = .6
$\frac{H_s}{H_o'}$	= .4	$\frac{H_s}{H_o'}$	= .47
H_s	= 7.6 ft	H_s	= 9.6 ft

By using the SPM Method shown on Figure 7-4, a slope of 1V to 100H, ds = 10 for revetment and ds = 12 for breakwater, and a T = 14 Secs, H_b is calculated as follows:

REVETMENT		BREAKWATER	
ds	= 10	ds	= 12
$\frac{ds}{gT^2}$	= .0016	$\frac{ds}{gT^2}$	= .0019
m	= .01	m	= .01
$\frac{H_b}{ds}$	= .85	$\frac{H_b}{ds}$	= .85
$\frac{H_b}{ds}$	= .85	$\frac{H_b}{ds}$	= .85
H_b	= 8.5 ft	H_b	= 10.2 ft

Since TP 80-3 supplements the SPM with the State-of-the-art irregular wave prediction techniques developed by Goda, the wave heights predicted by TP 80-3 will be used for the following calculations.

d. Stability Requirements: The weight of the stones and thickness of stone layers required for stability were computed using the following criteria as presented in SPM:

Armor stone size: (in pounds)

$$W = \frac{W_r H_b^3}{K_D (S_r - 1)^3 \cot \theta}$$

Layer thickness: (in feet)

$$t = nk \left(\frac{W}{W_r}\right)^{1/3}$$

Unit weight of stone: W_r = 165 pounds per cubic foot

Design Wave height: H_b = 7.6 (Revetment)
9.6 (Offsnore Breakwater)

Stability coefficient: K_D = 3.5 (Quarry Stones) Revetment
2.1 (Field Stones) Revetment
2.9 (Quarry Stones) Offshore Breakwater
1.7 (Field Stones) Offshore Breakwater

Specific gravity of stone relative to seawater: S_r = 165/64 = 2.58

Cotangent of structure slope: $\cot \theta$ = 1.5

Layer coefficient: K = 1.15 for n = 2

Layer thickness: n = 2

Based on the above, the weight of the stones and thickness of the stone layers are as follows:

	Stone Weight (Pounds)	Layer Thickness (Feet)	Crest Width (3 Stones)
Armor (Revet)			
KD = 3.5	3000 - 5000 (75% > 4000)[1/]	6.7	10.0
KD = 2.1	4500 - 7500 (75% > 6000)	7.6	11.4
Armor (Offshore BW)			
KD = 2.9	6000 - 10500 (75% > 8500)[2/]	8.6	15.0
KD = 1.7	11000 - 18000 (75% > 14500)	10.2	15.3
Underlayer (Revetment)	100 - 500 (50% > 300)[1/]	3.1	
	450 - 750 (75% > 600)	3.5	
Underlayer (Offshore BW)	600 - 1100 (75% > 800)[2/]	3.9	
	1100 - 1800 (75% > 1400)	4.7	

[1/] Stone sizes will be increased by 50% to compensate for major overtopping for Reach 1 only.

[2/] Stone sizes will be incresaed by 50% to compensate for major overtopping.

Based on CETA 80-7 the runup values are calculated as follows:

Runup for Breakwater:

$$\frac{R}{H} = \frac{az}{1+bz}$$

$$z = \frac{\text{Tan } \emptyset}{\sqrt{H/L_o}} = \frac{.66}{\sqrt{9.6/1003.52}} = 6.78$$

$a = .692$

$b = .504$

$H = 9.6$ ft

$$\frac{R}{9.6} = \frac{.692\ (6.78)}{1 + .504\ (6.78)} = \frac{4.69}{4.42} = 1.06$$

$R = 1.06\ (9.6) = 10.18$ ft say 10 ft

Runup Elevation = SWL+R = 4.6 + 10 = 14.6 ft

Runup for Revetment

$$\frac{R}{H} = \frac{az}{1 + bz}$$

$$z = \frac{\text{Tan } \emptyset}{\sqrt{H/L_o}} = \frac{.66}{\sqrt{7.6/1003.52}} = 7.17$$

$a = .692$

$b = .504$

$H = 7.6$

$$\frac{R}{7.6} = \frac{.692\ (7.17)}{1 + .504\ (7.17)} = \frac{4.96}{4.61} = 1.08$$

$R = 1.08\ (7.6) = 8.2$ ft say 8 ft

Runup Elevation = SWL+R = 4.6 + 8 = 12.6 ft.

Runup and Crest Elevation: The backshore park lands are at approximate elevation +6 to +8 feet, and thus the revetment and breakwater crests are set at +8.0 ft to be compatible with the aesthetics of the park environment. Furthermore, this reduction in crest height from 12.6 ft to 8.0 ft will result in considerable cost savings to the project. Since the revetment will therefore be subject to wave overtopping under severe design storm conditions, stone sizes will be increased by 50% for all the breakwater structures and for Reach 1 of the revetment. In addition the armor at the crest would be extended landward, providing a crest width of 15 feet, to minimize significant scour damage due to overtopping. Minor overtopping at the seaward crest of the revetment will occur when wave heights exceed 6 feet during mean high water conditions. Significant overtopping is expected along the seaward crest of

the revetment when wave heights exceed 6 feet during highest observed tide conditions. Frequency of occurrence for the minor overtopping condition is estimated at 1-5 years and major overtopping is estimated at a 50-year recurrence interval. The offshore breakwater will also have a crest elevation of +8.

4. WAVE TRANSMISSION

Based on CETA 80-7 the wave transmission values due to wave overtopping are calculated as follows:

The breakwater freeboard, F = h -ds = 16 -12 = 4 ft.
B = crest width
h = height of Breakwater
ds = depth at structure toe
$B/_h$ = .75, since this is within the $0 \leq B/_h \leq 3.2$ limits the following equation may be used:

$$C = 0.51 - 0.11\ B/_h$$

$C = .43$

This is the empirical coefficient for wave transmission by overtopping necessary for the following equation.

$$K_{To} = \frac{Ht}{H_i} = C\ (1 - \frac{F}{R})$$

$$K_{To} = .43\ (1 - \frac{4}{10})$$

$$K_{To} = .26$$

$$K_{To} = \frac{H_t}{H_i} = .26$$

$$H_T = .26(H_i)$$

$$H_i = 9.6$$

$$H_T = 2.5 \text{ ft}$$

where H_t = transmitted wave height
H_i = incident wave height
C = emperical coefficient for wave overtopping
F = freeboard
R = runup

Using the Cross and Sollitt method presented in the Aug 1972, Journal of the Waterways, Harbors and Coastal Engineering Division, proceedings of the American Society of Civil Engineers:

$$\frac{F}{R} = \frac{4}{10} = .4$$

$$K_t = \frac{H_t}{H_i} = .29$$

$$H_t = 2.8 \text{ ft}$$

The authors state that the transmission coefficient is slightly overestimated when the overtopping theory is applied to rubble mound breakwater. Therefore it is felt that the transmittal wave height of 2.5 ft is considered reasonable.

5. TYPICAL X-SECTIONS AND PLAN VIEWS: The typical X-sections and plan views are shown on Figures 10, 11, 12 and 13 of the main report. The X-sections are for all three alternatives. A detailed plan view of the selected plan is shown in Figure D-1 which follows this page.

6. OFFSHORE BREAKWATER SPACING:

$$\frac{d}{L_o} = \frac{12}{1003.52} = .01196$$

from Table C-1 g the SPM

$$\frac{d}{L} = .04421$$

$$L = 271 \text{ ft}$$

If B = gap width = 75 ft (this gap width was achieved using a graphical representation of the sideslopes of the breakwaters)

then $\frac{B}{L} = .28$

The SPM presents a diffraction diagram based on a B/L ratio of .5 which is the smallest ratio presented. Using B/L = .28, the diffraction coefficient in the area of the beach will be less than .7 which is shown in Figure 2-43 of the SPM. The diffraction coefficient for B/L = .28 is estimated to be between .4 and .5.

By using $E = \frac{\rho g H^2 L}{8}$ and a diffraction coefficient equal to .5, the wave energy (E) is reduced by approximately a factor of 4. Therefore, the use of a 75 foot gap for the offshore breakwaters is acceptable.

APPENDIX D

ENGINEERING APPENDIX

II. COST ESTIMATES

A. BASIS OF ESTIMATE

The following assumptions were utilized in estimating construction costs for the three alternative plans of this study:

1. An Oahu-based contractor will perform the work.

2. Work schedule will be straight-time only at 8-hours per day and 5-days per week.

3. Equipment and storage area will be adjacent to the work site.

4. Construction period will run 16-18 months.

5. Estimated quantities were based on existing topographic maps and surveys and typical plans and cross-sections.

6. Cost estimates are based on June 1983 price levels.

7. Disposal site for excess spoils will be at the Halawa dump site, approximately 8 miles away.

8. All new stones will be quarried from Kailua, 25 miles from Sand Island. Suitable stones will be salvaged from the existing structure.

9. The offshore breakwaters will be built by land equipment working on top of the breakwater and temporary causeways connecting them.

10. Engineering and design costs include the Plans and Specifications, and Engineering during construction.

11. Supervision and administration costs will be incurred during construction.

12. A 20% contingency cost is provided.

B. ALTERNATIVE PLAN 1

This alternative requires the construction of 1,950 feet of stone revetment along the shoreline of the study area. Typical cross-sections are shown in Figure 13 in Section IV of the Main Report.

1. Project First Cost

The following table summarizes the construction costs for this alternative.

Description	Quantity	Unit Cost ($)	Total ($)
Mobilization & Demobilization	1 Job	-	$ 80,000
Excavation[1]	9,600 CY	10	96,000
Armor Stone			
New Stones	14,300 T	37	529,100
Salvaged Stones	1,600 T	25	40,000
Underlayer			
New Stones	6,300 T	34	214,200
Salvaged Stones	5,800 T	21	121,800
Bedding	1,700 T	30	51,000
			1,132,100
Contingency Allowance (20%)			226,400
SUBTOTAL			$1,359,000
Engineering and Design[2]			75,000
Plans and Specifications	60,000		
Engineering During Construction	15,000		
Supervision and Administration			$ 88,000
			1,522,000
Indirect non-Federal Costs			20,000
TOTAL PROJECT FIRST COST			$1,542,000

1/ Disposal site at Halawa.
2/ Excludes Pre-authorization Study Costs (DPR costs).

2. Investment Cost and Interest During Construction

Investment Cost was calculated with the following assumptions:

a. Interest rate at 8-1/8% per annum.

b. Uniform distribution of costs.

c. Construction period of 18 months, with two 9-month compounding periods.

$$\text{Investment Cost} = (1 + i)^{1-1/2} \left(\frac{PFC}{2}\right) + (1 + i)^{1/2} \left(\frac{PFC}{2}\right)$$

$i = 0.75 \times 0.08125 = 0.06094$
PFC = Project First Cost
= 1,542,000

$$\text{Investment Cost} = (1+0.06094)^{1.5} \left(\frac{1,542,000}{2}\right) + (1+0.06094)^{0.5} \left(\frac{1,542,000}{2}\right)$$

= 1,637,000

Interest During Construction (IDC) = 1,637,000 - 1,542,000
= $95,000

3. Maintenance Cost

Annual maintenance costs are assumed to be approximately 1% of the cost of the armor stones:

0.01 x 569,000 = $5,700

The local sponsors, the Dept. of Land and Natural Resources, are responsible for all maintenance costs of the completed project, as will be agreed upon in the Section 221 contract.

C. ALTERNATIVE PLAN 2

This alternative requires the construction of nine detached offshore breakwater structures along the shoreline of the study area.

1. Project First Cost

The following table summarizes the construction costs for this alternative.

Description	Quantity	Unit Cost ($)	Total ($)
Mobilization & Demobilization	1 Job	-	$ 80,000
Armor Stone	43,100 T	43	1,853,300
Core	7,400 T	33	244,200
Temp. Causeway & Workload	10,600 CY	29	307,400
			2,484,900
Contingency Allowance (20%)			497,000
SUBTOTAL			$2,982,000
Engineering and Design1/			110,000
Plans and Specifications	80,000		
Engineering During Construction	30,000		
Supervision and Administration			194,000
			3,286,000
Indirect non-Federal Costs			20,000
TOTAL PROJECT FIRST COST			$3,306,000

1/ Excludes Pre-authorization Study Costs (DPR costs).

2. Investment Cost and Interest During Construction

Assumptions for determining Investment Costs are as stated in Subsection B, except that the construction period is assumed to be 22 months.

$$i = \frac{11}{12} \times 0.08125 = 0.0745$$

PFC = $3,306,000

$$\text{Investment Cost} = (1+0.0745)^{1.5} \left(\frac{3,306,000}{2}\right) + (1+0.0745)^{0.5} \left(\frac{3,306,000}{2}\right)$$

$$= 3,555,000$$

Interest During Construction (IDC) = 3,555,000 - 3,306,000
= $249,000

3. Maintenance Cost

Annual maintenance costs are assumed to be approximately 1% of the cost of the armor stones plus the cost of installing and dismantling causeways to gain access to the offshore structures every 10 years.

0.01 x 1,853,000 = $18,500

Cost of causeways (@ 10-year intervals)

Mobilization & Demobilization	$ 20,000
Causeway Material & Workload	307,400
	327,400
Contingency Allowance (20%)	65,500
TOTAL	$392,900

Annual Cost = (TOTAL) x (PWF) x (CRF)
= (392,900) (0.8074) (0.08292)
= 26,300

Total Annual Maintenance Cost = 18,500 + 26,300 = $44,800

The local sponsor of the project is responsible for all maintenance costs of the completed project.

D. ALTERNATIVE PLAN 3

This alternative requires the construction of 1,350 feet of stone revetment and three offshore breakwater structures fronting 600 feet of shoreline.

1. Project First Cost

The following table summarizes the construction costs for this alternative.

Description	Quantity	Unit Cost ($)	Total ($)
Mobilization & Demobilization	1 Job	-	$ 80,000
Revetment			
Excavation	7,000 CY	5 1/	35,000
Backfill	7,000 CY	3	21,000
Armor Stones			
New Stones	9,800 T	37	362,600
Salvaged	1,600 T	25	40,000
Underlayer Stones			
New	2,500 T	34	85,000
Salvaged	5,800 T	21	121,800
Bedding	1,000 T	30	30,000
Offshore Breakwater			
Temp Causeway & Workload	3,600 CY	29	104,400
Armor Stones	15,800 T	43	679,400
Core	2,900 T	33	95,700
			1,655,000
Contingency Allowance (20%)			331,000
SUBTOTAL			$1,986,000
Engineering and Design 2/			80,000
Plans and Specifications	60,000		
Engineering During Construction	20,000		
Supervision and Administration			134,000
			2,200,000
Indirect non-Federal Costs			20,000
TOTAL PROJECT FIRST COST			$2,220,000

1/ Excavated material to be used as fill within construction easement; no hauling and disposal costs involved.

2/ Excludes pre-authorization study costs (DPR costs).

2. Investment Cost and Interest During Construction

Assumptions for determining Investment Costs are as stated in Subsection B, except that the construction period is assumed to be 20 months.

$$i = \frac{10}{12} \times 0.08125 = 0.0677$$

PFC = $2,220,000

$$\text{Investment Cost} = (1+0.0677)^{1.5} \left(\frac{2,220,000}{2}\right) + (1+0.0677)^{0.5} \left(\frac{2,220,000}{2}\right)$$

$$= 2,371,000$$

Interest During Construction (IDC) = 2,371,000 - 2,220,000
= $151,000

3. Maintenance Costs

Annual maintenance costs are assumed to be approximately 1% of the cost of the armor stones plus the cost of installing and dismantling causeways to gain access to the offshore structures every 10 years.

0.01 x 1,082,000 = 10,800

Cost of Causeways (@ 10-year intervals)

Mobilization & Demobilization	$ 20,000
Causeway Material & Workload	104,400
	124,400
Contingency Allowance (20%)	24,900
TOTAL	$149,300

Annual Cost = (TOTAL) x (PWF) x (CRF)
= (149,300) (0.8074) (0.08292)
= 10,000

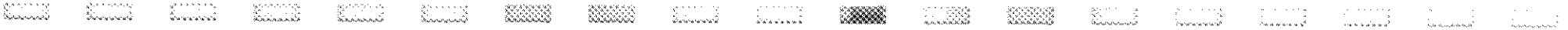
Total Annual Maintenance Cost = 10,800 + 10,000 = $20,800

All costs incurred for the maintenance of the completed works are the responsibility of the local sponsor.

E. SUMMARY OF COSTS

	ALT 1	ALT 2	ALT 3
Construction Cost	$1,359,000	$2,982,000	$1,986,000
Engrg and Design	75,000	110,000	80,000
Supervision & Admin.	88,000	194,000	134,000
Indirect Non-Federal Costs	20,000	20,000	20,000
Project First Cost	1,542,000	3,306,000	2,220,000
IDC Cost	95,000	249,000	151,000
PROJECT INVESTMENT	$1,637,000	$3,555,000	$2,371,000
TOTAL PROJECT INVESTMENT[1/]	1,724,500	3,642,500	2,458,500
Maintenance Costs	5,700	44,800	20,800

1/ Includes pre-authorization study costs ($87,500)



SAND ISLAND
SHORE PROTECTION

APPENDIX E

ECONOMIC EVALUATION

APPENDIX E

ECONOMIC APPENDIX

SAND ISLAND SHORE PROTECTION
OAHU, HAWAII

Table of Contents

		Page
A.	GENERAL	E-1
B.	VISITOR COUNT OF CURRENT DEVELOPING PARK	E-1
C.	PROJECTION OF PARK VISITORS	E-2
D.	RECREATION BENEFITS - PLAN 3	E-5
E.	BEACH USE BENEFITS	E-8
F.	PLANS 1 AND 2 - RECREATION BENEFITS	E-8

APPENDIX E

SAND ISLAND SHORE PROTECTION

Benefit Analysis

A. GENERAL

Benefits creditable to Sand Island Shore Protection result from an increase in the quality of recreation activity and an increase in sandy beach area. Benefits are the measured difference between conditions with and without a shore protection project and are expressed as an equivalent annual value, using a discount rate of 8-1/8 percent and a 50-year project life.

B. VISITOR COUNT OF CURRENT DEVELOPING PARK

Estimated park visitation figures are available from the State of Hawaii, Department of Land and Natural Resources (DLNR), State Parks Division from 1977 through 1982. The estimates are made for periods when the park was open for public use. There were periods when the park was closed because of construction. The number of visitors was estimated by DLNR by counting the number of cars using the parking areas. The person-per-vehicle ratio of 4 to 1 was used.

Field observation by POD staff of park use indicated that three persons-per-car would be more appropriate ratio to use for planning purposes. Applying this ratio, the total number of visitors for 1982 is 486,000 visits instead of 651,000 visits (Table 1).

Table 1. Estimated Cars and Visitors to Sand Island, 1977-1982

Month	FY77	FY78	FY79	FY80	FY81	FY82
Jul	Closed	4,984	4,873	5,705	Closed	18,252
Aug	Closed	3,800	4,400	1/	Closed	22,872
Sep	11,257	4,644	5,996	1/	Closed	16,473
Oct	4,700	5,850	5,555	1/	Closed	17,239
Nov	4,499	4,550	4,958	1/	Closed	13,388
Dec	4,157	5,000	7,501	1/	Closed	7,781
Jan	4,821	4,290	2,743	1/	Closed	15,740
Feb	4,267	3,750	3,493	1/	Closed	19,971
Mar	4,318	4,250	5,944	Closed	10,371	16,370
Apr	5,171	5,150	9,478	Closed	13,021	13,841
May	4,265	4,540	7,344	Closed	21,239	Closed
Jun	5,036	5,275	8,965	Closed	14,992	Closed
Total Cars	52,491	58,883	68,250		59,626	162,017
Est Visits @ 4/Auto	165,000	224,000	285,000	274,000	238,000	651,000
Est Visits @ 3/Auto	157,000	176,000	204,000	130,000	179,000	486,000

1/ open to public intermittently.

As indicated in earlier chapters of the main report the first increment of park development was 13 acres. The second increment includes an additional 30 acres which encompasses the current plans of improvement. To date, a total of 83 acres have been cleared and developed and will become available for public use in increments after the grassy vegetation is full grown.

Visits to the park available for public use were divided into two increments (30 ac and 13 ac) for planning purposes. Based on average visits per acre there were 339,000 visits made to the 30 acre site in 1982 (Table 2).

Table 2. Estimated Visits Made to 30 Acre Park Encompassing Project Site

Year	Estimated Visits at 3 Persons Per Auto (1,000)	Average Visits Per Acre (1,000)	Acres Available for Public Use (Ac)	Estimated Visits 13 Acres (1,000)	Estimated Visits 30 Acres (1,000)
1976	No Record	0	0	0	0
1977	157	12.1	13	157	0
1978	176	13.5	13	176	0
1979	204	15.7	13	204	0
1980	130	3.0	43	40	90
1981	179	4.2	43	54	125
1982	486	11.3	43	147	339

C. PROJECTION OF PARK VISITORS

A projection of the number of persons visiting the park was made using available population projections for Oahu by districts and available trends in recreation from the State Comprehensive Outdoor Recreation Plan published in 1975 and the State Recreational Plan of 1980. A summary of the reasoning used for the development of park use projections for the 50-year period beginning at the base year 1987 and extending to 2037 is presented in the following paragraphs.

Oahu Population - The 1980 population from the 1980 Census of Population and estimates for 1990 and 2000 were obtained from the State of Hawaii Data Book 1982 Department of Planning and Economic Development. The 1983 and 1987 population estimates were interpolated. The 2037 projected population is based on the same annual growth to year 2000. Planning areas for Oahu were those designated in the State Comprehensive Outdoor Recreation Plan (SCORP) 1975 and The State Recreation Plan (SRP) 1980.

Activity participation rates in activity occasion per 1,000 people included - picnicking, swimming, and camping. Computed total occasions were based on the activity occasion/1,000 people of 314.50/1,000 for a weekend day and 108.0/1,000 for a weekday.

On Oahu, residents are willing to travel outside of their planning area of origin for recreation. The willingness to travel to the Honolulu planning area, where Sand Island is located, is measured in percent distribution of recreation activities from all planning areas. Data from the SRP 1980 indicated 14 percent of total residential recreation participation from the Aiea-Pearl City planning area is destined for the Honolulu planning area. Percentages from other planning areas are listed in Table 3. The total number of recreational occasions (visits) destined to the Honolulu planning area in 1980 based on the above described format is 9,676,000 occasions (Table 3).

Table 3. Projected Recreational Occasions (Visits) to Honolulu Planning Area in 1980
(Camping, Swimming, Picnicking)

Oahu Planning Area Origin	1980 Population[1/]	Occasion Per Year to Picnic Camp & Swim[2/]	Percent of Occasion to Honolulu[3/]	Occasion to Honolulu
Honolulu	326,000	19,852,000	42	8,338,000
Ewa Waianae	65,300	3,976,000	1	40,000
Central Honolulu	85,300	5,194,000	2	104,000
Koolaupoku	110,900	6,753,000	0	0
Koolauloa, North Shore	25,500	1,552,000	0	0
Aiea - Pearl City	140,000	8,525,000	14	1,194,000
		Total Occasions Per Year =		9,676,000

1/ SRP 80, pg 77, Table 13.
2/ SCORP 75, pg 44, Table 5-2.
Occasions/1,000 people: Weekend day = 314.50, Weekday = 108.0
3/ SRP 80, pg 96, Table 35.

Population increases bear directly on the increase in number of recreation activities. Using 1980 recreation occasions to Honolulu of 9,676,000 occasions as the base, projected increases in occasions to the year 2037 followed projected State population (Table 4).

In the Honolulu planning area there exists 690.75 acres of improved passive recreational areas and beaches fronting a park. A capacity of 8,760,000 occasions to this acreage was computed based on the following parameters.

50 persons/acre = optimal density for sightseeing picnic use (consistent with Corps criteria and City and County Department of Parks and Recreation criteria.)

2 turnover rate per day (State Comprehensive Outdoor Recreation Plan, 1975)

82 percent of all park activity occurs on weekends. (SCORP 1975)

The projected available recreational occasions (visits) available to Sand Island is the total projected recreation occasions to Honolulu that cannot be satisfied by the limited available facilities. There were 9,676,000 occasions projected in 1980 and 8,760,000 occasions were satisfied by existing facilities, leaving 1,006,000 unsatisfied occasions that are available for Sand Island Park. Projections to year 2037 derived likewise are shown in Table 4.

Table 4. Projected Recreational Visits Available to Use Sand Island Park

Year	Projected State Population (1,000)	Percent Increase %	Projected Rec Occasion to Honolulu (1,000)	Exist Rec Occasion Limits to Honolulu (1,000)	Available Rec Occasions to Sand Isle (1,000)
1980	965.0		9,676	8,760	1,006
1983	1,005.0	4.1	10,072	8,760	1,312
1987	1,053.0	4.8	10,556	8,760	1,796
1990	1,091.0	3.6	10,936	8,760	2,176
2000	1,225.0	12.2	12,270	8,760	3,510
2037	1,880.0	53.4	18,800	8,760	10,040

Required acreage to accommodate the unsatisfied occasions can be computed using the same parameters mentioned in the earlier paragraph. They were 50 persons/acre, 2 turnover rate perday, and 82 percent of all park activities occur on weekends. Required acreage is 79 acres for 1980 and 791 acres for 2037 (Table 5). It is notable when comparing acreages in Table 5 that Sand Island Park does not have sufficient planned acreage to accommodate the projected required acreage for recreation to Honolulu and therefore could receive capacity annual visits during all times. However, will the park attract capacity usage? In 1982 these were 339,000 visits (Table 2) made to the Phase II 30 acre site that has a planning capacity of 380,000 annual visits. During that year the park was closed for two months because of construction and yet received 89 percent of its planned capacity. The State Parks Division's records of group-use permits indicate a growing demand to use the park.

As a result, in projecting visitors to Sand Island Park, maximum planned capacity is used. Projected visits to the 30 acres adjacent to the project site for the base year 1987 and throughout the project life is 380,000 visits (Table 5).

Table 5. Projected Visits to the Project Site Park (30 Acres)

Year	Available Rec Occasion to Sand Isle (1,000)	Required Acreage to Accommodate Occasions AC 1/	Planned Useable Rec Acreage at Sand Isle AC	Projected Visits to 30 Acre Park (1,000)
1980	1,006	79	43	90 2/
1983	1,312	103	43	339 2/
1987	1,796	141	66	380 3/
1990	2,176	171	83	380
2000	3,510	276	140	380
2037	10,040	791	140	380

1/ Parameters: 50 persons/AC, 2 turnover per day, 82% of all activity occur on weekends.

2/ Estimates from car counts.

3/ Maximum annual capacity of 380,000 visitor days for 30-acre park.

D. RECREATION BENEFITS - PLAN 3

The section of Sand Island Park needing shoreline protection is designated primarily as a passive-oriented ocean shore recreational area. According to the "Sand Island State Park Final Report," suitable activities identified for the study area include camping, picnicking, swimming, scenic viewing, strolling, and fishing.

Using criterion from US Water Resources Council Principles and Guidelines for Water and Related Land Resources, 10 March 1983, a judgment factor matrix was developed to estimate the increase in the value of recreation activity resulting from the project. Two different point totals are desired using this judgment approach to compare the existing (without-project) recreation value of Sand Island State Park use to the value of the park use with the tentatively recommended (Plan 3) shoreline project (Table 6).

Recreation Experience - Several general activities exist. Among these are picnicking, camping, seashore wading and exploring, fishing, scenic viewing, and strolling. Under existing conditions the land-water interface is unsafe and unsightly which detracts significantly from the enjoyment of these activities. With the improvement and protection of shoreline areas, the quality of existing activities is greatly enhanced. The park area itself is usually sunny and dry because of the effect of the mountains on the tradewinds. The project will allow better and safer access to the land-water interface and upgrade the recreation experiences to high quality for all general activities that exist. This improvement is recognized in the evaluation matrix.

Availability of Opportunities - Under existing conditions, several coastal picnicking and passively-oriented recreational areas are located within 15 to 60 minutes travel time. However, with the shoreline improved and protected, fewer alternatives matching the park in quality will be available. This improvement is reflected by an increase in score value for this particular criterion.

Carrying Capacity - Presently, facilities include restrooms, parking lots, lighting, paved paths, drinking fountains, and picnic furniture. These facilities were recently constructed and are in good condition. The implementation of the proposed project will not enhance the quality of these existing facilities. However, it may protect them against future damage and subsequent degradation of quality. No change of rating is indicated on the evaluation matrix.

Accessibility - Access to Sand Island State Park can presently be classified as fair. The proposed shoreline protection project would have no effect on park access. Therefore, no change in score is indicated.

Environmental Quality - The shoreline of this park is presently in very poor condition. The visual impact is a combination of deteriorating revetment, areas of severe erosion, and scattered jagged rocks washed inland from the revetment. This condition is shown dramatically in the photographs in the main report. A restored shoreline would enhance the overall aesthetic quality of the park and also provide for greater safety of persons using the immediate waterfront areas. This difference is indicated in the evaluation matrix.

TABLE 6. Judgement Factor Matrix for Recreation Activities

Criteria	Judgment factors				
(a) Recreation experience [1]	Two general activities [2]	Several general activities	Several general activities; one high quality value activity [3]	Several general activities; more than one high quality high activity	Numerous high quality value activities; some general activities
Total points: 30 Point value:	0-4	5-10	11-16	17-23	24-30
(b) Availability of opportunity [4]	Several within 1 hr. travel time; a few within 30 min. travel time	Several within 1 hr. travel time; none within 30 min. travel time	One or two within 1 hr. travel time; none within 45 min. travel time	None within 1 hr. travel time	None within 2 hr. travel time
Total points: 18 Point value:	0-3	4-6	7-10	11-14	15-18
(c) Carrying capacity [5]	Minimum facility development for public health and safety	Basic facilities to conduct activity(ies)	Adequate facilities to conduct without deterioration of the resource or activity experience	Optimum facilities to conduct activity at site potential	Ultimate facilities to achieve intent of selected alternative
Total points: 14 Point value:	0-2	3-5	6-8	9-11	12-14
(d) Accessibility	Limited access by any means to site or within site	Fair access, poor quality roads to site; limited access within site	Fair access, fair road to site; fair access, good roads within site	Good access, good roads to site; fair access, good roads within site	Good access, high standard road to site; good access within site
Total points: 18 Point value:	0-3	4-6	7-10	11-14	15-18
(e) Environmental quality	Low esthetic factors [6] exist that significantly lower quality [7]	Average esthetic quality; factors exist that lower quality to minor degree	Above average esthetic quality; any limiting factors can be reasonably rectified	High esthetic quality; no factors exist that lower quality	Outstanding esthetic quality; no factors exist that lower quality
Total points: 20 Point value:	0-2	3-6	7-10	11-15	16-20

[1] Value for water-oriented activities should be adjusted if significant seasonal water level changes occur.
[2] General activities include those that are common to the region and that are usually of normal quality. This includes picnicking, camping, hiking, riding, cycling, and fishing and hunting of normal quality.
[3] High quality value activities include those that are not common to the region and/or Nation and that are usually of high quality.
[4] Likelihood of success at fishing and hunting.
[5] Value should be adjusted for overuse.
[6] Major esthetic qualities to be considered include geology and topography, water, and vegetation.
[7] Factors to be considered to lowering quality include air and water pollution, pests, poor climate, and unsightly adjacent areas.

The point value totals for conditions without an improvement and with improvement conditions are based on the average value assigned for the judgment factor selected. The results are tabulated in the following matrix:

CRITERION	EVALUATION MATRIX JUDGMENT FACTOR SCORE PLAN III	
	Without	With
Recreation Experience	7.5	20
Availability of Opportunity	5	8.5
Carrying Capacity	7	7
Accessibility	8.5	8.5
Environmental Quality	1	8.5
TOTAL SCORE	29	52.5

The point score increases from 29 to 52.5 by improving conditions along the park shoreline. As shown below, the point value generated by the judgment factor matrix can be from 0 to 100 and can be used as an index to estimate a change in user day value within the currently established range of $1.60 to $4.80 (Water Resources Council, Principles and Guidelines for Water and Related Land Resources 10 March 1983).

POINT VALUE	0	10	20	30	40	50	60	70	80	90	100
RECREATION VALUE PER USER DAY	1.60	1.90	2.10	2.40	3.00	3.40	3.70	3.90	4.30	4.60	4.80

The existing recreational value of the park based on the judgment factor score is $2.37 per user day. The recreational value of park with the shoreline restored and protected is $3.48 per user day or an increase of $1.11 per user day over the without-project conditions.

Estimated average annual recreation benefits are shown in Table 7, based on an economic life of 50 years, and a base year of 1987.

Table 7. Average Annual Recreation Benefits

PERIOD	PROJECTED ANNUAL VISITS	INCREMENT	EQUIVALENT FACTOR	INCREMENTAL AVERAGE ANNUAL VISITS
Base Year	380,000	380,000	1.0000	380,000
50	380,000	0	-	0
Equivalent annual visits				380,000
Average annual value ($3.48/visit) under improved condition				$1,322,000
Average annual value ($2.37/visit) under condition without project				$900,000
Average annual recreation benefits				$422,000

E. BEACH USE BENEFITS

Plans 2 and 3 are designed to protect a wading pool and a sandy beach. The designed plans could possibly increase the existing 35,000 square foot beach in five years through accretion of sand. If this increase were to double the capacity of the beach area, then beach use would increase from 182,000 annual visits to 364,000 annual visits or a net increase in capacity of 182,000 annual visits. Beach capacity is computed using the following Corps of Engineers criteria.

75 square foot of dry beach area per bather at time of peak use.

Total peak-day use is twice peak-hour use.

The average weekday attendance approximates one-third of the peak-day attendance.

Because of the already crowded beaches in Oahu any additional beach area will encourage more beach visits. If a value of $1.11 per visit is used, then an average annual benefit of $202,000 is derived from increased visits due to increased beach area. However, these additional visits will probably be from those areas already counted to attend the beach park. To estimate the number of visits encouraged because of the additional beach area and to separate the numbers of park visits from additional visitors because of the increased beach area is difficult. Therefore to avoid double counting of visits to the park and the additional beach area, no quantified amount is used in the final benefits claimed for the project.

Table 8. Benefit Summary

Item	Average Annual Benefits
Park Recreation	$422,000
Increased Beach Use	Not Claimed
TOTAL	$422,000

F. PLANS 1 AND 2 - RECREATION BENEFITS

Because Plans 1 and 2 provide for shoreline protection differing from Plan 3 their judgment factor matrix development should be discussed.

In Plan I the entire shoreline is revetted, does not develop the wading pool, and the sandy beach, but increases areas for recreation opportunity such as fishing. This plan has the least diversity in recreation opportunity. A judgment factor matrix is listed in Table 9. The point score increases from 29.0 to 44.0 from without to with revetment improvements along the park shoreline. The recreational value of the park based on the judgment factor score within the range of $1.60 to $4.80 for the existing condition is $2.37 and for conditions with protected shoreline is $3.16.

Table 9. Judgment Factor Matrix for Plan 1

CRITERION	JUDGMENT FACTOR SCORE PLAN 1	
	Without	With
Recreation Experience	7.5	15.0
Availability of Opportunity	5.0	8.5
Carrying Capacity	7.0	7.0
Accessibility	8.5	8.5
Environmental Quality	1.0	5.0
TOTAL SCORE	29.0	44.0

The computed benefits based on equivalent annual visits of 380,000 visits are as follows:

Equivalent annual visits	380,000
Average annual value ($3.16/visit) under improved condition	$1,200,000
Average annual value ($2.37/visit) under condition without project	$900,000
Average annual recreation benefits	$300,000

In Plan 2 the entire shoreline is protected by offshore breakwaters creating an all water interface of high quality recreation from pockets of beaches, but hurts activities such as surfing. There are less diversity in recreation opportunities than Plan 3, but more rock surface areas. A judgment factor matrix is listed in Table 10. The point score increases from 29.0 to 49.5 from without to with offshore improvements along the park shoreline. The recreational value of the park based on the judgment factor score within the range of $1.60 to $4.80 for the existing condition is $2.37 and for conditions with protected shoreline is $3.38.

Table 10. Judgment Factor Matrix for Plan 2

CRITERION	JUDGMENT FACTOR SCORE PLAN 2	
	Without	With
Recreation Experience	7.5	17.0
Availability of Opportunity	5.0	8.5
Carrying Capacity	7.0	7.0
Accessibility	8.5	8.5
Environmental Quality	1.0	8.5
TOTAL SCORE	29.0	49.5

The computed benefits based on equivalent annual visits of 380,000 visits are as follows:

Equivalent annual visits	380,000
Average annual value ($3.38/visit) under improved condition	$1,284,000
Average annual value ($2.37/visit) under condition without project	$900,000
Average annual recreation benefits	$384,000

SAND ISLAND
SHORE PROTECTION

APPENDIX F

NATURAL RESOURCES

APPENDIX F

SAND ISLAND
SHORE PROTECTION

NATURAL RESOURCES

TABLE OF CONTENTS

SECTION	ITEM	PAGE
I	National Marine Fisheries Service Coordination	F-1
II	Fish and Wildlife Service Final Coordination Act Report	F-3

September 12, 1983

Floyd S. Anders
Acting Regional Director, SW Region
National Marine Fisheries Service NOAA
300 South Ferry Street
Terminal Island, California 96731

Dear Mr. Anders:

This letter forwards the US Army Corps of Engineers biological assessment on the effects of the proposed Sand Island Shore Protection project on the threatened Green Sea Turtle. The assessment fulfills the requirements of Section 7 of the Endangered Species Act of 1973 as amended. Based on our biological assessment (enclosure 1) we believe the proposed shore protection project for Sand Island, Oahu will not adversely impact the green turtle, nor result in the destruction or adverse modification of its habitat. If you have any question, please contact Mr. William Lennan, Environmental Resources Section at (808) 438-2264.

Sincerely,

Kisuk Cheung
Chief, Engineering Division

Enclosure

ENDANGERED SPECIES BIOLOGICAL ASSESSMENT FOR THE
SAND ISLAND SHORE PROTECTION STUDY

1. Background Information

a. Project description: The recommended shore protection plan for Sand Island, Hawaii, is Alternative 3 as shown on figure 12 of the Draft Detailed Project Report and Environmental Impact Statement, dated June 1983 which was previously furnished your Western Pacific Program Office. The project, if constructed, will protect approximately 2,000 feet of shoreline on Sand Island, an island consisting almost entirely of fill land. The shoreline and adjacent lands are part of the Sand Island State Park.

b. Biological Information: National Marine Fisheries Service informed the Corps that the waters adjacent to Sand Island are a likely foraging area for juveniles of the federally listed threatened green turtle, Chelonia mydas. Although the green turtle is commonly observed in the leeward waters off Oahu, the area around Sand Island was not identified as an important foraging area in Synopsis of Biological Data on the Green Turtle in the Hawaiian Islands by George Balazs, nor were turtles observed during five excursions into the off-shore waters of the study area.

2. Impact Assessment

Constructing the shoreline revetments at each end of the project will have no effect on turtle habitat since turtles probably do not come ashore in this area. There is much human activity associated with the park, and the shore material does not appear to be suitable for nesting. The off-shore breakwaters planned for the center of the project will cover some potential foraging habitat; however, during site surveys off-shore by Corps biologists, no significant stands of algae preferred by the green turtle were observed, nor were large numbers of small invertebrates seen. In fact, the nearshore waters off Sand Island appear to be depauperate except for some stands of Galaxaura.

3. Conclusion

Due to the nature and location of the proposed project and the apparent lack of significant quantities of turtle food in the area, it is our conclusion that the shore protection project at Sand Island will not have an adverse impact on the threatened green turtle.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
300 South Ferry Street
Terminal Island, California 90731

September 21, 1983 F/SWR1:FIN

Mr. Kisuk Cheung
Chief, Engineering Division
U.S. Army Corps of Engineers
Honolulu District
Fort Shafter, Hawaii 96858

Dear Mr. Cheung:

This responds to your letter of September 12, 1983, regarding the effects of the proposed Sand Island Shore Protection project on the threatened green turtle (Chelonia mydas). We concur with your assessment that the project is not likely to adversely impact the green turtle or result in the destruction or adverse modification of its habitat. Accordingly, formal consultation under Section 7 of the Endangered Species Act of 1973, as amended will not be required for this project.

Sincerely yours,

Floyd S. Anders
Acting Regional Director

cc: F/SWR1

United States Department of the Interior

FISH AND WILDLIFE SERVICE
300 ALA MOANA BOULEVARD
P O BOX 50167
HONOLULU HAWAII 96850

IN REPLY REFER TO:
ES
Room 6307

AUG 23 1983

Colonel Alfred J. Thiede
U.S. Army Engineer District, Honolulu
Building 230
Fort Shafter, Hawaii 96858

Re: Final Coordination Act Report for Sand Island Shore Protection, Honolulu, Hawaii

Dear Colonel Thiede:

This is the U. S. Fish and Wildlife Service's Final Coordination Act Report regarding plans of the Honolulu District to provide shore erosion control measures at Sand Island. This report has been prepared under the authority of and in accordance with the provisions of Section 2(b) of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.) and other authorities mandating Department of Interior concern for environmental values. It is also consistent with the intent of the National Environmental Policy Act.

This report has been prepared by Yvonne Ching using the results of biological and oceanographic surveys, maps, project engineering and design information and drawings provided by the Army Corps of Engineers, Honolulu District (COE). Oceanographic data is based upon field surveys conducted by William Lennan of your staff in early 1983 and by the Hawaiian Electric Company (HECO) and Tetra Tech Inc. in 1976. Ornithological information is based on Mr. Lennan's surveys and information provided by the Hawaii Division of Forestry and Wildlife during surveys from 1976 to 1983.

DESCRIPTION OF THE PLANNING AREA

The study area is located on the southern side of Oahu (Fig. 1). Features discussed in this letter are centered on the south shore of Sand Island which is located in Honolulu Harbor (Fig. 2). Previous studies and reports which present descriptions of the geology, water quality and fish and wildlife resources in the study area include References 3, 4, 15, 17 and 19. Sand Island is composed of dredged material from Honolulu Harbor and a remnant seaplane runway in Keehi Lagoon. The nearshore waters along the southern shore are designated Class "A" according to the Hawaii Water Quality Standards.

CONSERVE AMERICA'S ENERGY

Save Energy and You Serve America!

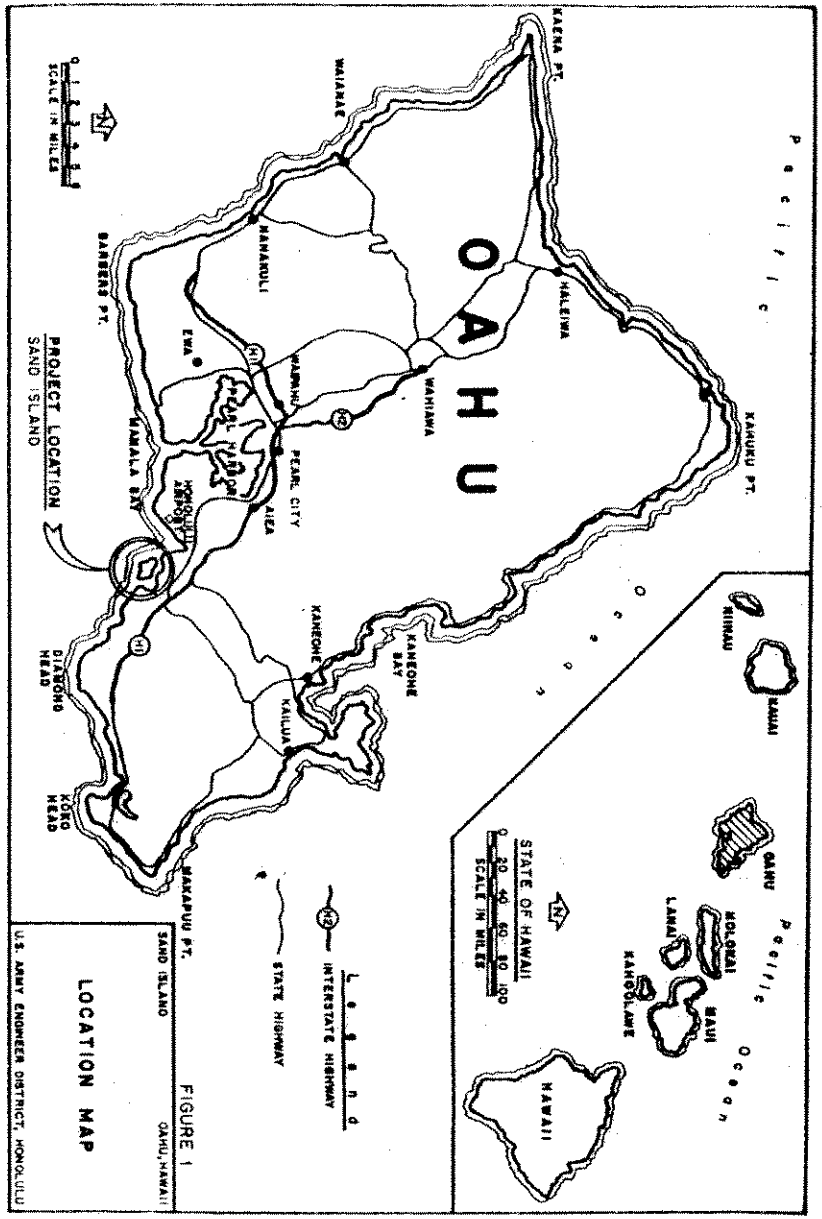


FIGURE 1

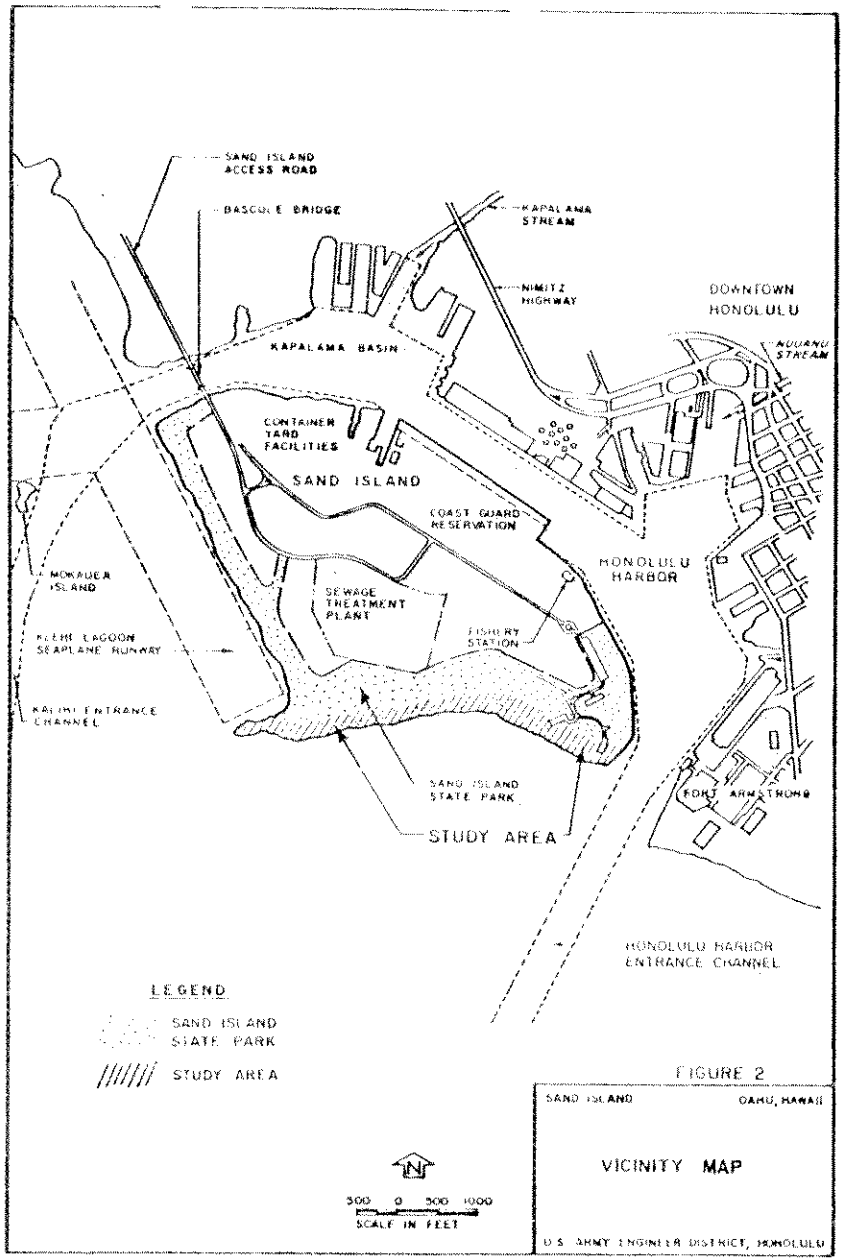


FIGURE 2

FISH AND WILDLIFE RESOURCES WITHOUT THE PROJECT

TERRESTRIAL RESOURCES. Terrestrial plant resources of the study area include common grasses, weeds and exotic trees and shrubs. Indigenous tree species which were planted in the park include milo (Thespesia populnea) and kou (Cordia sebestena). The avifauna observed in Keehi Lagoon by the Hawaii Division of Forestry and Wildlife (1976-1983) (Ref. 13) and on Sand Island by Corps survey (early 1983) (Ref. 17) are listed in Tables 1 and 2. At that time, both native, migratory and exotic birds were seen in the area. The Hawaiian Stilt, (Himantopus mexicanus knudseni), a listed endangered species (40 CFR 17.11 & 17.12), was recorded at Keehi Lagoon, but not at Sand Island. This waterbird may be an occasional visitor to the Island. Table 3 lists the mammals expected to occur on Sand Island.

MARINE RESOURCES. Table 4 presents an adapted list of fish species observed in Honolulu Harbor and off the south shore of Sand Island during surveys by HECO, Tetra Tech and COE (Ref. 3, 14 and 19). The Harbor and nearshore area off Sand Island provide habitat for a number of marine fish and invertebrates (Table 5). The Corps notes (Ref. 17 and 19) that fish, corals and invertebrates are not particularly abundant in the offshore area of the project.

Nehu (Stolephorous purpureus) is a principal commercial fishery bait resource for the Hawaiian Skipjack tuna industry. Aholehole (Kuhlia sandvicensis), Ama ama (Mugil cephalus), Awa (Chanos chanos), humuhumu (various Balistidae), Kala (Naso unicornis), Kumu (Parupeneus multifaciatus), Kupipi (Abudefduf sordidus) Manini (Acanthurus triostegus), Maomao (Abudefduf abdominalis), Moana (Parupeneus multifasciatus), Olo (Abula vulpes), Omaka (Stethojulis balteatus) and papio and ulua (various Carangidae) are species present which may have important recreational fishery value. Tidepools along reach 2 (Fig. 3), which have developed as a result of erosion behind the existing revetment, provide protected habitat for juvenile fish (Ref. 17). School children use this area for educational field trips.

The benthos in the offshore area is partially covered, continuous coral reef rock (Ref. 19). Talus and sand have been naturally deposited seaward to an existing, deteriorating, shoreline revetment. Coral cover is estimated to be less than 1%, with occasional small heads of Porites, Pocillopora and Montipora. The reef front, which varies from 200-600 feet from shore, is more biologically active than the nearshore areas, but in itself, is not particularly productive (Ref. 19). At the west end of the project area, sand from the adjacent beach covers most the offshore benthos.

TABLE 1. BIRDS RECORDED AT KEEHI LAGOON, OAHU
1976-1983

	ENGLISH NAME	HAWAIIAN NAME	SCIENTIFIC NAME
	I. NATIVE (RESIDENT) BIRDS		
1.	Hawaiian stilt*	aeo	Himantopus mexicanus knudseni
2.	Black-crowned night heron	auku'u	Nycticorax nycticorax hoactli
	II. MIGRATORY BIRDS		
1.	Pacific golden plover	kolea	Pluvialis dominica fulva
2.	Black-bellied plover		Squatarola squatarola
3.	Ruddy turnstone	akekeke	Arenaria interpres
4.	Wandering tattler	ulili	Heteroscelus incanum
5.	Sanderling	hunakai	Crocethia alba
6.	Glaucous gull	'opa'ipa'i	Larus hyberboreus
7.	Franklin's gull	'opa'ipa'i	Larus pipixcan
8.	Bonaparte's gull	'opa'ipa'i	Larus philadelphia
9.	Ring-billed gull	'opa'ipa'i	Larus delawarensis
10.	California gull	'opa'ipa'i	Larus californicus

TABLE 2. INTRODUCED (EXOTIC) BIRDS OBSERVED DURING 1983 CORPS STUDY

1.	Lace-necked dove	manuku	Streptopelia chinensis
2.	Barred dove	manuku	Geopelia striata
3.	Mockingbird		Mimus polyglottos
4.	Common mynah	manu-'ai-pilau	Acridotheres tristis
5.	House sparrow	manu-li'ili'i	Passer domesticus
6.	Cardinal	manu-'ula'ula	Cardinalis cardinalis
7.	House finch		Carpodacus mexicanus
8.	Brazilian cardinal		Paroaria coronata
9.	Ricebird	manu-'ai-laiki	Lonchura punctulata
10.	Cattle egret		Bulbulcus ibis
11.	Red-vented bulbul		Pycnonotus cafer

TABLE 3. MAMMALS

1.	Black rat	iole nui	Rattus rattus
2.	Brown rat	iole, Poo-wai	Rattus norvegicus
3.	Hawaiian rat	iole	Rattus exulans hawaiiensis
4.	House mouse	iole-liilii	Mus musculus domesticus
5.	Mongoose	iole-manakuke	Herpestes auropunctatus
6.	Feral cat	popoki	Felis catus
7.	Feral dog	ilio	Canis familiaris

*Federally listed Endangered species (50 CFR 17.11)

Tables taken from Ref. 19.

Table 4. Checklist of fishes in Honolulu Harbor and offshore of Sand Island. Adapted from Corps (1983), HECO (1976) and Tetra Tech (1976). Systematics based on Brock (1976) and unpublished corrections by University of Hawaii, Department of Zoology.

FISHES

ACANTHURIDAE

Acanthurus mata Randall
A. nigrofuscus (Forskal)
A. nigroris Cuvier & Valenciennes
A. triostegus (Randall)
A. xanthopterus Cuvier & Valenciennes
Ctenochaetus strigosus Randall
Naso unicornis (Bleeker)
Zanclus cornutus (Linnnaeus)
Zebrasoma flavescens (Bennett)

ALBULIDAE

Albula vulpes (Linnaeus)

AULOSTOMIDAE

Aulostomus chinenis (Linnaeus)

BALISTIDAE

Rhinecanthus rectangulus (Bloch & Schneider)

CARANGIDAE

Caranx ignobilis (Forskal)
C. melampygus (Cuvier & Valenciennes)
C. sexfaciatus Quoy & Gaimard
Scomberoides sancti-petri (Cuvier)

CHANIDAE

Chanos chanos (Forskal)

CHAETODONTIDAE

Chaetodon auriga Forskal
C. lunula (Lacepede)
C. miliaris Quoy & Gaimard
C. ornatissimus Cuvier & Valenciennes
C. unimaculatus Bloch

CICHLIDAE

Sarotherodon spp.

CONGRIDAE

Conger cinereus (Valenciennes)

DIODONTIDAE

Diodon holocanthus Linneaus
Diodon hystrix Linneaus

ELOPIDAE

Elops hawaiiensis Jordan & Evermann

ENGRAULIDAE

Stolephorous purpureus Fowler

HEMIRAMPHIDAE

Hemiramphus depauperatus Lay & Bennett

HOLOCENTRIDAE

Adioryx xantherythrus (Jordan & Evermann)
Flammeo sammara (Forskal)
Myripristis chryseres (Jordan & Evermann)
M. murdjan (Jordan & Evermann)

KUHLIIDAE

Kuhlia sandvicensis (Steindachner)

LABRIDAE

Gomphosus varius Lacepede
Stethojulis balteata (Quoy & Gaimard)
Thalassoma duperreyi (Quoy & Gaimard)
T. fuscum (Lacepede)

LUTJANIDAE

Lutjanus fulvus (Bloch & Schneider)

MONACANTHIDAE

Pervagor spilosoma (Lay & Bennett)

MUGILIDAE

Mugil cephalus Linnaeus

MULLIDAE

Mulloidichthys vanicolensis (Forskal)
M. flavolineatus (Gunther)
Parupeneus multifasciatus (Quoy & Gaimard)
P. porphyreus Jenkins
Upeneus arge Jordan & Evermann

MURAENIDAE

Gymnothorax undulatus (Lacepede)

OSTRACIONTIDAE

Ostracion meleagris Jenkins

POMACENTRIDAE

Abudefduf abdominalis (Quoy & Gaimard)
A. sordidus (Forskal)
Chromis ovalis (Steindachner)
Dascyllus albisella Gill
Stegastes fasciolatus (Jordan & Everman)

SCORPIDIDAE

Microcanthus strigatus (Curvier & Valenciennes)

SPHYRAENIDAE

Sphyraena snodgrassi (Walbaum)

SPHYRNIDAE

Sphyrna lewini (Griffith)

TETRAODONTIDAE

Arothron hispidus (Linnaeus)
Canthigaster jactator (Jenkins)

Table 5. Algae and invertebrates observed off the south shore of Sand Island. Adapted from Corps Survey, 1983.

ALGAE

CHLOROPHYTA

Bryopsis sp.
Dictyosphaeria cavernosa
D. versluyii
Neomeris annulata

RHODOPHYTA

Galaxaura rugosa
Pterocladia caerulescens
Porolithon gardineri

INVERTEBRATES

CNIDARIA

Palythoa tuberculosa
Montipora flabellata
Pocillopora meandrina
Porites brighami
Porites lobata

CRUSTACEA

Grapsus grapsus tenuicrustatus

ECHINODERMATA

Diadema paucispinum
Tripneustes gratilla
Holothuria atra
Actinopyga mauritiana

ENDANGERED SPECIES. There are no species of plants or animals listed or proposed for listing as threatened or endangered, under our jurisdiction, which would be affected by the proposed project. The National Marine Fisheries Service has advised that the project area is a likely foraging area for juvenile threatened Green Sea Turtles (Chelonia mydas) (40 CFR 17.11 and 17.12). Should the COE determine that the project may affect this threatened species, it is advised that formal consultation (in accordance with Section 7 of the Endangered Species Act) be initiated with the National Marine Fisheries Service.

DESCRIPTION OF THE PROPOSED PROJECT

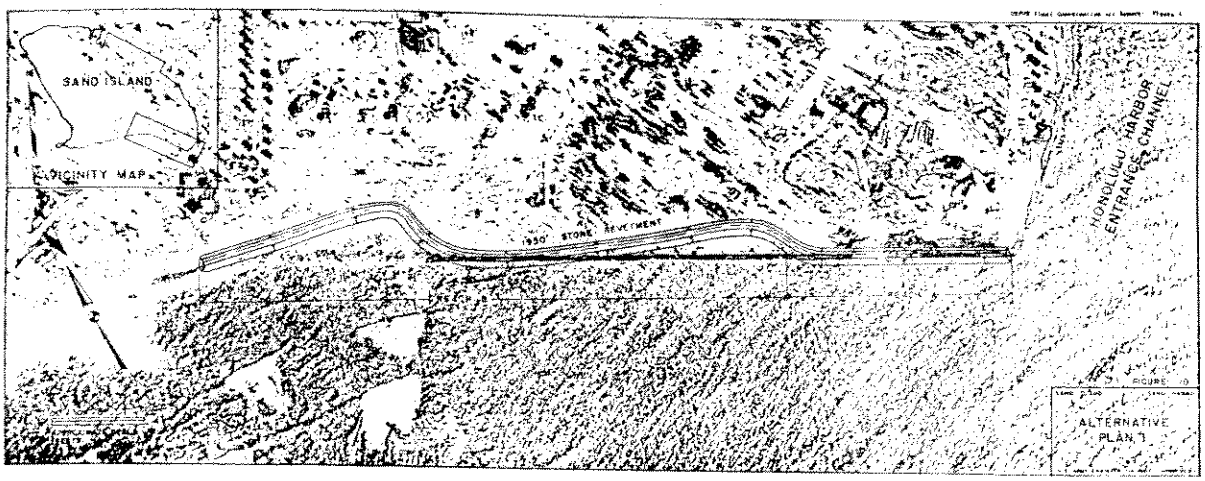
The following alternative plans were chosen for consideration as shoreline protection measures (Ref 19):

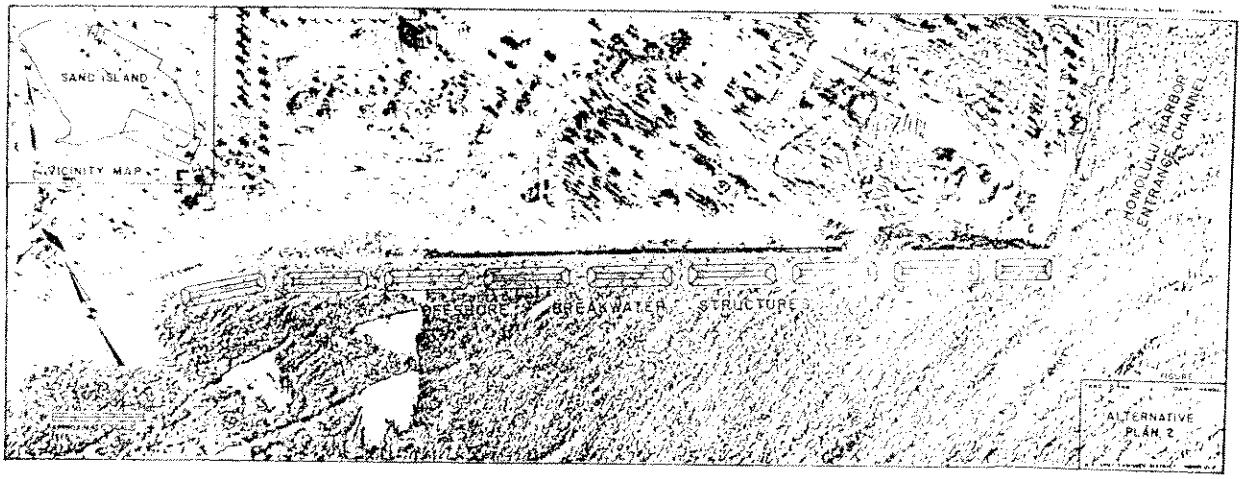
Alternative 1: Revetment
Alternative 2: Offshore Breakwater (Detached)
Alternative 3: Combination of Revetment and Breakwater

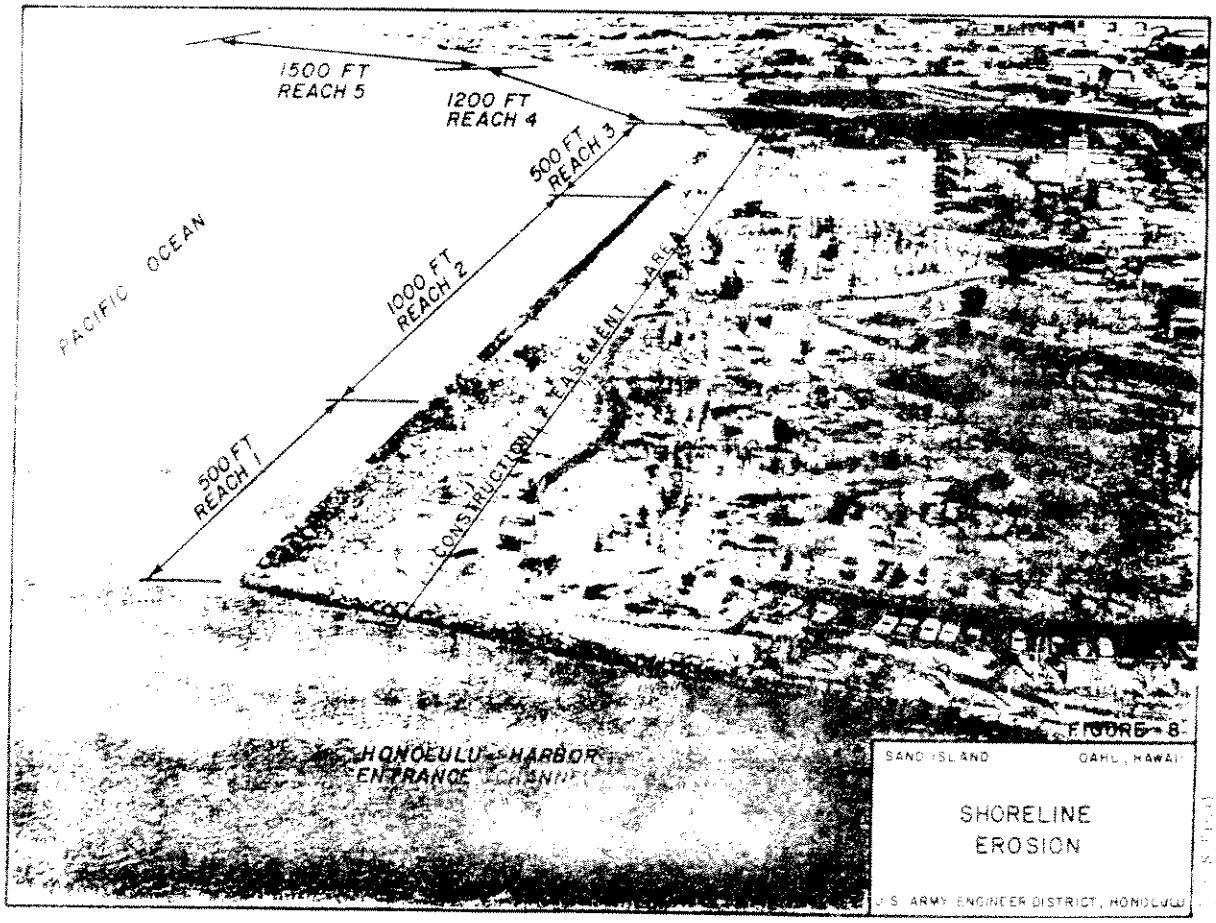
ALTERNATIVE 1. A 1,950-foot stone revetement would be constructed from the southeast corner of Sand Island, along the existing eroded shoreline to the sand beach (Fig. 4). In the first section of shoreline identified as reach 1 (Fig. 3), 500 feet of the existing revetment will be removed and replaced with new revetment. This section would require toe and bedding structures to be placed at a -15 foot depth. Other sections of the revetment would require toe structure placement down to or slightly below the ground grade. All sections of the revetment structure would have a crest width of 15 feet (3 stones) with stone size ranging from 1-1/2 to 2-1/2 tons for the armor layer and 300 to 500 lbs. for the underlayer (Fig. 7). Suitable stones removed from the existing revetment would be salvaged and used in construction of the new revetment.

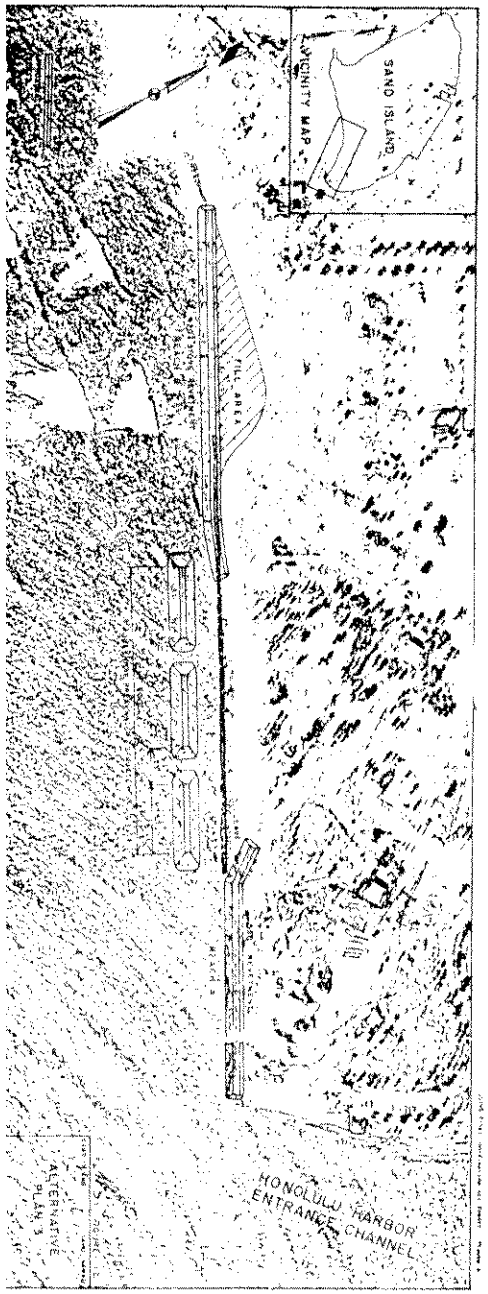
ALTERNATIVE 2. Nine detached breakwater structures would be constructed 100 feet offshore along an approximate 2,000 feet of shoreline (Fig. 5). Breakwaters would be placed in water depths ranging from 2-1/2 to 11 feet. Crest width and height will be 12.8 feet by 8.0 feet (MLLW). Stone size would range from 3 to 5-1/4 tons for the armor layer and 600 to 1,100 lbs for the core. Most of the offshore breakwater structures would be placed on the fringing reef. Approximately 600 linear feet of the structures' shoreward toe will require subgrade protection.

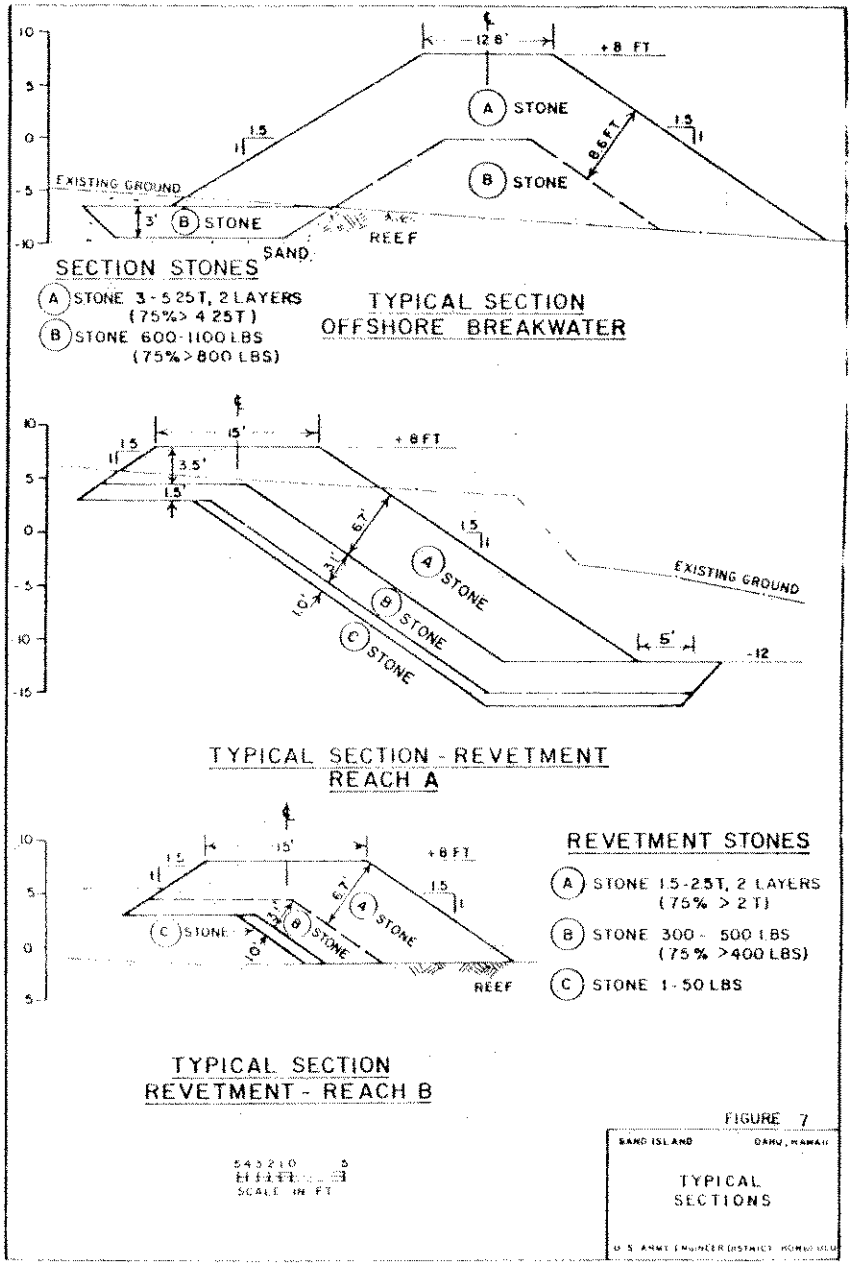
ALTERNATIVE 3. This alternative would combine componets of Alternatives 1 and 2, in an effort to mitigate negative impacts to recreational resource concerns expressed by the public (Fig. 6). Reach 1 would require removal of the existing revetment and construction of a 530-foot shoreline revetment. Design would be


SAND ISLAND
VICINITY MAP
1950' STONE REVETMENT
HONOLULU HARBOR ENTRANCE CHANNEL
ALTERNATIVE PLAN 1


SAND ISLAND
VICINITY MAP
HONOLULU HARBOR ENTRANCE CHANNEL
BREAKWATER STRUCTURE
ALTERNATIVE PLAN 2


1500 FT REACH 5
1200 FT REACH 4
500 FT REACH 3
1000 FT REACH 2
500 FT REACH 1
PACIFIC OCEAN
CONSTRUCTION & EASEMENT AREA
HONOLULU HARBOR ENTRANCE CHANNEL
FIGURE 8
SAND ISLAND OAHU, HAWAII
SHORELINE EROSION
U.S. ARMY ENGINEER DISTRICT, HONOLULU


VICINITY MAP
SAND ISLAND
FILL AREA
ALTERNATIVE PLAN 3
HONOLULU HARBOR ENTRANCE CHANNEL


+8 FT
A STONE
B STONE
EXISTING GROUND
3'
B STONE
SAND
REEF
SECTION STONES
A STONE 3 - 5 25T, 2 LAYERS (75%> 4 25T)
B STONE 600-1100 LBS (75%>800 LBS)
TYPICAL SECTION OFFSHORE BREAKWATER
+8FT
EXISTING GROUND
A STONE
B STONE
C STONE
TYPICAL SECTION - REVETMENT REACH A
+8 FT
A STONE
B STONE
C STONE
REEF
REVETMENT STONES
A STONE 1.5-2.5T, 2 LAYERS (75% > 2 T)
B STONE 300 - 500 LBS (75% >400 LBS)
C STONE 1-50 LBS
TYPICAL SECTION REVETMENT - REACH B
SCALE IN FT
FIGURE 7
SAND ISLAND
OAHU, HAWAII
TYPICAL SECTIONS
U.S. ARMY ENGINEER DISTRICT, HONOLULU

similar to the revetment design in Alternative 1. In reach 2, three offshore breakwaters would be placed along the following 600 feet of shoreline in water depths ranging from 4 to 7-1/2 feet. Designs would be similar to that described in Alternative 2. Approximately 300 linear feet of the structure will require subgrade protection. Approximately 200 feet of the existing shoreline revetment will be left intact to provide additional wading and swimming shelter. Reach 2 would include construction of an 820-foot revetment similar to the revetment in reach 1. Approximately 34,000 square feet of parkland, which had been lost through progressive erosion, would be reclaimed by backfilling behind the revetment.

Fill material will be provided by excavation spoils from other reaches of the shoreline. Armor stone, bedding material and graded aggregates used in construction will be mined from the Kapaa Quarry in the Kailua-Kaneohe area, located 25 miles from the project site. Stone from the existing revetment will be reused when possible. The disposal site for excess spoils will be at the Halawa dump site located approximately 8 miles from the project area.

FISH AND WILDLIFE RESOURCES WITH THE PROJECT

GENERAL IMPACTS. Heavy equipment used in transporting material to the site, preparing either the embankment or breakwater foundation and placing armor units may cause localized noise, vibration and air pollution. The Draft Environmental Impact Statement (Ref. 19) states that the existing noise level at Sand Island is affected by overhead aircraft flights as well as other light industrial activities. Carstea et al. (Ref. 1) reported that noise from such construction activities will only have an effect on areas within 100 feet (30 M) of the site. Nonetheless, construction activities that add to the existing noise level may be sufficient to temporarily disrupt nesting or resting avifauna at or near the site. Predominant northeast tradewinds would carry most air pollutants out to sea; however, poor air quality may occur in the project area if tradewinds diminish or give way to southerly Kona winds.

Construction activities will cause local erosion and sedimentation in the vicinity of the revetment or breakwater, especially where the structure will extend below the ground level or reef flat (Ref. 10). Dredging, erosion and disturbance of bottom sediments will result in increased turbidity and water quality degradation. Resuspension of bottom sediments which release trapped nutrients and heavy metals into the water column may have a detrimental effect on the biota of the immediate area (Ref. 2 and 8). Suspended materials can interfere with the respiratory and feeding mechanisms of aquatic organisms.

Effects of suspended sediments would be most significant upon the juvenile and sessile organisms. Although these water quality effects will probably not be permenant, they may last longer than the duration of the construction period.

REVETMENT IMPACTS. Construction may limit vegetation growth directly behind the revetment and may result in terrestrial habitat loss along reach 1, where the structure is placed over previous existing substrate. Interidal organisms and habitat will be destroyed (Alternative 3) where backfill will reclaim previously eroded parkland. Backfilled areas will provide extra habitat for terrestrial flora and fauna.

Established tidepools, located along reach 2, will be destroyed and intertidal flora and fauna buried along the revetment alignment of Alternative 1. This alternative would eliminate some habitat for juvenile fishes and tidepool organisms. Nonstructural development (i.e. offshore breakwaters of Alternatives 2 and 3) along the shoreline of the reach 2 will allow preservation of the existing tidepools. Some tidepools along reach 1 may be destroyed by placement of the revetment in Alternatives 1 and 3.

Completion of the revetment will create new and different habitat which may change the species composition of aquatic plants and animals now present in the area. Keith and Skjei (Ref. 8) reported that a revetment increased species diversity and abundance on a man-made island offshore of California. Although field studies have failed to demonstrate increased fish production due to riprap use, at the very least, riprap banks have been noted to attract fish (Ref. 12).

OFFSHORE BREAKWATER IMPACTS. Mulvihill et al. (Ref. 9) reported that physical effects from placement of breakwaters are similar to those for jetties, groins and revetments. Dredging, as well as the placement of armor stone and core will increase turbidity and can impact bottom dwelling organisms. Other impacts would include removal of algal and coral colonies, temporary emigration of fish from the immediate area and alteration of the existing habitat at the structure site (Ref. 8).

After breakwater completion, a new situation will exist at both the breakwater and within the protected zone. Secondary waves and altered currents may result from wave refraction. Sand deposition may accrete on the shoreline opposite the detached fixed breakwater. Tombolos or spits have formed in some cases, where the breakwater was long enough in proportion to its distance from shore (Ref. 16). Such formation would increase the beach area and create new habitat for beach dwelling seabirds. However, erosion is sometimes accelerated in downdrift areas.

Rubblemound breakwaters will provide irregular surfaces for rocky surf habitat on the seaward side and calm habitat on the lee side (Ref. 7). The sloped face will provide a intertidal habitat for aquatic plants and animals. These new inhabitants (e.g. Black Crab) will be gained at the cost of previous bottom dwelling organisms. Fish habitat in nearshore waters will have a greater spatial heterogeneity due to the placement of ungrouted riprap breakwaters along shore. An increase in species diversity due to these structures would be anticipated.

RECOMMENDATIONS

Revetment and offshore breakwaters will have similar physical and biological impacts. The destruction of tidepools in Alternative 1 will eliminate the existing marine educational value of these diverse habitats; however, no adverse impacts on significant fish and wildlife resources will result from any of the proposed alternatives. Alternative 2 and, to a lesser degree, Alternative 3 appear to afford both effective shoreline protection and minimized negative impact. We suggest that either Alternative 2 or 3 be considered for shoreline protection measures. Further mitigation, which we recommend, to minimize impacts on fish and wildlife resources include:

1. Turbidity control devices should be employed whenever necessary to confine plumes of suspended material.

2. Dredging associated with the action should be minimized.

3. Quarry stone should be cleaned of all terrigenous soils.

4. A filter bed of sand or permeable synthetic fabric should be used in the revetment to prevent movement of topsoil or backfill through the armor stone blanket.

5. Tidepools should be preserved whenever practicable.

6. Formal consultation with the National Marine Fisheries Service should be initiated, if blasting is used during construction.

Sincerely,

for William R. Kramer
Acting Project Leader
Office of Environmental Services

cc: NMFS-WPPO
HDAR
HDF&W
RD, FWS, Portland, OR (AHR)

BIBLIOGRAPHY

1. Carstea, D., A. Rinder, R. Strieter, L. Boberschmidt, L. Thomas and J. Golden. 1975. Guidelines for the Environmental Impact Assessment of Small Structures and Related Activities in Coastal Bodies of Water. The Mitre Corp., Mclean, Virginia Tech. Report MTR-6919. 344 pp.

2. Cronin L.E., G. Gunter and S.H. Hopkins. 1971. Effects of Engineering Activities on Coastal Ecology. Report to the Office of the Chief of Engineers, U.S. Army. 48 pp.

3. Environmental Consultants, Inc., Population Surveys, and Hawaiian Electric Co., Inc. 1976. The Marine Bilogical Impact of the Honolulu Generating Station: A Summary of the 1975-76 Investigations. Honolulu, Hawaii

4. Gosline W. A. and V. E. Brock. 1976. Handbook of Hawaiian Fishes. The University Press of Hawaii, Honolulu. 372 pp.

5. Jordan, D. S. and B. W. Evermann. 1973. The Shore Fishes of Hawaii. Charles E. Tuttle Company, Inc., Tokyo, Japan. 392 pp.

6. Keith, J. M. and R. E. Skjei. 1974. Engineering and Ecological Evaluation of Artificial-Island Design, Ricon Island, Punta Gorda, California. U. S. Army Corps of Engineers. Cerc Tech. Memo no. 43. 76 pp.

7. Kowalski, T. and N. Ross. 1975. "How to Build a Floating Scrap Tire Breakwater," Univ. of Rhode Island Marine Bull. 21. 15 pp.

8. Morton, J. W. 1976. Ecological Impacts of Dredging and Dredge Spoil Disposal: A Literature Review. M. S. Thesis. Cornell Univ., Ithaca, N.Y. 112 pp.

9. Mulvihill, E. L., C. A. Francisco, J. B. Glad, K. B. Kaster and R. E. Wilson. 1980. Biological Impacts of Minor Shoreline Structures on the Coastal Environment: State of the Art Review. U. S. Fish and Wildlife Service, Biological Services Program. FWS/OBS-77/51. 2 Vol.

10. Ortolano, L. and W. W. Hill. 1972. An Analysis of Environmental Statements for Corps of Engineers Water Projects. Stanford Univ., California. Dept. of Civil Engineering. 146 pp.

11. Saville, T., Jr., W. J. Garcia and C. E. Lee. 1965. Breakwaters with Vertical and Sloping Faces. U. S. Army Corps of Engineers. CERC Reprint no. 2-66. 24 pp.

12. Schnick, R. A., J. M. Morton, J. C. Mochalski and J. T. Beall. 1982. Mitigation and Enhancement Techniques for the Upper Mississippi River Systems. U. S. Fish and Wildlife Service, Resource Publication 149. Washington, D. C. 714 pp.

13. State of Hawaii, Department of Land and Natural Resources, Division of Forestry and Wildlife. Inventory of the Waterbirds in the State of Hawaii, Island of Oahu, Keehi Lagoon, 1967-1983. (Unpublished data on file).

14. Tetra Tech, Inc. 1976. Final Report, Study Areas II and VI-C Water Quality Analysis and Environmental Assessments Oahu, Hawaii. Prepared for Natural Commission on Water Quality. Pasadena, California.

15. Thompson, J. R. 1973. Ecological Effects of Offshsore Dredging and Beach Nourishment: A Review. U. S. Army Corps of Engineers. Cer. Misc. Pap. No. 1-73. 48 pp.

16. U. S. Army Corps of Engineers. 1975. Shore Protection Mannual. U. S. Gov. Printing Office, Washington, D. C. 3 Vols.

17. U. S. Army Corps of Engineers, Pacific Ocean Division. 1983. Report of Field Survey of the Sand Island Shore Protection Study Area. Fort Shafter, Hawaii.

18. U. S. Army Engineer District, Honolulu. 1978. Detailed Project Report and Environmental Statement, Sand Island Shore Protection, Honolulu, Hawaii. Fort Shafter, Hawaii.

19. U. S. Army Engineer District, Honolulu. 1983. Sand Island Shore Protection Study: Draft Detailed Project Report and Environmental Impact Statement. Fort Shafter, Hawaii.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
300 ALA MOANA BOULEVARD
P O BOX 50167
HONOLULU, HAWAII 96850

IN REPLY REFER TO:
ES
Room 6307

OCT 2 4 1983

Colonel Michael M. Jenks
U.S. Army Engineer District, Honolulu
Building 230
Ft. Shafter, Hawaii 96858

Re: Revised Final Coordination Act Report for Sand Island Shore Protection, Honolulu

Dear Colonel Jenks:

We have prepared this revision to our Final Coordination Act Report dated August 23, 1983 for the Corps' Sand Island Shore Protection Study. The purpose of this revision is to recognize certain design changes in all three alternatives. The Service was advised of these changes on October 12, 1983 by your Project Formulation staff. This updated description of the proposed shore protection features supercedes that portion of our August 23rd report.

DESCRIPTION OF THE PROPOSED ACTION

ALTERNATIVE 1. A 1,950-foot stone revetment would be constructed from the southeast corner of Sand Island, along the existing eroded shoreline to the sand beach. In the first section of shoreline identified as reach 1, 500 feet of the existing revetment will be removed and replaced with new revetment. This section would require toe and bedding structures to be placed at 0-foot depth. Other sections of the revetment would require toe structure placement down to or slightly below the ground grade. All sections of the revetment structure would have a crest width of 15 feet (3 stones) with stone size ranging from 1-1/2 to 3-3/4 tons for the armor layer and 100 to 750 lbs. for the underlayer. Suitable stones removed from the existing revetment would be salvaged and used in construction of the new revetment.

ALTERNATIVE 2. Nine detached breakwater structures would be constructed 120 feet offshore along an approximate 2,000 feet of shoreline. Breakwaters would be placed in water depths ranging from 2-1/2 to 12 feet. Their actual alignment would be slightly seaward of the location described in our August 23, 1983 report. Crest width and height will be 15.0 feet by 8.0 feet (MLLW).

Stone size would range from 5 to 8 tons for the armor layer and 1,000 to 1,600 lbs for the core. All of the offshore breakwater structures would be placed on the fringing reef.

ALTERNATIVE 3. This alternative would combine components of Alternatives 1 and 2 in an effort to mitigate negative impacts to recreational resource concerns expressed by the public. Reach 1 would require removal of the existing revetment and construction of a 530-foot shoreline revetment. Design would be similar to the revetment design in Alternative 1. In reach 2, three offshore breakwaters would be placed along the following 600 feet of shoreline in water depths ranging from 5 to 8-1/2 feet. Designs would be similar to that described in Alternative 2. About 200 feet of the existing shoreline revetment will be left intact to provide additional wading and swimming shelter. Reach 3 would include construction of an 820-foot revetment similar to the revetment in reach 1. Approximately 34,000 square feet of parkland, which had been lost through progressive erosion, would be reclaimed by backfilling behind the revetment.

Fill material will be provided by excavation spoils from other reaches of the shoreline. Armor stone, bedding material and graded aggregates used in construction will be mined from the Kapaa Quarry in the Kailua-Kaneohe area, located 25 miles from the project site. Stone from the existing revetment will be reused when possible. The disposal site for excess spoils will be at the Halawa dump site located approximately 8 miles from the project area.

F-13

FISH AND WILDLIFE RESOURCES WITH THE PROJECT

The Service does not believe that these design changes are great enough to result in impacts which are significantly different than those discussed in our earlier report. Therefore, our previous assessment of fish and wildlife resources with the project and our recommended mitigation plans remain valid.

Thank you for providing us with an opportunity to evaluate these minor project changes.

Sincerely,

for William R. Kramer
Acting Project Leader
Environmental Services

cc: RD, FWS, Portland, OR (AHR)
HDF&W
HDAR

SAND ISLAND
SHORE PROTECTION

APPENDIX G

DRAFT ENVIRONMENTAL IMPACT STATEMENT: Public Comments and Responses

APPENDIX G

SAND ISLAND
SHORE PROTECTION STUDY

DRAFT EIS COMMENTS AND RESPONSES APPENDIX

Section	Title	Page
I	List of Comments and Responses for Draft EIS	G-1

Draft EIS Comments and Responses

The following agencies, organizations, and individuals provided comments in reviewing the Draft EIS. A total of 25 comments letters were received.

A single asterisk (*) indicates those letters not requiring substantive responses. The comments are reproduced in this section.

A double asterisk (**) indicates those letters requiring substantive responses. The comments are reproduced in this section.

A. Federal Agencies
   * 1. Department of Agriculture, Soil Conservation Service
   * 2. Department of the Navy

B. State Agencies
   * 1. Department of Transportation
   * 2. Department of Land and Natural Resources
   * 3. Department of Agriculture
   * 4. Department of Defense, Hawaii Air National Guard
   * 5. Department of Business & Economic Development Housing Finance and Development Corporation
   * 6. Department of Accounting and General Services
   ** 7. University of Hawaii, Environmental Center
   ** 8. Department of Business and Economic Development
   ** 9. Department of Environmental Health

C. County Agencies
   * 1. Department of Transportation Services
   * 2. Fire Department
   * 3. Department of Building
   * 4. Department of Public Works
   * 5. Department of General Planning
   * 6. Board of Water Supply
   * 7. Department of Housing and Community Development
   ** 8. Department of Land Utilization
   ** 9. Police Department
   ** 10. Department of Parks and Recreation

D. Utilities
   * 1. Hawaiian Electric Co., Inc.

E. Public
   ** 1. Life of the Land
   ** 2. American Lung Association
   ** 3. Conservation Council for Hawaii

October 25, 1988

Dear

SUBJECT: Draft Environmental Impact Statement for Sand Island Shore Protection

Thank you for your review of the DEIS for the subject project. Your response is appreciated.

Should you have any further questions or comments, please call Clyde Hosokawa at 548-2696.

Sincerely,

RALSTON H. NAGATA
State Parks Administrator

CH:rn

10/26/88

Same

Letters mailed to the following addressees:

Mr. Edward Y. Hirata
Director of Transportation
Honolulu, HI

Mr. Yukio Kitagawa
Chairperson, Board of Agriculture
P. O. Box 22159
Honolulu, Hawaii 96822-0159

Mr. Richard N. Duncan
State Conservationist
P. O. Box 50004
Honolulu, HI 96850

Mr. Jerry M. Matsuda, Major
Hawaii Air National Guard
Contr & Engr Officer
Department of Defense
3949 Diamond Head Road
Honolulu, HI 9616-4495

Mr. Joseph K. Conant
Executive Director
Department of Business &
Economic Development
P. O. Box 17907
Honolulu, HI 96817

Mr. Brenner Munger, Ph.D.,P.E.
Manager
Environmental Department
Hawaiian Electric Co., Inc.
P. O. Box 2750
Honolulu, HI 96840-0001

Mr. John E. Hirten
City & County of Honolulu
650 South King St.
Honolulu, HI 96813

Mr. Lionel E. Camara
Acting Fire Chief
Fire Department
City & County of Honolulu
1455 S. Beretania St., Room 305
Honolulu, HI 96814

Mr. Herbert K. Muraoka
Director & Building Superintendent
City & County of Honolulu
650 South King St.
Honolulu, HI 96813

Mr. Alfred J. Thiede
Director & Chief Engineer
City & County of Honolulu
650 South King St.
Honolulu, HI 96813

Mr. Donald A. Clegg
Chief Planning Officer
City & County of Honolulu
650 South King St.
Honolulu, HI 96813

Mr. Teuane Tominaga
State Public Works Engineer
Dept. of Accounting & General Services
Division of Public Works
P. O. Box 119
Honolulu, HI 96810

Mr. W. K. Liu
Assistant Base Civil Engineer
Department of the Navy
Naval Base Pearl Harbor
Box 110
Pearl Harbor, HI 96860-5020

Mr. Kazu Hayashida
Manager & Chief Engineer
Board of Water Supply
City & County of Honolulu
630 S. Beretania St.
Honolulu, HI 96843

Mr. Mike Moon, Director
City & County of Honolulu
650 South King St.
Honolulu, HI 96813

19.002.1j(8)
2722

STP 8.2969

July 11, 1988

Dr. Marvin Miura, Director
Office of Environmental Quality Control
465 South King Street, Room 115
Honolulu, Hawaii 96813

Dear Dr. Miura:

Draft Environmental Impact Statement (EIS)
Sand Island Shore Protection, Oahu

Our comments of September 1, 1983, found on page B-32 of the draft EIS are still valid. We have no additional comments.

Thank you for this opportunity to provide comments.

Very truly yours,

Edward Y. Hirata
Director of Transportation

DT:ko

cc: HWY-P, HAR, STP(dt)
Clyde Horokawa, DLNR

JOHN WAIHEE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

DIVISION OF
STATE PARKS

MAY 17 9 44 AM '88

WILLIAM W. PATY, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

LIBERT K. LANDGRAF
DEPUTY

AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
CONSERVATION AND ENVIRONMENTAL AFFAIRS
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

MAY 16 1988

DOC. NO.: 3391E
FILE NO.: 88-471

Dr. Marvin T. Miura
Office of Environmental Quality Control
465 South King Street, Room 104
Honolulu, HI 96813

Dear Dr. Miura,

SUBJECT: Sand Island Shore Protection Draft Environmental Impact Statement

The project is a proposal of our Department. We have no further comment to offer. However, we appreciate your consideration.

Very truly yours,

WILLIAM W. PATY, Chairperson
Board of Land and Natural Resources

cc: Clyde Y. Hosokawa, State Parks

JOHN WAIHEE
GOVERNOR

SUZANNE D. PETERSON
CHAIRPERSON, BOARD OF AGRICULTURE

ROBERT Y. TSUYEMURA
ACTING DEPUTY
TO THE CHAIRPERSON

State of Hawaii
DEPARTMENT OF AGRICULTURE
1428 So. King Street
Honolulu, Hawaii 96814-2512

Mailing Address:
P. O. Box 22159
Honolulu, Hawaii 96822-0159

May 26, 1988

Dr. Marvin T. Miura, Interim Director
Office of Environmental Quality Control
465 South King Street, Room 104
Honolulu, Hawaii 96813

Dear Dr. Miura:

Subject: Draft Environmental Impact Statement (DEIS) for
Sand Island Shore Protection
Honolulu, Hawaii

The Department of Agriculture has received the subject DEIS and has no comment to offer. The subject document is returned for your further use.

Thank you for the opportunity to comment on this document.

Sincerely,

Suzanne D Peterson

SUZANNE D. PETERSON
Chairperson, Board of Agriculture

cc: Clyde Hosokawa, DLNR.

Enclosure

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
P. O. BOX 50004
HONOLULU, HAWAII
96850

May 16, 1988

RECEIVED
'88 MAY 25 P5:12
OFC. OF ENVIRONMENTAL QUALITY CONTROL

Dr. Marvin T. Miura
Office of Environmental Quality Control
465 South King Street, Room 104
Honolulu, HI 96813

Dear Dr. Miura:

Subject: Draft Environmental Impact Statement (DEIS) -
Sand Island Shore Protection, Honolulu, HI

We have no comments to offer at this time, however, we would appreciate the opportunity to review the final EIS.

Sincerely,

RICHARD N. DUNCAN
State Conservationist

cc:
Mr. Clyde Y. Hosokawa, Department of Land and Natural Resources, Div. of State Parks, P.O. Box 621, Honolulu, HI 96809

DIVISION OF
STATE PARKS
APR 22 3 12 PM '88

April 21, 1988

Engineering Office

Dr. Marvin T. Miura
Office of Environmental Quality Control
465 South King Street, Room 104
Honolulu, Hawaii 96813

Dear Dr. Miura:

Sand Island Shore Protection Draft
Environmental Impact Statement
Honolulu, Hawaii

Thank you for providing us the opportunity to review the above subject project.

We have no comments to offer at this time regarding this project.

Yours truly,

Jerry F. Matsuda
Major, Hawaii Air
National Guard
Contr / Engr Officer

Enclosure

cc: Mr. Clyde Hosokawa, DLNR, Division
of State Parks

TO:
[illegible]
ARCY BR.
PLAN. BR.
RES. MGT. BR.
PROJ. CONTROL
CZM REC. PLAN.
CLERICAL STAFF
HIST. SITES SEC.

FOR:
CIRC.
COMMENTS & REC.
DRAFT REPLY
FILE
FOLLOW UP
INFO
SEE ME
SIGNATURE

JOHN WAIHEE
GOVERNOR

DIVISION OF
STATE PARKS
APR 27 9 00 AM '88

Joseph K. Conant
Executive Director

STATE OF HAWAII
Department of Business and Economic Development
Housing Finance and Development Corporation
P. O. BOX 17907
HONOLULU, HAWAII 96817

IN REPLY REFER TO:
88:PLNG/1868JT

April 25, 1988

Dr. Marvin T. Miura, Interim Director
Office of Environmental Quality Control
465 South King Street, Room 104
Honolulu, Hawaii 96813

Dear Mr. Miura:

Re: Detailed Project Report and Draft Environmental Impact Statement (EIS) for Sand Island Shore Projection

We have reviewed the subject report and have no comments to offer.

Sincerely,

JOSEPH K. CONANT
Executive Director

cc: Mr. Clyde Y. Hosokawa
DLNR - Division of State Parks

Hawaiian Electric Company, Inc. • PO Box 2750 • Honolulu, HI 96840-0001

ENV 2-1
JA/G

Brenner Munger, Ph.D., P.E.
Manager
Environmental Department
(808) 548-6880

April 25, 1988

Dr. Marvin T. Miura
Office of Environmental Quality Control
465 South King Street, Room 104
Honolulu, Hawaii 96813

Dear Dr. Miura:

Subject: Environmental Impact Statement (EIS) for Sand Island Shore Protection, Oahu, Hawaii

We have reviewed the above document and have no comments.

Sincerely,

Brenner Munger

cc: Mr. Clyde Y. Hosokawa, DLNR

Mr. Clyde Y. Hosokawa

DEPARTMENT OF TRANSPORTATION SERVICES
CITY AND COUNTY OF HONOLULU
HONOLULU MUNICIPAL BUILDING
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

JOHN E. HIRTEN
DIRECTOR

JOSEPH M. MAGALDI JR.
DEPUTY DIRECTOR

TE-2445
PL1.1084

May 19, 1988

Dr. Marvin T. Miura
Office of Environmental Quality Control
465 South King Street
Room 104
Honolulu, Hawaii 96813

Dear Dr. Miura:

Subject: Sand Island Shore Protection
Draft Environmental Impact Statement
TMK: 1-5-41: 3

This is in response to your memorandum requesting our comments on the above subject.

We have no comments to offer at this time.

Yours truly,

(for) JOHN E. HIRTEN

cc: Mr. Clyde Y. Hosokawa

FIRE DEPARTMENT

CITY AND COUNTY OF HONOLULU

1455 S. BERETANIA STREET, ROOM 305
HONOLULU, HAWAII 96814

FRANK F. FASI
MAYOR

FRANK K. KAHOOHANOHANO
FIRE CHIEF

LIONEL E. CAMARA
DEPUTY FIRE CHIEF

April 15, 1988

DIVISION OF STATE PARKS
Apr 18 9 45 AM '88

Dr. Marvin T. Miura
Office of Environmental Quality Control
465 South King Street, Room 104
Honolulu, Hawaii 96813

Dear Dr. Miura:

SUBJECT: SAND ISLAND SHORE PROTECTION DRAFT EIS

We have reviewed the subject EIS and have no objections to the proposed project. Existing and planned fire protection services and facilities are considered adequate.

Should you have any questions, please contact Battalion Chief Kenneth Word of our Administrative Services Bureau at 943-3838.

Very truly yours,

Lionel E. Camara

LIONEL E. CAMARA
Acting Fire Chief

LEC/DF:lm

cc: Mr. Clyde Y. Hosokawa,
DLNR - Division of State Parks

DIVISION OF STATE PARKS
APR 20 11 54 AM '88

PH 88-380

April 18,11988

Dr. Marvin T. Miura, Director
Office of Environmental Quality Control
465 S. King Street, Room 104
Honolulu, Hawaii 96813

Dear Dr. Miura:

Subject: Sand Island Shore Protection Draft EIS

We have reviewed the Sand Island Shore Protection Draft EIS and have no comments.

Thank you for the opportunity to review the document.

Very truly yours,

Herbert K. Murakka

HERBERT K. MURAOKA
Director and Building Superintendent

TH:jo
cc: J. Harada
Clyde Hosokawa, DLNR

DIVISION OF STATE PARKS
APR 10 9 43 AM '88

In Reply Refer To:
ENV 88 95

April 11, 1988

Dr. Marvin T. Miura
Interim Director
Office of Environmental Quality Control
State of Hawaii
465 South King Street, Room 104
Honolulu, Hawaii 96813

Dear Dr. Miura:

Subject: Draft EIS for Sand Island Shore Protection, Honolulu, Oahu, Hawaii

We have reviewed the subject Draft EIS and have no additional comments to offer.

Very truly yours,

Sam Callejo
ALFRED J. TIMADE
Director and Chief Engineer

cc: Mr. Clyde Y. Hosokawa
(DLNR - State Parks)

DEPARTMENT OF GENERAL PLANNING
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

DIVISION OF STATE PARKS
MAY 5 10 07 AM '88

FRANK F. FASI
MAYOR

DONALD A. CLEGG
CHIEF PLANNING OFFICER

GENE CONNELL
DEPUTY CHIEF PLANNING OFFICER

JM/DGP 4/88-1467

May 3, 1988

Honorable Marvin T. Miura, Interim Director
Office of Environmental Quality Control
State of Hawaii
465 South King Street, Room 104
Honolulu, Hawaii 96813

Dear Dr. Miura:

Sand Island Shore Protection Draft
Environmental Impact Statement

We have reviewed the subject Draft Environmental Impact Statement (EIS) and have noted that our concerns about truck traffic during construction, as of August 17, 1983, have been adequately dealt with. We have no further comments at this time.

Thank you for the opportunity to review this document.

Sincerely,

DONALD A. CLEGG
Chief Planning Officer

cc: Mr. Clyde Y. Hosokawa
DLNR - Division of State Parks

(P)1330.6

APR 19 1988

Mr. Marvin Miura, Interim Director
Office of Environmental Quality Control
465 South King Street, Room 104
Honolulu, Hawaii 96813

Dear Mr. Miura:

Subject: Draft Environmental Impact Statement
Sand Island Shore Protection

We have reviewed the subject document and have no comments to offer.

Very truly yours,

TEUANE TOMINAGA
State Public Works Engineer

/jnt
cc: Mr. Clyde Y. Hosokawa

DEPARTMENT OF THE NAVY
COMMANDER
NAVAL BASE PEARL HARBOR
BOX 110
PEARL HARBOR, HAWAII 96860-5020

DIVISION OF
STATE PARKS
APR 15 10 03 AM '88

IN REPLY REFER TO:
5090 (248)
Ser N5B/867

13 APR 1988

Dr. Marvin T. Miura, Director
Office of Environmental Quality Control
465 South King Street, Room 104
Honolulu, Hawaii 96813

Dear Mr. Miura:

DRAFT ENVIRONMENTAL IMPACT STATEMENT
SAND ISLAND SHORE PROTECTION

The Draft Environmental Impact Statement for the Sand Island Shore Protection has been reviewed and we have no comments to offer. Since we have no further use for the EIS, it is being returned to your office.

Thank you for the opportunity to review the Draft.

Sincerely,

W. K. Liu

W K LIU
Assistant Base Civil Engineer
By direction of
the Commander

Enclosure

Copy to:
Mr. Clyde Y. Hosokawa
Division of State Parks
Department of Land and Natural Resources
P. O. Box 621
Honolulu, Hawaii 96809

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

April 14, 1988

Dr. Marvin T. Miura,
Director
Office of Environmental
Quality Control
State of Hawaii
465 South King Street, Room 104
Honolulu, Hawaii 96813

Dear Dr. Miura:

Subject: Draft Environmental Impact Statement (EIS) for Sand Island Shore Protection

Thank you for allowing us to review the Draft EIS. The proposed project will not have any effect on our water system.

If you have any questions, please contact Lawrence Whang at 527-6138.

Very truly yours,

Kazu Hayashida

KAZU HAYASHIDA
Manager and Chief Engineer

cc: Clyde Y. Hosokawa
(Division of State Parks, DLNR)

DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813
PHONE 523-4161

FRANK F. FASI
MAYOR

MIKE MOON
DIRECTOR

ROBERT MIYASATO
DEPUTY DIRECTOR

DIVISION OF STATE PARKS
APR 19 1 49 PM '88

April 14, 1988

Dr. Marvin T. Miura
Interim Director
Office of Environmental Quality Control
465 South King Street, Room 104
Honolulu, Hawaii 96813

Dear Dr. Miura:

Subject: Detailed Project Report
and Environmental Impact Statement

We appreciate the opportunity to review the subject report. The Department has no comments to offer at this time.

Sincerely,

Robert Miyasato
for MIKE MOON
Director

cc: Mr. Clyde Y. Hosokawa, DLNR

University of Hawaii at Manoa
Environmental Center
Crawford 317 • 2550 Campus Road
Honolulu, Hawaii 96822
Telephone (808) 948-7361

DIVISION OF STATE PARKS
JUL 19 8 42 AM '88

May 12, 1988
RR:0065

Dr. Marvin T. Miura, Director
Office of Environmental Quality Control
Department of Health
465 South King Street, Room 104
Honolulu, Hawaii 96813

Dear Dr. Miura:

Waiver of Preparation Notice (Consultation Phase)
of Environmental Impact Statement (EIS)
Sand Island Shoreline Protection
Honolulu, Oahu

We have noted in the April 8, 1988 OEQC Bulletin that, "the preparation notice requirement," has been waived for the Sand Island Shoreline Protection project by OEQC and the Final EIS prepared under NEPA is being processed as a Draft EIS.

We are concerned that this waiver may be inappropriate and we request a reconsideration of the decision. We favor maximum coordination of State and Federal efforts with regard to EIS preparation and review. We similarly concur with the provision in the EIS regulations whereby the consultation phase (preparation stage) be waived, "if the action involves minor environmental concerns." However, in the case of the Sand Island Shoreline Protection Project, concerns identified by the Corps of Engineers were not "minor". In addition, advances in analytic methods for assessment of shoreline process have rendered the 1983 document out of date. Thus, a waiver of the consultation process under these circumstances is inappropriate and inconsistent with the State EIS Rules (Title II, Chapter 200-15).

The normal consultation process would provide an opportunity for incorporation of more current shoreline assessment information. If no revisions are recommended, then the proposing agency (DLNR) can be assured that the design and plans are adequate, and the NEPA EIS can indeed serve as the basis for the State EIS document. If a need to update is identified, the consultation phase will provide a more realistic time period to develop that additional information.

We urge that the decision to waive the EIS consultation phase be reconsidered so as to assure an adequate and timely EIS, and so that prospective legal challenges based on lack of adherance to the EIS Rules may be avoided.

Yours truly,

John Harrison
Environmental Coordinator

cc: L. Stephen Lau
Environmental Council
Frans Gerritsen
Hans Krock-Jurgen
Charles Mader

October 28, 1988

Mr. John Harrison
Environmental Coordinator
University of Hawaii at Manoa
Crawford 317, 2550 Campus Road
Honolulu, HI 96822

Dear Mr. Harrison:

SUBJECT: Waiver of Preparation Notice[Consultation Phase] of Environmental Impact Statement (EIS) Sand Island Shoreline Protection Honolulu, Oahu

Thank you for your comments regarding the subject project. The Office of Environmental Quality Control has addressed your concerns and has considered the procedures and contents of the document to be adequate as submitted.

Should you have any further questions or comments, please call Clyde Hosokawa at 548-2696.

Sincerely,

/s/ RALSTON H. NAGATA

RALSTON H. NAGATA
State Parks Administrator

CH:rn

JOHN WAIHEE
GOVERNOR
ROGER A. ULVELING
DIRECTOR
BARBARA KIM STANTON
DEPUTY DIRECTOR
LESLIE S. MATSUBARA
DEPUTY DIRECTOR

DEPARTMENT OF BUSINESS
AND ECONOMIC DEVELOPMENT

KAMAMALU BUILDING, 250 SOUTH KING ST., HONOLULU, HAWAII
MAILING ADDRESS: P.O. BOX 2359, HONOLULU, HAWAII 96804 TELEX: 7409810 HIDED

Ref. No. P-8381

May 19, 1988

MEMORANDUM

TO: Dr. Marvin T. Miura, Director
Office of Environmental Quality Control

FROM: Roger A. Ulveling

SUBJECT: Draft EIS for the Sand Island Shore Protection Project

We previously reviewed the subject project for Federal consistency with the Hawaii Coastal Zone Management (CZM) Program and certified to the U.S. Army Corps of Engineers, on May 10, 1984, that the project was consistent.

On this basis we have no objections to the project in general. However, we believe that the EIS needs to be updated. The EIS has not been revised since 1983, and the applicant's submittal letter does not mention or include any up-to-date information. Although the project need and design may not have changed, other project-related factors have changed in the five years since the EIS was prepared.

It is probable that the environmental conditions and associated project impacts have changed. Also, the related needs of, and plans for, the Sand Island/Keehi Lagoon area are now different (ref. EIS pp.27-30). For example, there are recent State initiatives to develop the Keehi Lagoon area and portions of Sand Island for water-oriented recreational activities. The Honolulu Waterfront Redevelopment project also includes Sand Island. These related projects are not identified and discussed in the EIS. We feel that the applicant should provide supplemental information in order to adequately fulfill the requirements of the State EIS regulations.

In addition we believe that a shore protection project should account for future sea level rise. Because the project is being proposed as a permanent, long-term solution, it should be designed for the likely rise in sea level. Sand Island is particularly vulnerable to any amount of rise in sea level as indicated in the enclosed CZM report entitled, Effects on Hawaii of a Worldwide Rise in Sea Level Induced by the "Greenhouse Effect."

Thank you for the opportunity to provide our comments on this EIS.

for Director

Enclosure

cc: Mr. Clyde Y. Hosokawa, DLNR (w/enc.)

October 28, 1988

MEMORANDUM

TO: Roger A. Ulveling, Director
Depart. of Business & Economic Development

From: Ralston H. Nagata, State Parks Administrator

SUBJECT: Draft EIS for the Sand Island Shore Protection Project

Thank you for your comments regarding the subject project. The Office of Environmental Quality Control has addressed your concerns and has considered the procedures and contents of the document to be adequate as submitted.

The proposed sea wall has been adequately designed for shore protection. If there are any future impacts due to the "Greenhouse Effect", the US Army Corps of Engineers will analyze the project accordingly at that time.

Should you have any further questions or comments, please call Clyde Hosokawa at 548-2696.

Sincerely,

/s [illegible]

RALSTON H. NAGATA

CH:rn

DIVISION OF STATE PARKS
MAY 13 11 02 PM '88

DIV. AD.
PLAN. BR.
RES. MGT. BR.
PROJ. CONTROL
CW REC. PLAN.
CLERICAL STAFF
HIST. SITES SEC.

FOR:
CIRC.
COMMENTS & REC.
DRAFT REPLY
FILE
FOLLOW UP
INFO
SEE ME
SIGNATURE

May 6, 1988

MEMORANDUM

To: Dr. Marvin T. Miura, Director
Office of Environmental Quality Control

From: Deputy Director for Environmental Health

Subject: Detailed Project Report and Environmental Impact Statement (EIS) for Sand Island Shore Protection, Honolulu, Hawaii

Thank you for allowing us to review and comment on the subject EIS. We provide the following comments relating to noise:

1. Activities associated with the construction phase must comply with the provisions of Title 11, Administrative Rules Chapter 43, Community Noise Control for Oahu.

   a. The contractor must obtain a noise permit if the noise levels from the construction activities are expected to exceed the allowable levels of the rules.

   b. Construction equipment and on-site vehicles requiring an exhaust of gas or air must be equipped with mufflers.

   c. The contractor must comply with the conditional use of the permit as specified in the rules and conditions issued with the permit.

2. Traffic noise from heavy vehicles travelling to and from the construction site must be minimized near existing residential areas and must comply with the provisions of Title 11, Administrative Rules Chapter 42, Vehicular Noise Control for Oahu.

BRUCE S. ANDERSON, Ph.D.

cc: Mr. Clyde Hosokawa ✓

October 28, 1988

Bruce S. Anderson, Ph.D.
Deputy Director of Environmental Health
Office of the Director
P.O. Box 3378
Honolulu, HI 96801

Dear Dr. Anderson:

SUBJECT: Detailed Project Report and EIS for Sand Island Shore Protection, Honolulu, Hawaii

Thank you for your comments on noise control for the subject project. In the final plans and specifications, the contractor will be required to attain the noise permit and comply with the provisions of Title 11: Administrative Rules Chapter 42 Vehicular Noise Control for Oahu and Administrative Rules Chapter 43 Community Noise Control for Oahu.

Should you have any further questions or comments, please call Clyde Hosokawa at 548-2696.

Sincerely,

/s/ RALSTON H. NAGATA

RALSTON H. NAGATA
State Parks Administrator

CH:rn

DEPARTMENT OF LAND UTILIZATION
CITY AND COUNTY OF HONOLULU

JOHN P. WHALEN
DIRECTOR

BENJAMIN B. LEE
DEPUTY DIRECTOR

LU4/88-3113(BWM)

May 23, 1988

Marvin T. Miura, Ph. D
Interim Director
Office of Environmental Quality Control
State of Hawaii
Kekuanaoa Building, Room 104
465 South King Street
Honolulu, Hawaii 96813

Dear Dr. Miura:

Sand Island Shore Protection
Draft Environmental Impact Statement (EIS)

The Department of Land Utilization (DLU) has reviewed the Draft EIS and has the following comments:

1. A Special Management Area Use Permit (SMP) and a Shoreline Setback Variance (SV) will be required for those portions of the revetments landward of the certified shoreline. A current Certified Shoreline Survey must be submitted to complete your SMA and SV applications, and the Certified Shoreline should be clearly shown on your construction plans.

2. The acceptance of the Final EIS by the Office of Environmental Quality Control (OEQC) will satisfy the environmental compliance requirements for processing the SMP and SV. The acceptance of the Final EIS by OEQC is a prerequisite to DLU's accepting the SMP and SV applications.

3. The Final EIS should include a section listing the Federal, State, and City regulatory approvals required.

4. In Section V, the benefits and costs are described. Since the original report was completed in 1983, are all these figures based on the 1983 dollar?

Thank you for the opportunity to comment. If you have any questions regarding these comments, please contact Bennett Mark of our staff at 527-5038.

Very truly yours,

JOHN P. WHALEN
Director of Land Utilization

JPW:al
1852B

cc: Clyde Y. Hosokawa, DLNR

October 28, 1988

Mr. John P. Whalen
Department of Land Utilization
City & County of Honolulu
650 So. King St.
Honolulu, HI 96813

Dear Mr. Whalen:

SUBJECT: Sand Island Shore Protection DEIS

Thank you for your comments regarding the subject project. The required permits and documents as stated in your letter will be processed with your agency prior to initiation of construction. In regards to your last comment, the benefits and costs were based on the 1983 dollar.

Should you have any further questions or comments, please call Clyde Hosokawa at 548-2696.

Sincerely,

RALSTON H. NAGATA

CH:rn

POLICE DEPARTMENT

CITY AND COUNTY OF HONOLULU

1455 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96814 • AREA CODE (808) 943-3111

HANK F. FAM
MAYOR

DOUGLAS G. GIBB
CHIEF

WARREN FERREIRA
DEPUTY CHIEF

IN REFERENCE TO: SS-LK

May 5, 1988

Dr. Marvin T. Miura
Office of Environmental Quality Control
465 South King Street, Room 104
Honolulu, Hawaii 96813

Dear Dr. Miura:

Subject: Sand Island Shore Protection Draft Environmental Impact Statement (EIS), Honolulu, Hawaii

We have reviewed the above EIS to eliminate the shore erosion problem of Sand Island and have the following comments to offer.

Due to the fact that Sand Island State Park is used by the public for various recreational activities, we recommend that measures be implemented during the construction phases of the project to maximize public safety. This may involve hiring special duty officers when warranted and closing off various sections of the park with highly visible barricades and signs.

Also, since access to Sand Island is limited to the Sand Island Access Road and a two-lane bascule bridge, we recommend that measures be undertaken to alleviate any traffic congestion or hazards that may occur in the trucking operations and the hauling of construction materials and equipment.

Sincerely,

DOUGLAS G. GIBB
Chief of Police

cc: Mr. Clyde Y. Hosokawa

October 28, 1988

Mr. Douglas G. Gibb
Chief of Police
Police Department
City & County of Honolulu
1455 So. Beretania Street
Honolulu, HI 96814

Dear Mr. Gibb:

Thank you for your comments regarding the subject project. We appreciate your recommended safety measures concerning the construction phases of the project.

In the final plans and specifications, the contractor will be required to set up the appropriate visible signs and barricades in order to maximize public safety. The contractor will also be required to undertake measures to alleviate any traffic congestion or hazards which may occur during the construction period. Special duty officers will be hired as warranted.

Should you have any further questions or comments, please call Clyde Hosokawa at 548-2696.

Sincerely,

/s/ RALSTON H. NAGATA

RALSTON H. NAGATA
State Parks Administrator

CH:rn

DEPARTMENT OF PARKS AND RECREATION

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET
HONOLULU, HAWAII 96813

HIRAM K. KAMAKA
DIRECTOR

WALTER M. OZAWA
DEPUTY DIRECTOR

May 16, 1988

Dr. Marvin T. Miura, Director
Office of Environmental Quality Control
State of Hawaii
465 South King Street, Room 4
Honolulu, Hawaii 96813

Dear Dr. Miura:

Subject: Sand Island Shore Protection Plan Environmental Impact Statement

Regarding the final Sand Island Shore Protection EIS, the position of the Department of Parks and Recreation is similar to that previously forwarded on August 9, 1983 commenting on the study's preferred Alternate Plan 3 which uses a combination of breakwater sections and revetments to protect Sand Island's 2,000 feet of south shoreline.

Our previous comments recommended that Reach 3 be protected by an intermittent stone breakwater rather than a revetment because this section is shoreward of the primary surfing area, and the open channels between the breakwater sections would allow a safer egress route from the water by surfers than an armor stone revetment could offer. The surfable waves terminate before they would reach the breakwater, but there are still swells and an ocean surge that makes scrambling up the face of a revetment with a surfboard a risky maneuver. An added bonus could also be the establishment of a sand beach resulting from the more tranquil water shoreward of the breakwater.

On the other hand, if it is decided to proceed with the original concept of Alternate Plan 3, it is recommended that at least a stairway be designed from water level to the top of the revetment on its seaward face.

Thank you for allowing us to comment on this project.

Sincerely,

HIRAM K. KAMAKA, Director

HKK:ei

cc: Mr. Clyde Hosokawa, Department of Land & Natural Resources

HAY 23 3 33 PM '88
DIVISION OF STATE PARKS

PLAN. BR.
CIRC.
COMMENTS & REC.
DRAFT REPLY
FILE

October 28, 1988

Mr. Hiram K. Kamaka, Director
Department of Parks & Recreation
City & County of Honolulu
650 South King Street
Honolulu, HI 96813

Dear Mr. Kamaka:

SUBJECT: DEIS for Sand Island Shore Protection

Thank you for your comments regarding the subject project. Alternate Plan 3 has been selected by the Army Corps of Engineers for the final design. Your suggestion to include a stairway was not included in the final design.

Should you have any further questions or comments, please call Clyde Hosokawa at 548-2696.

Sincerely,

/s/ RALSTON H. NAGATA
RALSTON H. NAGATA
State Parks Administrator

CH:rn

LIFE
OF
THE
LAND

RECEIVED
'88 MAY 23 P3:38
OFC. OF ENVIRONMENTAL
QUALITY CONTROL

May 19, 1988

Office of Environmental Quality Control
465 South King Street, Suite 104
Honolulu, Hawaii 96813

RE: Waiver of Preparation Notice Requirement/
Sand Island Shore Protection Project

Dear Sirs:

Please be advised that the Board of Directors of Life of the Land, at its May 12, 1988 monthly meeting, voted to oppose the waiver of the Preparation Notice requirement of the above project.

Along with other things, Life of the Land would note that the "draft" which your office is circulating on the project is at least five (5) years old. Additionally, we would note that full public input is the primary objective of the EIS Law, and we believe that public input is particularly crucial for this project.

Thank you very much for your attention to this matter. If you have any questions or comments, please call Life of the Land at 595-3903.

Very respectfully yours,

Fred Paul Benco

Fred Paul Benco
Director

FPB/sn

October 28, 1988

Mr. Fred Paul Benco
Life of the Land
19 Niolopa Place
Honolulu, HI 96817

Dear Mr. Benco:

SUBJECT: Draft EIS for Sand Island Shore Protection

Thank you for your comments regarding the subject project. The Office of Environmental Quality Control has addressed your concerns and has considered the document content and procedure as submitted to be adequate

Should you have any questions or comments in the future, please call Mr. Clye Hosokawa at 548-2696.

Sincerely,

RALSTON H. NAGATA
State Parks Administrator

CH:rn

245 North Kukui Street, Honolulu, Hawaii 96817, Telephone (808) 537-5966

AMERICAN LUNG ASSOCIATION of Hawaii
The Christmas Seal People®

RECEIVED
'88 MAY 25 P5:11
OFC. OF ENVIRON. QUALITY CONTR.

May 23, 1988

Marvin T. Miura, Ph.D.
Office or Environmental Quality Control
465 South King Street, Suite 104
Honolulu, Hawaii 96813

Dear Dr. Miura:

Subject: "Draft" Environmental Impact Statement
Sand Island Shore Protection Project
U.S. Corps of Engineers and Department
of Land & Natural Resources

We have reviewed the subject "draft" EIS and offer the following comments.

1. We hereby incorporate by reference our April 29, 1988, letter to you in which we stated our belief that this EIS has been improperly processed due to the unlawful waiver of the consultation process by the OEQC. This waiver denied public input which would have contributed to preparation of a "fully acceptable EIS" which is the intent of the consulation process as stated in state EIS Rules [§11-200-15].

2. This document which is being circulated as a Chapter 343, HRS, draft EIS is in actuality several old documents prepared by the US Army Corps of Engineers in the early 1980's. It consists of a Main Report, a 27-page Final NEPA EIS, and six appendices covering various federal and technical aspects of the proposed action.

3. The "draft" EIS fails in many ways to meet the content requirements detailed in EIS Rules, §11-200-17.

   a. No summary sheet [§11-200-17(a)].
   b. No "no action" alternative [§11-200-17(f)].
   c. Outdated description of environmental setting [§11-200-17(g)].
   d. No discussion of related projects in the area which may result in cumulative impacts [§11-200-17(g)].
   e. No discussion of the relationship of the proposed action to land use plans, policies, and controls for the affected area [§11-200-17(h)].

   f. No list of necessary approvals and their status [§11-200-17(h).
   g. Outdated discussion of impacts due to the 6-year time span since the EIS was prepared [§11-200-17(i)].
   h. No discussion of cumulative direct and indirect impacts and interrelationship with other related projects in the area [§11-200-17(i)]
   i. No discussion of the relationship between local short term uses of humanity's environment and the maintenance and enhancement of long-term productivity [§11-200-17(j)].
   j. No discussion of irreversible and irretrievable commitments of resources [§11-200-17(k)].
   k. No discussion of unavoidable impacts and rationale for proceeding notwithstanding such impacts [§11-200-17(l)].
   l. No discussion of consequences adverse to environmental goals and guidelines established by HRS Chapters 342 and 344 [§11-200-17(l)].
   m. No discussion of mitigation measures [§11-200-17(m)].
   n. No summary of unresolved issues [§11-200-17(n)].
   o. No list of persons, agencies, and organizations consulted in the preparation of the EIS [§11-200-17(o)].
   p. No reproductions of comments and responses made during the consultation process [§11-200-17(p)].

The inadequacy of this document is substantial and could have easily been avoided had the applicant complied with Chapter 343, HRS, by going through a consultation process. We again urge you to reject this EIS and ask the DLNR to fully comply with the State's EIS Rules.

Sincerely yours,

Stephen Francis /ct

Stephen Francis
Vice Chairman
Environmental Health Committee

SF:ct
18826

cc: DLNR

October 28, 1988

Mr. Steven Francis
American Lung Assn.
245 No. Kukui St.
Honolulu, HI 96817

Dear Mr. Francis:

SUBJECT: "Draft" EIS Sand Island Shore Protection Project
U.S. Corps of Engineers & Department of Land &
Natural Resources

Thank you for your comments regarding the subject project. The Office of Environmental Quality Control has addressed your concerns and has considered the procedures and contents of the document to be adequate as submitted.

Should you have any further questions or comments, please call Clyde Hosokawa at 548-2696.

Sincerely,

/s/ RALSTON H. NAGATA

RALSTON H. NAGATA
State Parks Administrator

CH:rn

JOHN WAIHEE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF STATE PARKS
P. O. BOX 621
HONOLULU, HAWAII 96809

WILLIAM W. PATY, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

LIBERT K. LANDGRAF
DEPUTY

AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
CONSERVATION AND ENVIRONMENTAL AFFAIRS
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

February 2, 1989

Mr. Steven Francis
American Lung Association
245 N. Kukui Street
Honolulu, Hawaii 96817

Dear Mr. Francis:

SUBJECT: "Draft" Environmental Impact Statement Sand Island Shore Protection Project U.S. Corps of Engineers & Department of Land & Natural Resources

This is a follow up of our October 28, 1988 letter concerning your comments on the Draft EIS for the subject project. The following is our item by item response to your specific comments:

1. The OEQC's waiver of the consultation phase was not required because the Preparation Notice for the project was published in the April 8, 1986 OEQC Bulletin.

2. This document has been recently reviewed by the Corps of Engineers. They have reconfirmed that the EIS document of October 1983 is still valid and the information it contains is current and pertinent.

3a. A summary sheet will be added to the Final EIS. A copy is attached for your information.

3b. The "No Action" alternative is discussed on the following pages:

1) pages 16-18, section D. "Future (Without Project) Conditions"

2) pages between pages 44 & 45; Table 9, "Summary Comparison of Alternative Plans and System of Accounts".

3) page EIS-5, Section 3.2 "Without Conditions"

3c. The information in the Draft EIS of October 1983 is still current and pertinent as indicated in item 2 above.

3d. The discussion of related projects in the area which may result in cumulative impacts are discussed as follows:

1) page 16-18, Section D. "Future (without project) Conditions"

2) page 38:
"An existing 66-inch sewage force main line from the Ala Moana Pump Station crosses under the Honolulu Harbor entrance channel and enters Sand Island near the eastern limit of the study area. Since it lies approximately 28 feet below sea level, it will not be affected by construction activities near the surface."

3e. The relationship of the proposed action to land use plans, policies, and controls for the affected area is discussed in the following sections:

1) page 13, Section D. Table 2 "Land Use"

2) pages 16-18, Section D. "Future (without project) Conditions

3f. The permits that have been filed are the Shoreline Management Area permit and the Conservation District Use Application permit.

3g. The information in the Draft EIS of October 1983 is still current and pertinent as indicated in item 2 above.

3h. The discussion of cumulative direct and indirect impacts and interrelationship with other related projects in the area are discussed on the following pages:

Direct impacts:

1) page 40:
"...an effort to mitigate the negative impacts to the recreational resources cited by the public (see Figure 12)."
"...to insure the preservation of the existing tide pools that have naturally developed shoreward of the existing revetment."

2) page 42:
"...to mitigate impacts on the surf zone by proposing shoreline structures in this reach."

3) between pages 44 & 45:
Table 9 "Summary Comparison of Alternative Plans and System of Accounts"

4) page EIS-1:
"...by eliminating erosion along that stretch of shoreline, and by providing more rocky intertidal habitat for benthic organisms."

5) page EIS-17:
Sections "Flora" and "Fauna"

Indirect impacts:

1) page 40:
"It is expected that sand will gradually accumulate behind the structure further enhancing the recreational resource of this reach."

2) page EIS-5:
"...will cause some increased turbidity and siltation during construction, as well as increased noise, dust and traffic."

3) pages 44-45: Table 9. Summary Comparison of Alternative Plans and System of Accounts

4) page A-2 (EIS):
   a) 3. Physical Substrate Determination
   b) 4. Water Quality, Circulation, Fluctuation and Salinity Determination
   c) 5. Suspended Particulate and Turbidity Determination

5) pages EIS-6,7,8: Table 3. Comparison of Alternative Impacts

6) page EIS-10:
   a) 4.4 Water Quality
   b) 4.5 Sedimentation and Sediment Quality
   c) 4.6 Noise
   d) 4.7 Air Quality
   e) 4.8 Historic Resources
   f) 4.9 Biological Resources

7) page EIS-16:
   a) 5.3 Water Quality
   b) 5.4 Sedimentation and Sediment Quality
   c) 5.5 Noise
   d) 5.6 Air Quality
   e) 5.7 Historic Resources
   f) 5.8 Biological Resources

Combination of Direct/Indirect impacts:

1) page 40
"...about 200 feet of the existing structure will be left intact along this reach, and a stone wall enclosure added to tie it into the shore, to provide the desired shelter."

Interrelationship with other related projects in the area:

1) page 13
"Plans for an ultimate four-lane parkway on Sand Island to accommodate the anticipated traffic increases due to the expanded container yard facilities and the State park development are being considered by the State DLNR. Plans are also being developed by the State of Hawaii, Department of Transportation to add a second bridge alongside the bascule bridge. Sand Island State park is presently served by the two-lane asphaltic concrete road which extends the length of Sand Island."

3i. The discussion of the relationship between local short term uses of humanity's environment and the maintenance and enhancement of long-term productivity are as follows:

1) The development of Alternative plan 3 will serve the short-term uses of man's environment by eliminating erosion along that stretch and by insuring the preservation of the existing tide pools that have naturally developed on the shore side of the existing revetment.

2) Maintenance for long term productivity is included in this action through its consideration of the environment, construction standards, and need for recreational lands.

3) The development will also enhance the long-term productivity of the designate park use.

4) The proposed project will not involve trade-offs between short-term environmental gains at the expense of long-term losses, narrow the ranges of beneficial use of the environment, or propose long-term risks of health and safety.

3j. The discussion of irreversible and irretrievable commitments of resources are as follows:

1) The construction and operation of the proposed project would involve the irretrievable commitment of certain natural and fiscal resources. Major resource commitments include land, construction materials, manpower and energy. The impacts of using these resources should, however, be weighed against the economic benefits to the residents of the County and State, and the consequences resulting from taking no action.

2) The commitment of construction materials, manpower, and energy are mostly not renewable and irretrievable. Benefits will accrue to the environment. The operation of the project will also include the consumption of potable water and electricity which also represents the irretrievable commitment of resources.

3k. The discussion of unavoidable impacts and rationale for proceeding notwithstanding such impacts is discussed in Section 5 "Environmental Effects"; pages EIS-15,16,17.

31. The discussion of consequences adverse to environmental goals and guidelines established by HRS Chapters 342 and 344

is discussed in Section 5 "Environmental Effects"; pages EIS-15,16,17.

3m. The discussion of mitigation measures based on Alternative Plan 3 is discussed on the following pages:

1) page 40:
"...an effort to mitigate the negative impacts to the recreational resources cited by the public (see Figure 12)."

2) page 42:
"...to mitigate impacts on the surf zone by proposing shoreline structures in this reach."

3n. The summary of unresolved issues is discussed in Section 1.3; "Unresolved Issues" page EIS-1.

3o. Since the Draft EIS is a fully accepted final Federal National Environmental Policy Act document that has undergone processing and reviews (refer to pages EIS-18,19,20; Section 6.3 "Statement Recipients") and the information in the document was reconfirmed to be current and pertinent, no further persons, agencies or organizations were contacted during the consultation phase for the Draft EIS.

3p. No further comments were received in response to the EIS Preparation Notice of April 8, 1986.

I appreciate your interest and concern regarding the subject project.

Sincerely,

Richard Kanayama
for Ralston H. Nagata
State Parks Administrator

cc: Office of Environmental Quality Control
cc: Div. of Water & Land Development

SUMMARY

PROPOSED PROJECT: Sand Island Shore Protection

PROPOSING AGENCY: Department of Land and Natural Resources
Division of Water and Land Development
Division of State Parks
State of Hawaii

PROJECT LOCATION: TMK: 1-5-41:62
Honolulu, Oahu, Hawaii

PROJECT DESCRIPTION:

The study area is located on Sand Island on the southern coast of Oahu (Fig 2). Approximately 520 acres in area, Sand Island shelters Honolulu Harbor from the open sea and is connected to the Kapalama peninsula by a bascule bridge at its western end.

The study site consists of approximately 4700 feet of shoreline on the south side of the island adjacent to the State park.

The study focused on the evaluation of shore erosion and related problems at Sand Island State Park and their impacts upon the overall environmental, cultural, and recreational resources of the area. Alternative plans for protecting the shore from further erosion were developed, and the costs, benefits, and environmental impacts associated with implementing these plans were evaluated.

Three plans were evaluated for the Sand Island Shore Protection Study. These plans were Plan 1 - Riprap revetment, Plan 2 - Offshore protective structures, and Plan 3 - Combination

of Revetment and Offshore protective structures.

Plan 3 is the tentative recommended alternative because of its greater overall benefits. There is no nonstructural plan that will fulfill the goals of the project. The project is expected to have a beneficial impact on the environment in the study area by eliminating erosion along that stretch of shoreline, and by providing more rocky intertidal habitat for benthic organisms.

There are no unresolved issues. There is compatibility with land use plans and policies as shown in Table 2 (EIS-2,3). The permits that have been filed are the Shoreline Management Area permit and the Conservation District Use Application permit.

PURPOSE AND NEED FOR ACTION

The purpose of this study is to identify the cause and extent of erosion on the south shoreline of Sand Island and to determine the feasibility in providing protective measures at the problem area. The study area begins at the southeast corner of Sand Island next to the harbor entrance and terminates at the Island's southwest corner. Approximately 2000 feet of this shoreline is unprotected against wave action because of the partial or complete failure of the original revetment. The resulting erosion of the shoreline is in a progressive stage and is evident in the aerial photos in Figure 7.

The Sand Island area is the site of a variety of

recreational opportunities. The nearshore waters around the island are an attractive resource that provides an assortment of recreational activities such as sailing and boating, water skiing, sunbathing, fishing, limu (seaweed) gathering, snorkeling, and swimming.

Due to the diversity of activities at the project location, action is needed in order to prevent further erosion of the shoreline.

CONSERVATION COUNCIL for HAWAII

A CITIZENS' ORGANIZATION PROMOTING ENVIRONMENTAL HEALTH AND EDUCATION, CONSERVATION AND MANAGEMENT OF HAWAII'S NATURAL RESOURCES

May 23, 1988

Marvin T. Miura, Ph.D., Director
Office of Environmental Quality Control
465 South King Street, Suite 104
Honolulu, Hawaii 96813

Dear Dr. Miura:

Subject: "Draft" Environmental Impact Statement Sand Island Shore Protection Project
U.S. Corps of Engineers and Department of Land & Natural Resources

We have reviewed the subject "draft" EIS and offer the following comments.

1) We hereby incorporate by reference our May 6, 1988, letter to you in which we stated our belief that OEQC could not waive the consultation process. This waiver denied our input which would have contributed to preparation of a "fully acceptable EIS" which is the intent of the consultation process as stated in state EIS Rules [Sec 11-200-15].

2) The document being circulated for review as a Chapter 343, HRS, draft EIS is an out-dated set of documents prepared by the US Army Corps of Engineers in the early 1980's. It's the Corps' standard set of a Main Report, a brief Final NEPA EIS, and six appendices covering various federal and technical aspects of the proposed action.

3) The "draft" EIS fails in many ways to meet the content requirements set out in the EIS Rules, Sec 11-200-17.

a. No summary sheet [Sec 11-200-17(a)].
b. The "no action" alternative is not considered [Sec 11-200-17(f)].
c. Outdated description of environmental setting [Sec 11-200-17(g)]. The current shoreline is different from that shown in the set of documents, yet none of this information has been updated. It is impossible to determine if the current situation is better or worse than in 1983, or for that matter if the project shouldn't be totally redesigned or dropped.
d. No discussion of related projects in the area which may result in cumulative impacts, for example, the proposed changes to the discharges of the sand island sewage treatment plant and their degree of treatment are not discussed. [Sec 11-200-17(g)].
e. No discussion of the relationship of the proposed action to land use plans, policies, and controls for the affected area [Sec 11-200-17(h)]. How does the project relate to the State plans, City and County General Plan and their shoreline management rules?
f. No list of necessary approvals and their status [Sec 11-200-17(h). Is a section 401 permit required? Is a CDUA required?
g. The discussion of the impacts is outdated in light of the 6-year time span since the EIS was prepared [Sec 11-200-17(i)].
h. No discussion of cumulative direct and indirect impacts and interrelationship with other related projects in the area [Sec 11-200-17(i)].

i. No discussion of the relationship between local short term uses of humanity's environment and the maintenance and enhancement of long-term productivity [Sec 11-200-17(j)].
j. No discussion of irreversible and irretrievable commitments of resources [Sec 11-200-17(k)].
k. No discussion of unavoidable impacts and rationale for proceeding notwithstanding such impacts [Sec 11-200-17(l)].
l. No discussion of consequences adverse to environmental goals and guidelines established by HRS Chapters 342 and 344 [Sec 11-200-17(l)].
m. No discussion of mitigation measures [Sec 11-200-17(m)]. How will the surfing sites be protected from degradation by this project?
n. No summary of unresolved issues [Sec 11-200-17(n)].
o. Since OEQC illegally waived the consultation process, we find no list of persons, agencies, and organizations consulted in the preparation of the EIS [Sec 11-200-17(o)].
p. Since the Corps document was dusted off and circulated as is, there is no reproductions of comments and responses made during the consultation process [Sec 11-200-17(p)].

It is quite clear to us that many of the above deficiencies could have been avoided if a consultation process had been undertaken as required. We again state that the DLNR should prepare and file an up-to-date environmental assessment for the proposed project and go through the full state eis preparation and review process.

We are disappointed that you have not already withdrawn this document and required DLNR to follow the rules like any other agency. This document needs a new beginning, one starting off on the right foot.

Sincerely yours,

Rick Scudder,
Chairman

cc: DLNR

October 28, 1988

Mr. Rick Scudder, Chairman
Conservation Council of hawaii
Box 2923
Honolulu, HI 96802

Dear Mr. Scudder:

SUBJECT: Draft EIS for the Sand Island Shore Protection Project

Thank you for your comments regarding the subject project. In accordance with the July 13, 1988 Environmental Council meeting, the procedure and contents of the document has been determined to satisfy Section 11-200-17.

In response to your specific comments listed under Item No. 3 in your letter:

c) The current condition of the shoreline, whether better or worse than in 1983 does not require a redesign of the seawall.

f) The following permits will be processed with the appropriate agencies:

1) 401 permit - Corps of Engineers
2) 404 permit - Department of Health
3) Special Management Area Use Permit (SMP) City & County of Honolulu
4) Shoreline Setback Variance (SV) - City and County of Honolulu.
5) Conservation District Use Application (CDUA) - Department of Land & Natural Resources
6) Building Permit - City and County of Honolulu

Should you have any further questions or comments, please call Clyde Hosokawa at 548-2696.

Sincerely,

/s/ RALSTON H. NAGATA

CH:rn

RALSON H. NAGATA
State Parks Administrator

JOHN WAIHEE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF STATE PARKS
P. O. BOX 621
HONOLULU, HAWAII 96809

WILLIAM W. PATY, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

LIBERT K. LANDGRAF
DEPUTY

AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
CONSERVATION AND ENVIRONMENTAL AFFAIRS
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

February 2, 1989

Mr. Rick Scudder
Conservation Council for Hawaii
P.O. Box 2923
Honolulu, Hawaii 96802

Dear Mr. Scudder:

SUBJECT: "Draft" Environmental Impact Statement Sand Island Shore Protection Project U.S. Corps of Engineers & Department of Land & Natural Resources

This is a follow up of our October 28, 1988 letter concerning your comments on the Draft EIS for the subject project. The following is our item by item response to your specific comments:

1. The OEQC's waiver of the consultation phase was not required because the Preparation Notice for the project was published in the April 8, 1986 OEQC Bulletin.

2. This document has been recently reviewed by the Corps of Engineers. They have reconfirmed that the EIS document of October 1983 is still valid and the information it contains is current and pertinent.

3a. A summary sheet will be added to the Final EIS. A copy is attached for your information.

3b. The "No Action" alternative is discussed on the following pages:

1) pages 16-18, section D. "Future (Without Project) Conditions"

2) pages between pages 44 & 45; Table 9, "Summary Comparison of Alternative Plans and System of Accounts".

3) page EIS-5, Section 3.2 "Without Conditions"

3c. The information in the Draft EIS of October 1983 is still current and pertinent as indicated in item 2 above.

3d. The discussion of related projects in the area which may result in cumulative impacts are discussed as follows:

1) page 16-18, Section D. "Future (without project) Conditions"

2) page 38:

"An existing 66-inch sewage force main line from the Ala Moana Pump Station crosses under the Honolulu Harbor entrance channel and enters Sand Island near the eastern limit of the study area. Since it lies approximately 28 feet below sea level, it will not be affected by construction activities near the surface."

3e. The relationship of the proposed action to land use plans, policies, and controls for the affected area is discussed in the following sections:

1) page 13, Section D. Table 2 "Land Use"

2) pages 16-18, Section D. "Future (without project) Conditions

3f. The permits that have been filed are the Shoreline Management Area permit and the Conservation District Use Application permit. Currently it has not been determined if a 401 permit is required for the subject project. If required, a 401 permit will be filed.

3g. The information in the Draft EIS of October 1983 is still current and pertinent as indicated in item 2 above.

3h. The discussion of cumulative direct and indirect impacts and interrelationship with other related projects in the area are discussed on the following pages:

Direct impacts:

1) page 40:
"...an effort to mitigate the negative impacts to the recreational resources cited by the public (see Figure 12)."
"...to insure the preservation of the existing tide pools that have naturally developed shoreward of the existing revetment."

2) page 42:
"...to mitigate impacts on the surf zone by proposing shoreline structures in this reach."

3) between pages 44 & 45:
Table 9 "Summary Comparison of Alternative Plans and System of Accounts"

4) page EIS-1:
"...by eliminating erosion along that stretch of shoreline, and by providing more rocky intertidal habitat for benthic organisms."

5) page EIS-17:
Sections "Flora" and "Fauna"

Indirect impacts:

1) page 40:
"It is expected that sand will gradually accumulate behind the structure further enhancing the recreational resource of this reach."

2) page EIS-5:
"...will cause some increased turbidity and siltation during construction, as well as increased noise, dust and traffic."

3) pages 44-45: Table 9. Summary Comparison of Alternative Plans and System of Accounts

4) page A-2 (EIS):
a) 3. Physical Substrate Determination
b) 4. Water Quality, Circulation, Fluctuation and Salinity Determination
c) 5. Suspended Particulate and Turbidity Determination

5) pages EIS-6,7,8: Table 3. Comparison of Alternative Impacts

6) page EIS-10:
a) 4.4 Water Quality
b) 4.5 Sedimentation and Sediment Quality
c) 4.6 Noise
d) 4.7 Air Quality
e) 4.8 Historic Resources
f) 4.9 Biological Resources

7) page EIS-16:
a) 5.3 Water Quality
b) 5.4 Sedimentation and Sediment Quality
c) 5.5 Noise
d) 5.6 Air Quality
e) 5.7 Historic Resources
f) 5.8 Biological Resources

Combination of Direct/Indirect impacts:

1) page 40
"...about 200 feet of the existing structure will be left intact along this reach, and a stone wall enclosure added to tie it into the shore, to provide the desired shelter."

Interrelationship with other related projects in the area:

1) page 13
"Plans for an ultimate four-lane parkway on Sand Island to accommodate the anticipated traffic increases due to the expanded container yard facilities and the State park development are being considered by the State DLNR. Plans are also being developed by the State of Hawaii, Department of Transportation to add a second bridge alongside the bascule bridge. Sand Island State park is presently served by the two-lane asphaltic concrete road which extends the length of Sand Island."

3i. The discussion of the relationship between local short term uses of humanity's environment and the maintenance and enhancement of long-term productivity are as follows:

1) The development of Alternative plan 3 will serve the short-term uses of man's environment by eliminating erosion along that stretch and by insuring the preservation of the existing tide pools that have naturally developed on the shore side of the existing revetment.
2) Maintenance for long term productivity is included in this action through its consideration of the environment, construction standards, and need for recreational lands.
3) The development will also enhance the long-term productivity of the designate park use.
4) The proposed project will not involve trade-offs between short-term environmental gains at the expense of long-term losses, narrow the ranges of beneficial use of the environment, or propose long-term risks of health and safety.

3j. The discussion of irreversible and irretrievable commitments of resources are as follows:

1) The construction and operation of the proposed project would involve the irretrievable commitment of certain natural and fiscal resources. Major resource commitments include land, construction materials, manpower and energy. The impacts of using these resources should, however, be weighed against the economic benefits to the residents of the County and State, and the consequences resulting from taking no action.
2) The commitment of construction materials, manpower, and energy are mostly not renewable and irretrievable. Benefits will accrue to the environment. The operation of the project will also include the consumption of potable water and electricity which also represents the irretrievable commitment of resources.

3k. The discussion of unavoidable impacts and rationale for proceeding notwithstanding such impacts is discussed in Section 5 "Environmental Effects"; pages EIS-15,16,17.

3l. The discussion of consequences adverse to environmental

goals and guidelines established by HRS Chapters 342 and 344 is discussed in Section 5 "Environmental Effects"; pages EIS-15,16,17.

3m. The discussion of mitigation measures based on Alternative Plan 3 is discussed on the following pages:

1) page 40:
"...an effort to mitigate the negative impacts to the recreational resources cited by the public (see Figure 12)."
2) page 42:
"...to mitigate impacts on the surf zone by proposing shoreline structures in this reach."

3n. The summary of unresolved issues is discussed in Section 1.3; "Unresolved Issues" page EIS-1.

3o. Since the Draft EIS is a fully accepted final Federal National Environmental Policy Act document that has undergone processing and reviews (refer to pages EIS-18,19,20; Section 6.3 "Statement Recipients") and the information in the document was reconfirmed to be current and pertinent, no further persons, agencies or organizations were contacted during the consultation phase for the Draft EIS.

3p. No further comments were received in response to the EIS Preparation Notice of April 8, 1986.

I appreciate your interest and concern regarding the subject project.

Sincerely,

Richard Kanayama
for Ralston H. Nagata
State Parks Administrator

cc: Office of Environmental Quality Control
cc: Div. of Water & Land Development

SUMMARY

PROPOSED PROJECT: Sand Island Shore Protection

PROPOSING AGENCY: Department of Land and Natural Resources
Division of Water and Land Development
Division of State Parks
State of Hawaii

PROJECT LOCATION: TMK: 1-5-41:62
Honolulu, Oahu, Hawaii

PROJECT DESCRIPTION:

The study area is located on Sand Island on the southern coast of Oahu (Fig 2). Approximately 520 acres in area, Sand Island shelters Honolulu Harbor from the open sea and is connected to the Kapalama peninsula by a bascule bridge at its western end.

The study site consists of approximately 4700 feet of shoreline on the south side of the island adjacent to the State park.

The study focused on the evaluation of shore erosion and related problems at Sand Island State Park and their impacts upon the overall environmental, cultural, and recreational resources of the area. Alternative plans for protecting the shore from further erosion were developed, and the costs, benefits, and environmental impacts associated with implementing these plans were evaluated.

Three plans were evaluated for the Sand Island Shore Protection Study. These plans were Plan 1 - Riprap revetment, Plan 2 - Offshore protective structures, and Plan 3 - Combination

of Revetment and Offshore protective structures.

Plan 3 is the tentative recommended alternative because of its greater overall benefits. There is no nonstructural plan that will fulfill the goals of the project. The project is expected to have a beneficial impact on the environment in the study area by eliminating erosion along that stretch of shoreline, and by providing more rocky intertidal habitat for benthic organisms.

There are no unresolved issues. There is compatibility with land use plans and policies as shown in Table 2 (EIS-2,3). The permits that have been filed are the Shoreline Management Area permit and the Conservation District Use Application permit.

PURPOSE AND NEED FOR ACTION

The purpose of this study is to identify the cause and extent of erosion on the south shoreline of Sand Island and to determine the feasibility in providing protective measures at the problem area. The study area begins at the southeast corner of Sand Island next to the harbor entrance and terminates at the Island's southwest corner. Approximately 2000 feet of this shoreline is unprotected against wave action because of the partial or complete failure of the original revetment. The resulting erosion of the shoreline is in a progressive stage and is evident in the aerial photos in Figure 7.

The Sand Island area is the site of a variety of

recreational opportunities. The nearshore waters around the island are an attractive resource that provides an assortment of recreational activities such as sailing and boating, water skiing, sunbathing, fishing, limu (seaweed) gathering, snorkeling, and swimming.

Due to the diversity of activities at the project location, action is needed in order to prevent further erosion of the shoreline.