DRAFT SUPPLEMENT II
ENVIRONMENTAL IMPACT STATEMENT
FOR
MA'ALAEA HARBOR FOR
LIGHT DRAFT VESSELS
MAUI, HAWAII

TAX MAP KEYS: 3-6-01:2, 41, 43, 45, 49, 50, 51

THIS JOINT DOCUMENT IS SUBMITTED PURSUANT TO 42 USC 4321, 40 CFR 1500-1508, 33 CFR 230, ER 1105-2-100, AND CHAPTER 343, HRS

FEDERAL PROPONENT:
U.S. ARMY ENGINEER DISTRICT, HONOLULU

STATE PROPONENT:
HAWAII DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF BOATING AND OCEAN RECREATION

ACCEPTING AUTHORITIES:
DISTRICT ENGINEER, HONOLULU ENGINEER DISTRICT
AND
GOVERNOR, STATE OF HAWAII

Ralph H. Graves
Lieutenant Colonel, U.S. Army
District Engineer

8 May '98
Date

Michael D. Wilson
Chairperson, Board of Land and Natural Resources

5/7/98
Date

DRAFT SUPPLEMENT II ENVIRONMENTAL IMPACT STATEMENT
MA'ALAEA HARBOR FOR LIGHT-DRAFT VESSELS, MAUI, HAWAII

Co-Lead Agencies:

Federal: **U.S. Army Engineer District, Honolulu**
State: **Hawaii Department of Land and Natural Resources, Division of Boating and Ocean Recreation**

Proposed Action: **Improve Ma'alaea Harbor for Light-Draft Vessels, Ma'alaea Harbor, Maui, Hawaii**

ABSTRACT: The U.S. Army Engineer District, Honolulu, in partnership with the State of Hawaii, is planning to construct improvements to the Ma'alaea Harbor for light-draft vessels at Ma'alaea, Maui, Hawaii. The Federal portion of the proposed action consists of realigning the entrance channel and modifying the existing breakwater to protect the new entrance channel. The purposes of these improvements are to reduce the surge within the harbor basin, reduce navigation hazards in the entrance channel, and provide opportunity for addition of commercial and recreational berthing spaces and associated harbor facilities. The local sponsor, the State of Hawaii Department of Land and Natural Resources, Division of Boating and Ocean Recreation, would provide expanded berthing facilities and improved infrastructure, including fuel, sewage treatment and pumpout facilities. Total construction costs are estimated at $9,301,000.

A General Design Memorandum and Final Environmental Impact Statement (EIS) was approved by the Chief of Engineers in 1980, and a State of Hawaii Revised EIS was accepted by the Governor in 1982. The 1980 and 1982 plans of improvement were modifications of the plan originally approved by Congress in 1968. A Final Supplemental EIS was prepared and circulated in 1994 to update the environmental information regarding the proposed project and alternatives. A second supplemental EIS is now being prepared to provide additional information on design modifications to avoid and minimize impacts to surfing sites, coral reefs, and other aquatic habitat; to provide further evaluation of potential effects to endangered and threatened species; to provide clarification and additional discussion of Alternative plan 6; and to respond to public and agency comments received on the 1994 Final Supplemental EIS.

Previous and present studies indicate that the proposed project will fully achieve the Federal and State purposes. A mitigation plan developed by a team of Federal and State agencies would provide mitigation for unavoidable adverse environmental impacts, which include destruction or alteration of 8.16 acres of marine habitat, including 4.8 acres of coral reefs, destruction of a small sandy beach, and destruction of one surfing site.

The proposed action is consistent with Hawaii Coastal Zone Management (CZM) Program policies and objectives. The National Marine Fisheries Service and Fish and Wildlife Service have determined that the proposed action is not likely to jeopardize the continued existence of listed endangered or threatened species. The recommendations of the Fish and Wildlife Service and Hawaii DLNR have been considered with respect to fish and wildlife resources. Hawaii Department of Health is expected to issue Section 401 water quality certification. A preliminary evaluation pursuant to 40 CFR 230, EPA's Guidelines for the Specification of Disposal Sites for Dredged and Fill Material, concludes that the proposed action complies with those guidelines.

Comments on this Draft Supplement II EIS should be provided to the address below within 45 days of the date of publication of the Notice of Availability in the Federal Register.

Commander
U.S. Army Engineer District, Honolulu (Attn: CEHED-ED-CE)
Building 230
Fort Shafter, Hawaii 96825-5440
Telephone (808) 438-1157: Fax (808) 841-1581

TABLE OF CONTENTS

Page

LIST OF TABLES

LIST OF FIGURES

NO. FOLLOWS:

APPENDIXES

1 SUMMARY

1.1 BACKGROUND

Ma'alaea Harbor on the island of Maui (Figure 1) was first developed by the Territory of Hawaii in 1952, and was modified by the Territory and State in 1955, 1959, and 1979 to its present configuration (Figure 2). In 1968 Congress approved a Federal plan of improvement for the harbor. Because of community concern for the destruction of the surf break known as "Ma'alaea Pipeline" that would be caused by the 1968 design, a post-authorization study and redesign was conducted and approved in 1980.

No new civil works construction starts were authorized during most of the 1980's because of national administration policy. In 1989, Congress allocated funds for the Ma'alaea project, and work on the project resumed. An environmental assessment in 1990 determined that a supplemental environmental impact statement (SEIS) was required. An SEIS was prepared, and the final document was circulated in 1994.

As a result of public input, the need to inform the public about minor engineering changes, and the desire to more fully document the analysis of Alternative 6 (the interior mole) HED and the project sponsor determined that a second SEIS should be prepared.

Additional information provided in this document consists of the following:

- results of harbor sediment sampling;

- results of coral reef surveys;

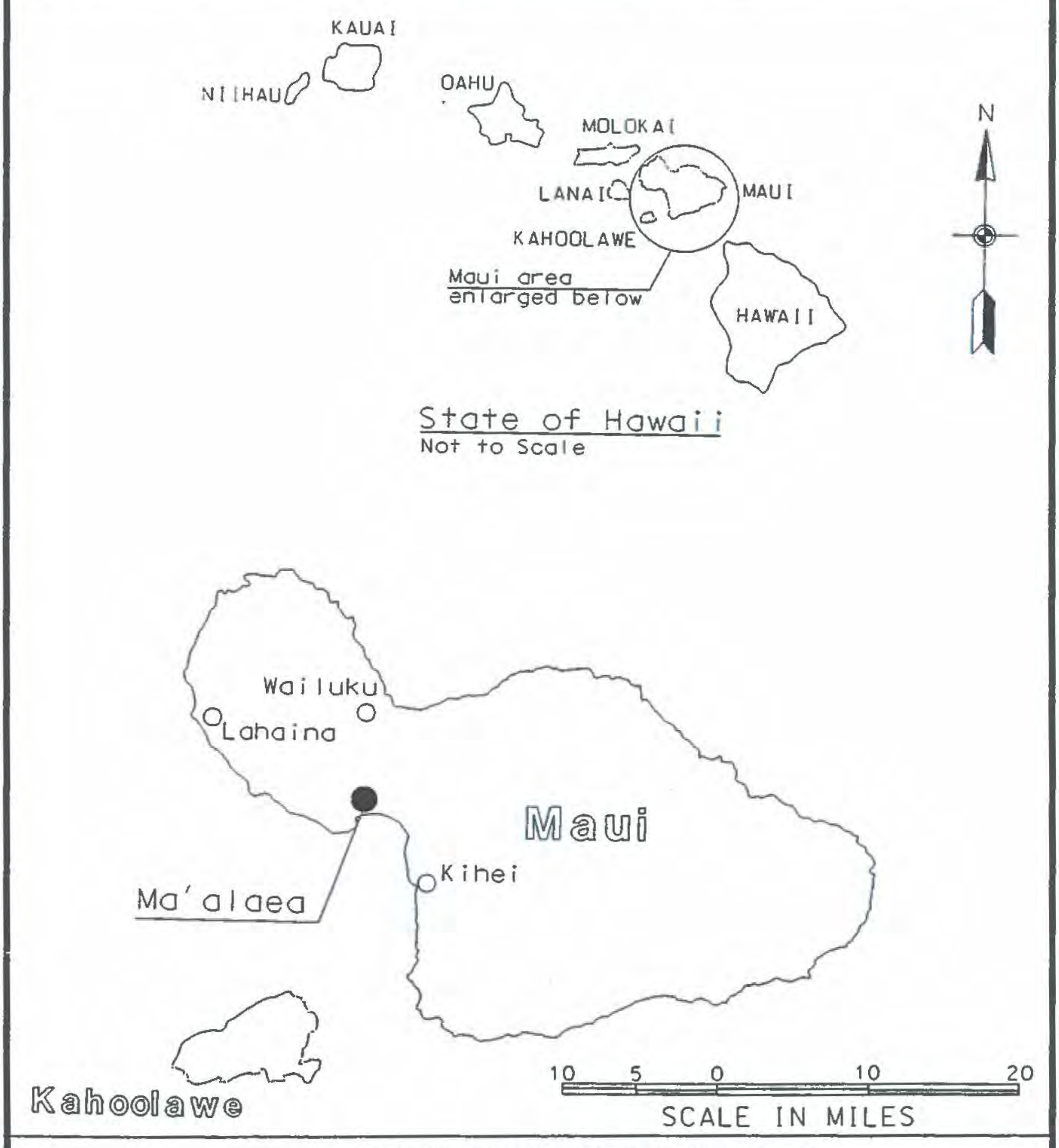
- further evaluation of Alternative 6 (previously eliminated), including additional details regarding safety and navigation factors, further comparison of alternatives, and additional detail regarding surge and wave studies;

- updated information on the Hawaiian Islands Humpback Whale National Marine Sanctuary;

- additional information on threatened and endangered species and further coordination completed;

- updated status of compliance with environmental laws and regulations;

- presentation of a mitigation plan developed as a cooperative effort between State and Federal agencies; and

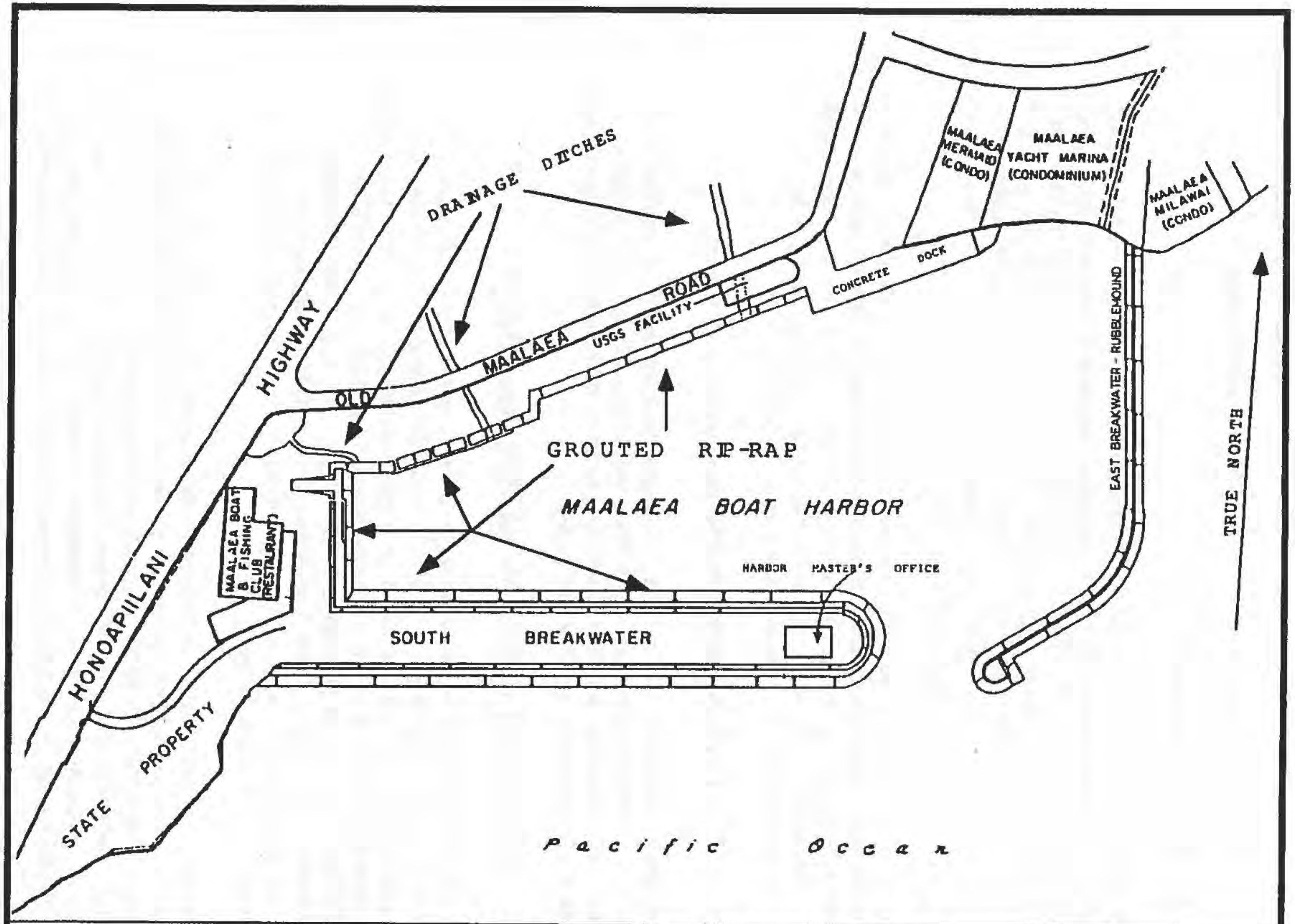


MA'ALAEA LIGHT-DRAFT HARBOR
Island of Maui, Hawaii

Prepared By: Civil Works Branch
Engineering and
Environmental Section

Figure 1. Location Map.

U.S. ARMY CORPS
OF ENGINEERS
Honolulu Engineer District



MA'ALAEA LIGHT-DRAFT HARBOR
Island of Maui, Hawaii

Prepared By: Civil Works Branch
Engineering and
Environmental Section

Figure 2. Ma'alaea Light-Draft Harbor Present Configuration.

U.S. ARMY CORPS
OF ENGINEERS
Honolulu Engineer District

- revision of figures to accurately reflect design modifications.

1.2 Purpose and Need

The Federal purposes of the proposed project are to (1) reduce surge within the harbor basin and entrance channel; (2) reduce navigation hazards in the entrance channel; and (3) provide opportunity for the addition of berthing spaces and attendant harbor facilities. The State's (project sponsor) purposes are to (1) improve the existing harbor support facilities; and (2) increase the number of berths that presently exist in the harbor. The improvements are needed to address long-standing problems associated with navigation safety, surge within the harbor, and inadequate harbor facilities.

Because of the surge and navigation problems, a good portion of Ma'alaea Harbor is underutilized, with much of the space unusable for berthing. With improvements to correct these problems, more efficient use can be made of the space within the full harbor. Ma'alaea Harbor is one of the very few harbors in the State which presents the opportunity to expand its capacity without expanding its size.

1.3 Affected Environment (Environmental Setting)

The basic environment of the area has not changed since distribution of the 1994 FSEIS; however, additional information is presented concerning wave responses, navigation safety, harbor flushing, economic feasibility, threatened and endangered species, bottom sediments of the harbor, and coral reef studies.

1.4 Alternatives Including the Proposed Action

A total of nine alternatives including the proposed action and "No Action" were considered in the 1994 SEIS. Several of these were eliminated early in the planning process because they would not fulfill the purpose and need for the project. The proposed action and four of the alternatives are reexamined in this Draft Supplement II EIS (DSIIEIS). Reexamined alternatives are Alternative 1 (proposed action), Alternative 2, Alternative 3, Alternative 4, and Alternative 6. Not examined in detail are the "No Action" alternative, dry stack storage, alternative harbor location, the 1968 authorized plan and the 1980 proposed plan.

Alternative 1 features include an extension to the existing south breakwater, entrance channel, turning basin, main access channel, and the addition of a revetted mole to the existing south breakwater for a bus turn-around. Alternative 2 is the same as Alternative 1, except that the revetted mole on the south breakwater would be replaced by a wave absorber. Alternative 3 is similar to Alternative 2, except that it consists of a detached breakwater instead of an extension to the existing south breakwater. An extension to the east breakwater is the main feature of Alternative 4, with a corresponding entrance channel, turning basin, and main access channel. Alternative 6 consists of an internal breakwater to reduce wave action within the harbor, and dredging for entrance channel, access channel and turning basin.

The Hawaii Department of Land and Natural Resources (DLNR), Division of Boating and Ocean Recreation (DBOR) is the project sponsor. The State's proposed development and berthing plan is based on a harbor configuration of Alternatives 1, 2, or 3 and would consist of a harbor center mole, east mole, administration facilities, an increase in the number of berths, and increase in the number of parking stalls and paved areas, a fueling and service dock, and new utilities, including an upgrade of the sewage disposal system. Improvements are planned to the loading dock and boat ramp. Berths, parking, sewage pumpout, fuel facility and sewage wharf are planned for the new center mole. Parking, berths, comfort station, and landscaping improvements are planned for the south mole. East mole improvements include berths, access, and landscaping. A comfort station would be constructed near the Coast Guard Station. Parking and picnic areas would be developed at the west end of the harbor.

All alternatives studied would reduce harbor surge to acceptable levels in the berthing areas and in the entrance channel. Alternatives 1-4 would greatly improve navigation conditions in the entrance channel; Alternative 6 would pose severe navigational hazards. Alternatives 1-4 would allow for the capacity of the harbor to be increased from the existing 89 berths to about 220 berths, whereas Alternative 6 would allow a capacity of 125 berths. Alternatives 1-4 would meet 60 percent of the present demand for berthing, and Alternative 6 would meet 11 percent.

All alternatives were determined to be economically feasible. Alternative 1 was the National Economic Development Plan with a benefit-cost ratio of 2.59 to 1, the highest of the alternatives. The lowest benefit-cost ratio was 1.14 to 1 for Alternative 6.

Alternative 1 would fully accommodate the State's proposed plan for improvement of the Harbor. Alternatives 2, 3, 4, and 6 would partially accommodate the State's plan.

1.5 Environmental Consequences (Impacts of the Proposed Action on The Environment)

The areas of effect for the proposed action have been updated in accordance with the most recent project drawings. In addition, the mitigation plan developed by the Hawaii Department of Land and Natural Resources (DLNR), the National Marine Fisheries Service(NMFS), Corps of Engineers, Honolulu District (HED), and Hawaii Department of Business, Economic Development and Tourism (DBET) Coastal Zone Management (CZM) Program has been included to show how the unavoidable impacts of the project will be minimized or compensated for. The requirements expected to be imposed by the Hawaii Department of Health (DOH) for Section 401 Water Quality Certification have been added.

Alternative 1 would result in the dredging and filling of approximately 11.89 acres of marine habitat, including about 4.8 acres of coral reef reef. About 1.5 acres of useable habitat would be created by construction of the breakwater extension. One surf site (Off-the-Wall) would be lost, and design modifications have avoided impacts to two other sites. The 24-hour harbor flushing rate would be reduced from about 50 percent to 38 percent.

Alternative 2 would result in the dredging and filling of approximately 11.48 acres of marine habitat, including 4.7 acres of coral reef. About 1.5 acres of useable habitat would be created by construction of the breakwater extension. One surf site would be lost, and design modifications similar to Alternative 1 would avoid impacts to other sites. The 24-hour harbor flushing rate would be the same as for Alternative 1.

Approximately 11.69 acres of marine habitat, including 4.7 acres of coral reef, would be dredged or filled with Alternative 3. About 1.7 acres of habitat would be created by construction of the breakwater. One surf site would be lost and two others would be modified in an unknown manner. The 24-hour harbor flushing rate would be the same as for Alternative 1.

Alternative 4 would result in the dredging and filling of 18.59 acres of marine habitat, including 2.3 acres of coral reef. About 2.2 acres of habitat would be created by construction of the breakwater extension. Two surf sites would be lost and two others would be modified in an unknown manner. The 24-hour harbor flushing rate would be the same as for Alternative 1.

About 8.54 acres of aquatic habitat would be dredged or filled with Alternative 6, including 1.0 acre of coral reef. About 1.8 acres of habitat would be created by construction of the internal breakwater. There would be no effect on surf sites. The 24-hour harbor flushing rate would be reduced from 50 percent to 26 percent.

A small sandy beach inside the harbor would be lost with all of the alternatives.

The NMFS issued a Biological Opinion which concluded that the proposed activities are not likely to jeopardize the continued existence of humpback whales or green sea turtles. Increased vessel activity associated with the expansion and operation of the harbor may adversely affect humpback whales, but despite the potential for adding vessel traffic, the benefits of consolidating vessel activity in existing facilities and preserving nearshore whale habitat in other areas of west Maui outweigh the possible adverse effects of displacement of humpback whales. An Incidental Take Statement was provided for the green sea turtle. Reasonable and prudent alternatives and conservation recommendations provided in the Biological Opinion would be implemented in conjunction with the proposed action. NMFS determined that adverse effects from construction could occur to the hawksbill turtle, and provided an incidental take provision. The NMFS concurred with the HED determination that the proposed project is not likely to adversely affect the Hawaiian monk seal.

The U.S. Fish and Wildlife Service (FWS) concurred with the HED determination that the construction and operation of the facility would not affect any listed, proposed, or candidate threatened and endangered species within the FWS's jurisdiction.

The Hawaii Office of Planning, DBET issued a Hawaii Coastal Zone Management (CZM) Program Federal Consistency determination for the proposed project on the basis of information provided in the draft mitigation plan and its implementation.

The FWS provided a final report pursuant to the Fish and Wildlife Coordination Act (FWCA). The report concluded that if the proposed action were issued a CZM consistency determination, the FWS would consider mitigation for unavoidable impacts. HED provided a copy of the CZM consistency determination and mitigation plan to FWS in August 1997 and requested any additional comments pursuant to FWCA. No response has been received to date.

The State of Hawaii Historic Preservation Officer concurred with the HED determination of "no effect" to cultural resources, in accordance with the National Historic Preservation Act.

The proposed action would be consistent with the policies, objectives and provisions of Federal, State, and local land use and resource management plans.

1.6 MAJOR CONCLUSIONS

Alternative 1 is the Federal and State preferred plan because it maximizes net benefits, best meets the project objectives, the environmental impacts have been avoided or minimized to the extent practicable, and the project has received CZM consistency determination. It has been determined that the proposed action is not likely to jeopardize Federally listed threatened or endangered species. A mitigation plan has been developed to compensate for unavoidable adverse impacts.

Because of navigational safety issues, Alternative 6, which is based on a concept which limits all modifications to the interior of the existing harbor, is not a feasible alternative. No feasible design could be found that would eliminate the navigational hazards in conjunction with this alternative.

1.7 AREAS OF CONTROVERSY

There is opposition to developing increased capacity at Ma'alaea Harbor by some members of the public. In addition, many surfers are opposed to the project because they believe any impact to surf sites is unacceptable. Others are opposed to the project because they believe there will be unacceptable impacts to threatened and endangered species and the marine environment.

The final Fish and Wildlife Coordination Act Section 2 (b) Report was issued in December 1994, after publication of the November 1994 FEIS. The final 2(b) Report recommended that the Corps undertake further evaluation of a design based on the Alternative 6 concept. That further evaluation is presented in this DSIIEIS. FWS also deferred making mitigation recommendations until such time as a CZM consistency determination was issued. An interagency team developed a mitigation plan (Appendix C) which was transmitted to the State Office of Planning with a request to reconsider its earlier denial of a consistency determination. By letter dated September 12, 1996, the Office of Planning issued CZM consistency approval for the project, based on implementation of the mitigation plan. By letter dated July 18, 1997, the Corps transmitted the mitigation plan and CZM consistency approval determination to the FWS, with a request for additional mitigation recommendations, if any. To date, no further mitigation measures have been made by FWS. The mitigation plan and related CZM correspondence are in Appendix C.

1.8 ISSUES YET TO BE RESOLVED

Section 401 Water Quality Certification must be provided by the Hawaii Department of Health (DOH) prior to issuance of a permit pursuant to Section 404 of the Clean Water Act.

DBOR is seeking a confirmation from the County of Maui that a Special Management Area permit is not required for this project. DBOR is further consulting with the County of Maui Planning Department to determine whether landside work consisting of connecting the breakwater improvements and center mole to the shoreline within the harbor will require a shoreline setback variance permit or any other County authorization.

2 PURPOSE AND NEED

2.1 BACKGROUND

Ma'alaea Harbor on the island of Maui (Figure 1) was first developed by the Territory of Hawaii in 1952 and was modified by the Territory and State in 1955, 1959 and 1979 to its present configuration (Figure 2). A Federal plan of improvement was approved by Congress in 1968, but controversy surrounding the impact to the surf break known as "Ma'alaea Pipeline" resulted in a post-authorization study and redesign in 1980. A General Design Memorandum (GDM) and Final Environmental Impact Statement (FEIS) was approved by the Chief of Engineers in 1980, and a State of Hawaii Revised EIS was accepted by the Governor in 1982.

After several years with no new civil works construction starts, Congress added construction funds for the Ma'alaea harbor project to the fiscal year 1990 Water and Energy Appropriations Bill. In 1990 , the U.S. Army Engineer District, Honolulu (HED) prepared a draft and Final Environmental Assessment (EA) in which it determined to prepare a supplemental environmental impact statement (SEIS) to assess the proposed project's impact on surf sites, endangered species, the marine environment and other parameters. The HED prepared a Draft SEIS (DSEIS) in 1992, and after that DSEIS was distributed for public comment, issued a Final SEIS (FSEIS) in 1994. The 1994 FSEIS provides detailed information on the background of the project and its environmental impacts, and references the prior relevant studies. In 1996, HED prepared a Limited Reevaulation Report (LRR), which provided an update of the economic analysis and environmental issues for the expansion of Ma'alaea Harbor.

The HED determined the need to prepare a second supplemental EIS in 1997 in order to address public input, new mitigation developed, minor changes to the project since the first SEIS was circulated, and to further evaluate the interior mole alternative (Alternative 6).

2.2 PURPOSE OF THE PROPOSED ACTION

The Federal purpose for the proposed action is specifically directed to the need for navigation improvements for commercial and recreational purposes at Ma'alaea Harbor. Objectives include: (1) reduce surge within the harbor basin and entrance channel and the resultant damage to vessels; (2) reduce navigation hazards in the entrance channel; and (3) provide opportunity for the addition of berthing spaces and attendant harbor facilities.

The Hawaii DBOR (project sponsor) purpose is to develop the internal improvements to the boat harbor that will be made feasible once the Federal navigation improvements are completed. Objectives include: (1) improve the existing harbor support facilities; and (2) increase the number of berths that presently exist in the harbor. These improvements are not included in the Federal portion of the project but are dependent upon the construction of the Federal improvements.

2.3 NEED FOR THE ACTION

Problems related to the harbor include severe harbor surge which causes damage to vessels and to harbor structures and facilities, difficulties in navigating in the entrance channel, and the shortage of berths and adequate harbor facilities. Other problems include competition among recreational uses of the harbor and adjacent areas.

2.3.1 NEED TO REDUCE HARBOR SURGE

Ma'alaea Harbor experiences severe surge in the harbor and entrance channel navigation difficulties. The surge results from the existing configuration and alignment of the harbor entrance, which allows direct wave attack through the channel opening. The harbor is vulnerable to southern swells and "kona" or southern storm waves. The southern swells occur over 50 percent of the year. Kona storms may occur several times in any year or not at all.

The severe harbor surge creates navigational hazards at the harbor entrance and prevents safe berthing in some portions of the harbor, rendering portions of the harbor unsafe for mooring. These conditions prevent the full utilization of the available 11.3 acres of dredged water area within the harbor. Surge occurs in various locations within the harbor basin when wave heights exceed about 2 feet at the harbor entrance. This renders several areas of the harbor unsuitable for berthing. Waves breaking in the entrance channel during these swells send turbulence throughout the harbor. Boat owners either leave the harbor with their vessels or secure their vessels and remain on board to prevent damages. Large vessels leave the harbor during severe conditions as it is safer for these vessels to be out at sea. Costs associated with the rough conditions include increased labor costs for staying with the boat during rough conditions, higher maintenance costs, the need for more durable and higher-cost equipment and supplies (for example, thicker mooring lines), and increased fuel costs for those boats needing to leave the harbor during rough conditions. Total average annual costs for extra equipment and labor generated by the rough conditions for both commercial and recreational boaters are estimated at $262,000. Estimated annualized damages to boats are $56,000, for a total of $318,000 per year in costs and damages. The Updated Economic Analysis in Appendix A presents the details of these costs.

2.3.2 NEED TO IMPROVE NAVIGATION SAFETY

Navigation is very hazardous within the entrance channel when wave heights exceed about 6 feet. This occurs about 6.5 percent of the time (about 24 days each year). Dangers include boats hitting the channel bottom, broaching, and grounding on the breakwater structures. Surfers occasionally attempt to ride breaking waves through the harbor entrance, creating an additional hazard to themselves and harbor users.

2.3.3 NEED FOR HARBOR IMPROVEMENTS

The harbor consists of 95 slips and one mooring spot in the basin for a total of 96 berths. In October 1994, 89 vessels were listed as harbor occupants. Most of these occupied a single slip, but a few occupy multiple slips. Of the 89 vessels, 49 were recreation craft, 13 were commercial (occupational) fishing, and 27 were commercial passenger (includes tour boats and charter fishing boats). Commercial passenger and commercial (occupational) fishing boats represented 45 percent of the vessels and recreational craft were 55 percent. (See Updated Economic Analysis, Appendix A.)

The DLNR maintains a waiting list for mooring slips at Ma'alaea Harbor. Recently it contained 208 applicants, of which 111 are recreation craft, 55 are commercial (occupational) fishing boats, and 42 are commercial passenger vessels. Not more than 27 slips can be occupied by commercial passenger vessels, in accordance with current State limits. There is also a moratorium of the number of commercial passenger-carrying vessels moored elsewhere that can use Ma'alaea's docking facilities temporarily. There are 44 vessels on the waiting list for permits to operate commercial passenger-carrying operations out of Ma'alaea. Ma'alaea Harbor is one of the few harbors with the potential for additional mooring capacity without enlarging the size of the harbor (R.M. Towill Corp 1982).

2.3.4 OTHER NEEDS

Harbor users have indicated an inadequate availability of fresh water, electricity, fuel and equipment storage space as well as inadequate boat launching and retrieving capability, a shortage of parking spaces for automobiles and trailers, and lack of a bus turnaround on the south breakwater. Currently, buses loading and unloading passengers on the south mole for commercial vessel operations must back up several hundred feet in order to exit the south mole. There is insufficient space for these vehicles to turn around. This is a continuing safety concern.

In addition, there is an immediate need to upgrade the existing sewage disposal facilities.

There is a need to minimize conflicts regarding recreational uses of the harbor and surrounding area among boaters, surfers, and other uses. Environmental needs include protection of coral reef resources, maintenance or improvement of existing water quality within the harbor, protection of threatened and endangered species and other fish and wildlife resources, and minimizing impacts to surf sites.

2.4 INCORPORATION BY REFERENCE

The GDM and FEIS for the post-authorization modification plan, revision of September 26, 1980 (U.S. Army Corps of Engineers, Honolulu District 1980); the Revised Environmental Impact Statement for Improvements to the Ma'alaea Boat Harbor (R.M. Towill Corp. 1982); and the Final Supplemental EIS (FSEIS) for Ma'alaea Harbor for Light-Draft Vessels (U.S. Army Engineer District, Honolulu 1994) are incorporated herein by reference.

3 AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This chapter summarizes the discussion of the affected environment contained in the 1994 FSEIS and its referenced materials and incorporates additional information that has been obtained since publication of that document.

The 1994 FSEIS provides detailed information regarding the resources of the affected environment. Details in that document regarding location, a general description of the area, climate, natural hazards, air quality, noise, and cultural resources are not repeated here. Only a brief summary of these resources is provided here; please refer to the 1994 FSEIS for more detailed information.

Additional information on several other resources, including water quality, harbor flushing, biological resources, surfing sites, boating and navigation, commercial (occupational) fishing, land use, and socioeconomics, is presented below in order to respond to public and agency comments, to provide clarification on several items, and to present new information.

3.1.1 LOCATION

Ma'alaea Harbor is located on the southwest shore of the island of Maui, about 7 miles south of the county seat, Wailuku, and about 8 miles south of the commercial and business center of Kahului. It is located at the western end of the Ma'alaea Bay shoreline (Figures 1 and 2).

3.1.2 DESCRIPTION

The present configuration of Ma'alaea Harbor (Figure 2) consists of a south revetted mole approximately 1,100 feet long and 90 feet wide and an eastern rubble-mound breakwater approximately 850 feet long and 8 feet wide. A 90-foot-wide, 13-foot-deep entrance channel provides access to the harbor, and the interior dredged basin consists of about 11.3 acres. The south revetted mole provides parking for about 164 autos and buses, berths for about 30 of the larger commercial vessels, and contains the office building for the Ma'alaea Harbor Master. The total berthing capacity is 96; the harbor is at maximum capacity with a waiting list of approximately 208 craft. Of the 89 vessels currently moored in the harbor (six occupy more than one slip), 49 are recreation vessels, 13 are commercial (occupational) fishing, and 27 are commercial passenger vessels.

Additional facilities include a one-lane concrete launch ramp, 277 marked parking spaces, a haul-out facility, a small restroom, two small harbor storage buildings, and space for boat repair and maintenance. The north side of the harbor contains berths mainly occupied by fishing boats, the U.S. Coast Guard facility, and a concrete loading dock with parking spaces. Additional parking is available along roadways and adjacent to some of the boat slips.

The Coast Guard previously kept a 95-foot patrol vessel at Ma'alaea Harbor for search and rescue operations, but a few years ago this vessel was replaced with two 24-foot high-speed, rigid-hull inflatable boats (U.S. Fish and Wildlife Service 1994b).

3.2 CLIMATE

Maui's climate is semi-tropical with a mean annual temperature of about 75°F. The Ma'alaea Bay area is relatively dry. Northwest trade winds are predominant, averaging 10 to 20 miles per hour (mph) and frequently exceed 25 mph. Ocean current flow near the harbor is a trade wind generated surface movement generally toward the southwest. The current speed is typically less than 1 knot (1.2 mph). Strong wind-generated rip currents may develop during periods of high swell activity, especially during Kona storms.

3.3 NATURAL HAZARDS

Hurricanes occur infrequently, generally during the summer and fall months, and are a source of large destructive waves. Damaging hurricanes passed through the Hawaiian islands in 1950, 1957, 1978, 1982, and 1992. Like many coastal areas in Hawaii, Ma'alaea Harbor is subject to potential tsunami inundation. It is located in a Coastal High Hazard Area, which is an area subject to a 100-year coastal flood, designated Flood Zone V18, with base flood elevation of 11 feet above mean sea level (Federal Emergency Management Agency (FEMA) 1981a; FEMA 1981b). The designation is due to the potential for tsunami inundation.

The Hawaii Coastal Zone Management (CZM) Program's objective with respect to coastal hazards is to reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion and subsidence.

3.4 AIR QUALITY

Air quality at the harbor is excellent, with the present main sources of pollution being dust from construction, periodic burning of sugar cane fields, exhaust from motorized vehicles and vessels in the harbor area and volcanic eruptions on the island of Hawaii. The strong offshore winds quickly disperse any air pollutants. Air samples are not taken at the harbor, but samples taken by the State Department of Health (DOH) at Kihei during the period 1988-1993 consistently met Federal and State of Hawaii air quality standards (Hawaii DOH, undated & Hawaii DOH, undated).

3.5 NOISE

The main source of noise in and around the harbor is motorized vehicles and vessels, although wind is frequently the dominant noise. Aircraft flying over the area intermittently add to the noise level.

3.6 WATER QUALITY

The waters within Ma'alaea Harbor are designated by Chapter 11-54 of the Hawaii Administrative Rules as Class A waters. The objective of this class of waters is that their use for recreational purposes and aesthetic enjoyment be protected. The harbor is also designated as a Class II Marine Bottom Ecosystem, for which the objective is that its use for protection and/or propagation of fish, shellfish, and wildlife, and for recreational purposes not be limited. Any action which may modify marine bottoms require approval from the Hawaii DOH (DOH).

Waters outside the harbor are designated Class AA waters. The objective for this classification is that these waters remain in their natural pristine state as nearly as possible with an absolute minimum of pollution or alteration of water quality from any human-caused source or action.

The water within Ma'alaea Harbor is moderately turbid at times as a result of fine sediments which enter the harbor through three drainage ditches on the northern side of the harbor. The harbor acts as a sediment basin, and as these sediments are resuspended by wind and harbor boat traffic, the fines are slowly flushed from the harbor.

The Hawaii DOH routinely samples the water in Ma'alaea Harbor. Between 1991 and 1996 State water quality criteria for turbidity was exceeded between one to four times per year from 1991-1994. There were no exceedences in 1995 and 1996. Exceedences of chlorophyll A occurred between one and three times per year, and enterococci standards were exceeded from one to six times from 1991 through 1996 (Hawaii DOH 1997). Table 1 shows a summary of water quality standards exceedences for several parameters from the period 1991 through1996 in Ma'alaea Harbor.

All ocean waters in the State, including bays, fully support beneficial uses. However, seasonal algae blooms have begun to interfere with aquatic recreational activities. A DOH task force is studying the problem. In addition, measurements of enterococci from 1991 through 1996 found that between 25 and 50 percent of samples exceeded the criteria, indicating that the water quality of the harbor does not support designated use, and use is likely to be impaired.

Table 1
Summary of Selected State Water Quality Standards Exceedences

Parameter	Criteria	1991	1992	1993	1994	1995	1996
Fecal Coliform (#/100 ml)	200	0	0	0	NA	NA	NA
Enterococci (#/100 ml)	7	1	1	3	3	3	6
pH (pH units)	8.1+/-0.5	0	0	0	0	0	0
Turbidity (NTU's)	1.5*	1	3	4	3	0	0
Nitrogen (dis) (ug/L)	8	0	0	3	2	0	1
Ammonia (ug/L)	6.0	0	0	11	8	2	3
Phosphorus (dis)(ug/L)	25*, 20	0	0	0	0	0	0
Chlorophyll A (ug/L)	1.5*, 0.5	1	2	2	2	2	3

*Wet Season Values
Note: The water quality criteria are somewhat complex and involve various percentages of samples exceeding different criteria. The values shown are the most stringent.
Source: Hawaii DOH 1997.

Water quality sampling and analyses were performed outside the Ma'alaea Harbor in the nearshore ocean off of the existing harbor breakwaters in 1997 (Marine Research Consultants 1998). Measured were total suspended solids (TSS), turbidity, and pH. The results for TSS ranged from 0.73 mg/L to 3.87 mg/L, with geometric means between 1.77 to 1.92, which were slightly higher in surface samples than in bottom samples. Figure 3 shows water quality sample locations.

Results for turbidity ranged from a low of 0.08 to a high of 0.29 ntu, with the mean surface turbidity at 0.15 ntu and a mean bottom turbidity of 0.13 ntu. None of the turbidity measurements exceed the most stringent limits for turbidity.

The geometric means of pH were slightly lower in the surface samples (8.13-8.15) compared to bottom samples (8.16).

The existing cesspool serving the harbor is considered to be a failed system due to overflows and frequent pumpout services; however, no groundwater contamination is known to occur in the project area.

In order to address concerns regarding potential release of contaminants from sediments during dredging operations, harbor sediments were tested for contaminants in October 1996. Appendix B presents a listing of the inorganics, pesticides, herbicides, volatiles, and semivolatiles for which the samples were analyzed, as well as the results of the analyses. All samples were tested in accordance with the methods specified in Environmental Protection Agency (EPA) Publication SW-846, Test Methods for

Evaluating Solid Waste, Physical/Chemical, test method 131, Characteristic Leaching Procedure. Figure 3 shows the locations of the sample sites.

None of the samples tested were found to be near action limits established by the EPA for those substances and most were below detection limits (Associated Laboratories 1996).

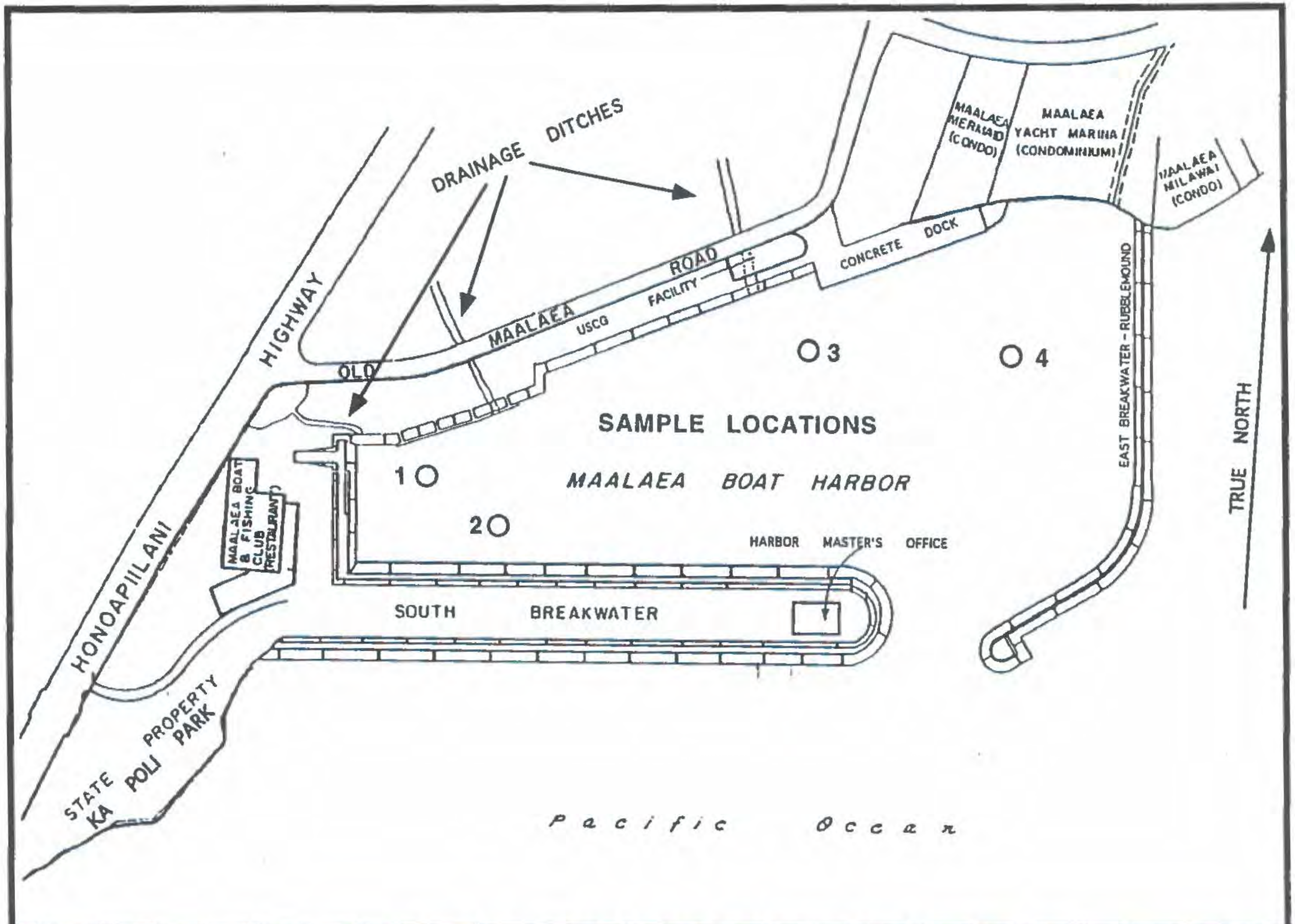
3.7 FLUSHING

Flushing is the amount of time that it takes to exchange the water within the harbor with the receiving water. Factors having primary influence on flushing in a similar type basin are tide, wind velocity and direction, basin topography, and entrance control. Flushing time is one of the key criteria in measuring the physical influence of a project on the aquatic system. If a marina is not properly flushed, pollutants (if present) may concentrate to unacceptable levels in the water and/or sediments, resulting in impacts to biological resources (EPA 1993).

The 1994 FSEIS Appendix B contains a study of the flushing characteristics of the existing harbor and selected project alternatives. The flushing study referenced a 1983 source by Clark which stated that a period of more than 10 days should be considered an unacceptable flushing time and that EPA guidelines established a 5-day threshold for coastal marina flushing (EPA 1983). The U.S. Army Corps of Engineers Waterways Experiment Station (WES) also subsequently provided additional information on flushing rates in a letter dated 14 July 1994, Subject: *An Additional Numerical Model Run for Modified Plan 2 in the Ma'alaea Harbor* (Houston 1994), that cited EPA Guidelines establishing a 5-day flushing threshold.

The study found that the strong steady north/northeast winds have a strong influence on the harbor circulation. Ma'alaea Harbor is unique in that a wind-induced two-layer flow pattern exists; the surface layer flows outward while the bottom layer flows inward. Circulation in the harbor is in a clockwise pattern caused by the wind pushing the water against the south breakwater. Existing harbor flushing is estimated to range from 2.1 to 2.9 days depending on position within the harbor, with an average of 2.6 days.

More recent EPA guidelines now suggest that different measures for flushing rates may be appropriate for different regions, depending on tide and position, and should be expressed as the percent of the water exchanged in a 24-hour period (EPA 1993). In 1997 WES converted the flushing time in days to the newer method which reports flushing time as the percent of harbor water replaced in 24 hours (Wang 1998). For the existing condition the average flushing percentage is 50.3 percent in 24 hours (see Appendix K).



Prepared By: Civil Works Branch
Engineering and
Environmental Section

MA'ALAEA LIGHT-DRAFT HARBOR
Island of Maui, Hawaii

Figure 3. Water Quality Sampling Locations.

U.S. ARMY CORPS
OF ENGINEERS
Honolulu Engineer District

3.8 LITTORAL PROCESSES AND SHORELINE STRUCTURES

There does not appear to be any substantial longshore transportation of material in the areas adjacent to the harbor, as evidenced by the fact that the harbor entrance channel has never been dredged, and there is no entrapment of sand by existing structures.

3.9 SURFACE DRAINAGE AND SEDIMENT TRANSPORT

Sediments from three drainage ditches accumulate in the vicinity of the outfalls. Because rainfall in the area is low, the amount of runoff feeding into these ditches is relatively low; however, during periods of high rainfall, the sediment load in nearshore waters of Ma'alaea Bay increases substantially as a result of drainage from erosion-prone uplands. Although the harbor acts as a sediment trap, finer sediments are regularly resuspended by vessel activity and exit the harbor in the surface flow. Bottom sediments remain within the harbor where they are confined by the inward bottom flow pattern.

Recently, there appeared to be considerable turbid water in the harbor as a result of upstream non-harbor related development and construction. The DLNR and DOH are pursuing regulatory compliance with the developers.

3.10 BIOLOGICAL RESOURCES

3.10.1 TERRESTRIAL RESOURCES

Plants found at the harbor site include *kiawe* (mesquite) and bristly foxtail. Coconuts and ironwood are also present. Ground cover is primarily seaside purslane and beach fan flower. Terrestrial birds include common mynahs and house sparrows. Migratory shorebirds use the intertidal flats at the site. Domestic cats and dogs, mice and rats, and mongoose, skinks and geckos are present. No listed, candidate, or proposed threatened or endangered terrestrial species are known to exist in the harbor area, and no special or sensitive upland habitats are located within the harbor area.

3.10.2 MARINE RESOURCES

Information on the marine resources in the project area was obtained primarily from the U.S. Fish and Wildlife Service (FWS)(1994b), in its Final Fish and Wildlife Coordination Act (FWCA) Report (see Appendix E), an algal survey (McDermid 1990a; 1990b) (see Appendix B in 1994 FSEIS), a recent coral survey (Jokiel and Brown 1998) (see Appendix D), and other surveys and reports. Additional detailed information regarding marine species can be found in the Final FWCA report and in the 1994 FSEIS.

The primary concern is the project's potential impacts on the live coral located in the immediate project area. The reef seaward of Ma'alaea Harbor is well developed, with a diverse community of corals and common reef organisms. The reef slope fronting and eastward of the east breakwater is the richest and most valuable area adjacent to the harbor, with large coral heads and abundant, diverse biological resources.

The FWS identifies coral reefs as Resource Category 2 habitats, or habitats which are of high value for certain species and are relatively scarce. The FWS goal for Resource Category 2 is to prevent net loss of in-kind habitat values. The EPA designates coral reefs as "*special aquatic sites*" (40 CFR 230). The State of Hawaii's Coastal Zone Management (CZM) Program includes corals and coral reefs as part of the "valuable coastal ecosystem" which it seeks to protect and minimize adverse impacts.

The published CZM Program objective associated with corals and coral reefs, fishes, and algae, and Federally protected species, is to "protect valuable coastal ecosystems from disruption and minimize adverse impacts on all coastal ecosystems" (Hawaii DLNR et al. 1996). Policies regarding coastal ecosystems include: (1) improve the technical basis for natural resource management; (2) preserve valuable coastal ecosystems of significant biological or economic importance; (3) minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land uses, recognizing competing water needs; and (4) promote water quantity and water quality planning and management practices which reflect the tolerance of freshwater and marine ecosystems and prohibit land and water uses which violate State water quality standards.

A recent detailed study (Jokiel and Brown 1998) consisting of more than 50 transects by University of Hawaii (UH) researchers found coral cover outside the harbor in the range of 30-40 percent, with the dominant species *Porites lobata*. Coral coverage is extensive along both sides of the entrance channel and extending eastward. Coral coverage within the harbor reached about 51 percent along areas of high slope. This community is dominated by *Montipora verrucosa* and *Porites compressa*. The greatest concentration of coral inside the harbor is located near the entrance along the east mole and along the eastern face of the triangular reef remnant in the center of the harbor. Figure 4 shows the coral coverage found during this survey. The complete UH report is contained in Appendix D of this document.

Outside the harbor the highest densities of fish occurred around the entrance or along the sand channel. Fish populations are dominated by parrotfish, tobies, sturgeonfish, wrasses and damselfish. Although outside the harbor fish abundance was positively correlated with coral coverage, within the harbor this relationship weakens. The highest fish densities recorded during this study occurred inside the harbor along the eastern mole in depths less than 3 feet. Within the harbor, dominant fish species found were yellow goatfish *(Mulloides vanicolensis)* and Hawaiian Flagtails *(Kuhlia sandvicensis)*, which

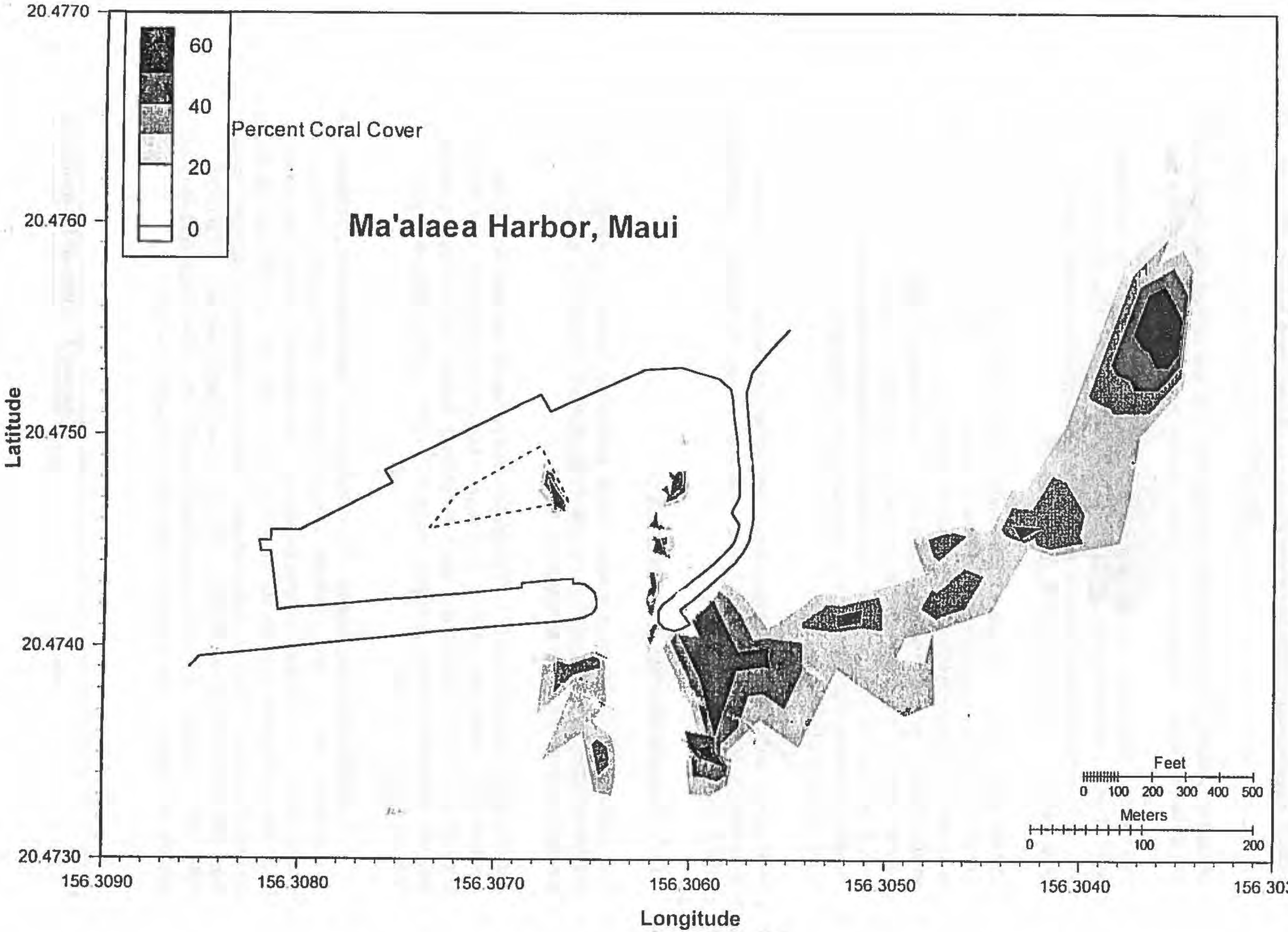


Figure 4. Location of Coral Reefs in and around Ma'alaea Harbor.

comprised almost 2/3 of the total fish numbers observed around the harbor entrance and along the east mole. The harbor serves as a valuable nursery ground for juvenile fish.

There is very little coral coverage on the reef immediately fronting the south revetted mole. Further out on the reef slope in deeper water, coverage is about 50 percent. The alga *Hypnea musciformis* is abundant on the reef pavement at the western end of the south mole (U.S. Fish and Wildlife Service 1994b).

The western portion of the harbor is a low-relief shoal covered with sand, mud and silt. The introduced red alga, *Hypnea musciformis*, inhabits most of the shoal. Bordering the shoal on the north and west edges are basalt boulders that have been colonized by a few small coral colonies. The eastern portion of the harbor contains a shallow reef flat adjacent to the east breakwater. The reef flat also had extensive patches of *Hypnea musciformis*, as well as other algae. The harbor reef becomes rockier near the harbor mouth with species more typical of an exposed outer-reef community (U.S. Fish and Wildlife Service 1994b).

Additional detailed information regarding other biological resources of the marine ecosystem of the project area is contained in Section 4.10 and Appendixes A and B of the 1994 FSEIS.

3.10.3 THREATENED AND ENDANGERED SPECIES

The waters around the Hawaiian Islands provide habitat for threatened and endangered species including the endangered humpback whale, Hawaiian monk seal, and hawksbill sea turtle, and the threatened green sea turtle.

The Endangered Species Act (P.L. 93-205) provides protection for Federally listed threatened and endangered species. The Marine Mammal Protection Act (P.L. 92-522) provides protection for marine mammals. In addition, Hawaii's CZM Program includes federally protected species as a resource category it seeks to protect from disruption (Hawaii DLNR et al 1996).

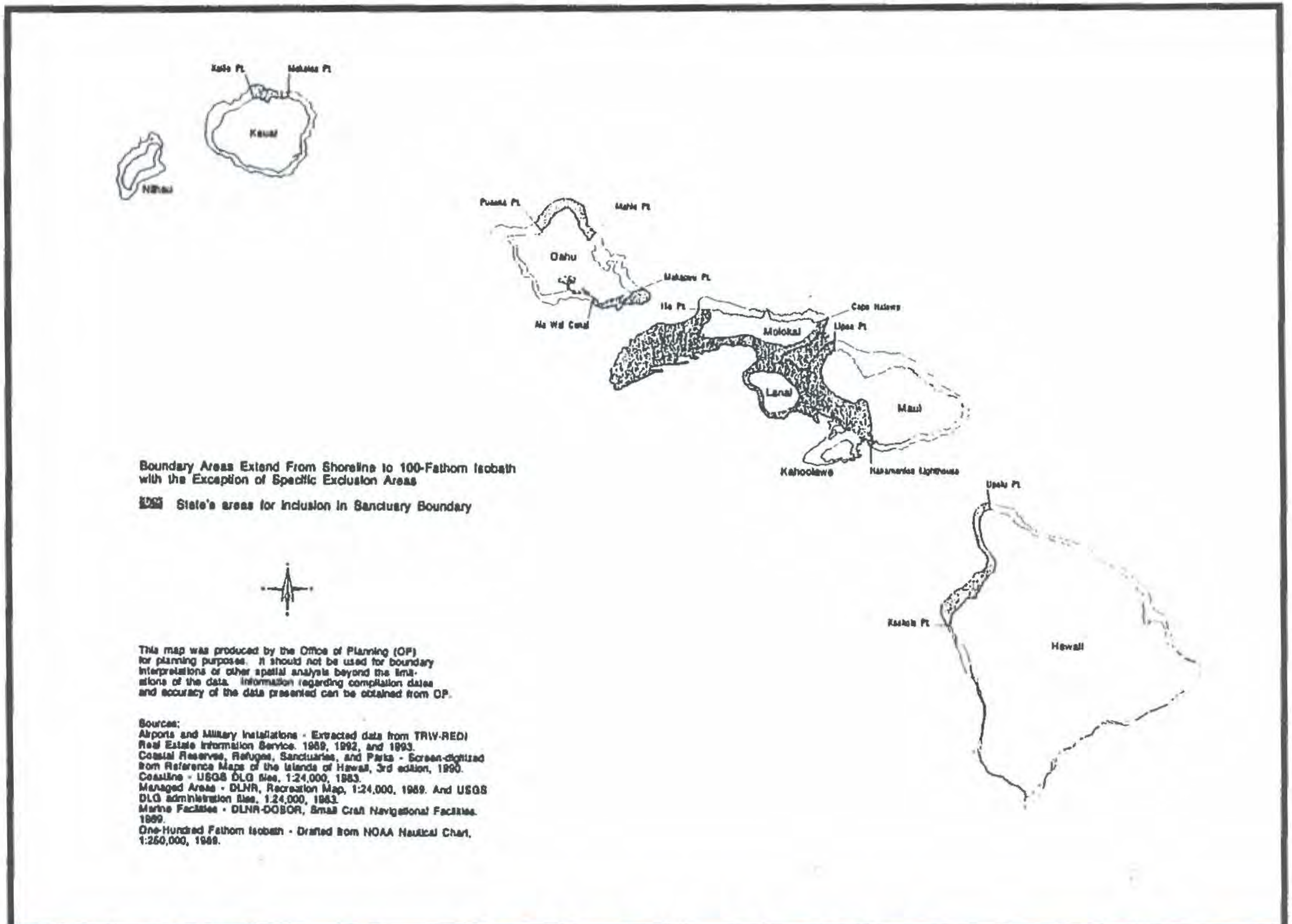
3.10.3.1Humpback Whales. Ma'alaea Bay is an important calving, breeding and nursing area for the endangered humpback whale (*Megaptera novaengliae*). These whales winter in the Hawaiian Islands beginning in December and lasting until as late as May. The whales seem to prefer the shallow waters, usually less than 100 fathoms during the breeding season. Areas of highest concentration in the Hawaiian Islands are Penguin Bank and the four-island area between Molokai, Maui, Kahoolawe, and Lanai (NMFS 1990; 1997). Section 4.10.3 and Appendixes A and B of the 1994 FSEIS contain more detailed information on the use of Ma'alaea Bay by humpback whales.

The Bay (exclusive of the harbor) is included in the Hawaiian Islands Humpback Whale National Marine Sanctuary in accordance with the Oceans Act of 1992. The U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), and the State of Hawaii Office of Planning in February 1997 completed a Final Environmental Impact Statement/Management Plan for the cooperative management of the sanctuary. The Governor of Hawaii in June 1997 agreed to include selected portions of State waters within the boundary of the Sanctuary, with certain conditions. The new boundaries, as identified by the Governor, are shown in Figure 5.

The Sanctuary Management Plan proposes utilization and reliance on existing Federal and State authorities, when possible, to manage activities that may negatively affect humpback whales and their habitats, and the Management Plan adopted existing NMFS humpback whale take and approach restrictions as Sanctuary regulations. In addition, it proposes a regulation to ensure greater coordination and to strengthen long-term protection of habitat. Degradation of water quality and the physical alteration of the submerged lands within the Sanctuary are concerns regarding the humpback whales' habitat. To supplement and complement existing Federal and State regulations that address water quality and alteration of the seabed activities, the Sanctuary regulations prohibit any activity requiring a Federal or State permit or other authorization to be conducted without such permit or in violation of the permit. Any authorized discharge or alteration of the seabed conducted in compliance with the specific authorization is not a violation of Sanctuary regulations.

NOAA did not propose any Sanctuary restrictions on fishing or fishing activities.

<u>3.10.3.2 Green Sea Turtle and Hawksbill Sea Turtle</u>. The coral reef fronting the harbor provides habitat for the Federally threatened green sea turtle and possibly the endangered hawksbill sea turtle. The green sea turtle is commonly seen in the project vicinity (U.S. Fish and Wildlife Service 1994b), which supports several algal species known to be used by the turtle as food sources. Feeding areas are generally shallow (less than 30 feet deep) and resting sites include coral recesses, under ledges, and sand bottom areas located in proximity to feeding areas. Approximately 1/2 mile from the harbor entrance is a patch reef known as "Turtle Town" by some boaters. Jokiel and Brown (1998) noted as many as 30-50 turtles on this small reef which is at a depth of about 45 feet. Hawksbill sea turtles feed on a variety of sponges and small marine animals inhabiting the Ma'alaea reef (U.S. Fish and Wildlife Service 1994a), but are not known to have been observed there. Nesting of this turtle on the beach fronting Kealia Pond National Wildlife Refuge, located approximately 0.8 mile east of Ma'alaea Harbor, was verified on July 1991 and August 1993 (National Marine Fisheries Service 1995). The NMFS also assumes that because there have been confirmed nestings, at least one or two hawksbill turtles may be present in Ma'alaea Bay during the nesting season.



Prepared By: Civil Works Branch
Engineering and
Environmental Section

MA'ALAEA LIGHT-DRAFT HARBOR
Island of Maui, Hawaii

U.S. ARMY CORPS
OF ENGINEERS
Honolulu Engineer District

Figure 5. State Boundary Selected
Hawaiian Islands Humpback Whale National Marine Sanctuary

3.10.3.3. Hawaiian Monk Seal. Endangered Hawaiian monk seals (*monachus schauinslandi)* are rarely observed along the coast of Maui. One was observed in February 1993 on a beach at Ma'alaea Bay, east of the Harbor.

3.11 CULTURAL RESOURCES

The 1994 FSEIS, Appendix H, provides detailed information regarding the cultural history of the project site (Joerger and Kaschko 1979). In addition the 1994 FSEIS identifies two artifacts located near the project area. They are a *piko* stone and a large sharpening stone known as the "King's Table".

According to Mr. Edwin Lindsey (Lindsey 1997) the area was famous for *alaea* (red dirt - iron oxide). There are two types of *alaea--kane* and *wahine*. The *kane* is found in the ocean, and the *wahine* on land. Ma'alaea is the source of both kinds. Mr. Lindsey also stated that other traditional food and medicinal algae and other organisms were gathered in the ocean; and endemic and indigenous plants used for medicinal and spiritual ceremonies are still located in the *ahupuaa.*

3.12 RECREATION

Hawaii's CZM Program, seeking to ensure recreational opportunity in the coastal zone, provides protection to surfing sites and sandy beaches, and requires the "replacement" of the resources--either in kind or through monetary compensation--when they are unavoidably damaged by public development. The CZM Program also recognizes the need to expand public recreational use of County, State and Federally owned waters, and the need to provide access to such waters.

Other applicable CZM policies for recreational resources include: (1) provide coastal resources uniquely suited for recreational activities that cannot be provided in other areas; (2) provide and manage adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value; (3) provide an adequate supply of shoreline parks and other recreational facilities suitable for public recreation; (4) encourage expanded public recreational use of County, State, and Federally owned or controlled shoreline lands and waters having recreational value; (5) adopt water quality standards and regulate sources of pollution to protect and restore recreational value of coastal waters; develop new shoreline recreational opportunities; and encourage reasonable dedication of shoreline areas with recreational value as part of discretionary approvals by land use and planning commissions.

3.12.1 SURF SITES

Three surf sites are located adjacent to the harbor: (1) the "Ma'alaea Pipeline" (including "Freight Trains" and "Left Overs"), located east of the entrance channel; (2) "Off-the-Wall", near the harbor entrance channel; and (3) Buzz's, consisting of three separate breaks, located along the south breakwater on the west side of the entrance channel (Figure 6). The 1994 FSEIS, Appendix E, contains more detailed information regarding these surf sites.

The Ma'alaea Pipeline" is known internationally as one of the best waves in the world, and is considered to be a unique surf site. "Off-the-Wall" is also considered to be unique because it is one of the few hollow-plunging waves in the area. Both of these surf sites have surfable conditions over 50 percent of the time, and frequency of use is high, although Off-the-Wall is a small break that can accommodate only a few surfers at a time.

Buzz's No. 1 at the eastern end of the south breakwater has surfable conditions only 20 percent of the time, and the site has a low density of use. Buzz's No. 2 is the most popular and consistent break with unique characteristics. Use is high. Buzz's No. 3 at the western end of the south breakwater is usually only ridden by body boarders. The site is similar to others in the area and is not of high quality.

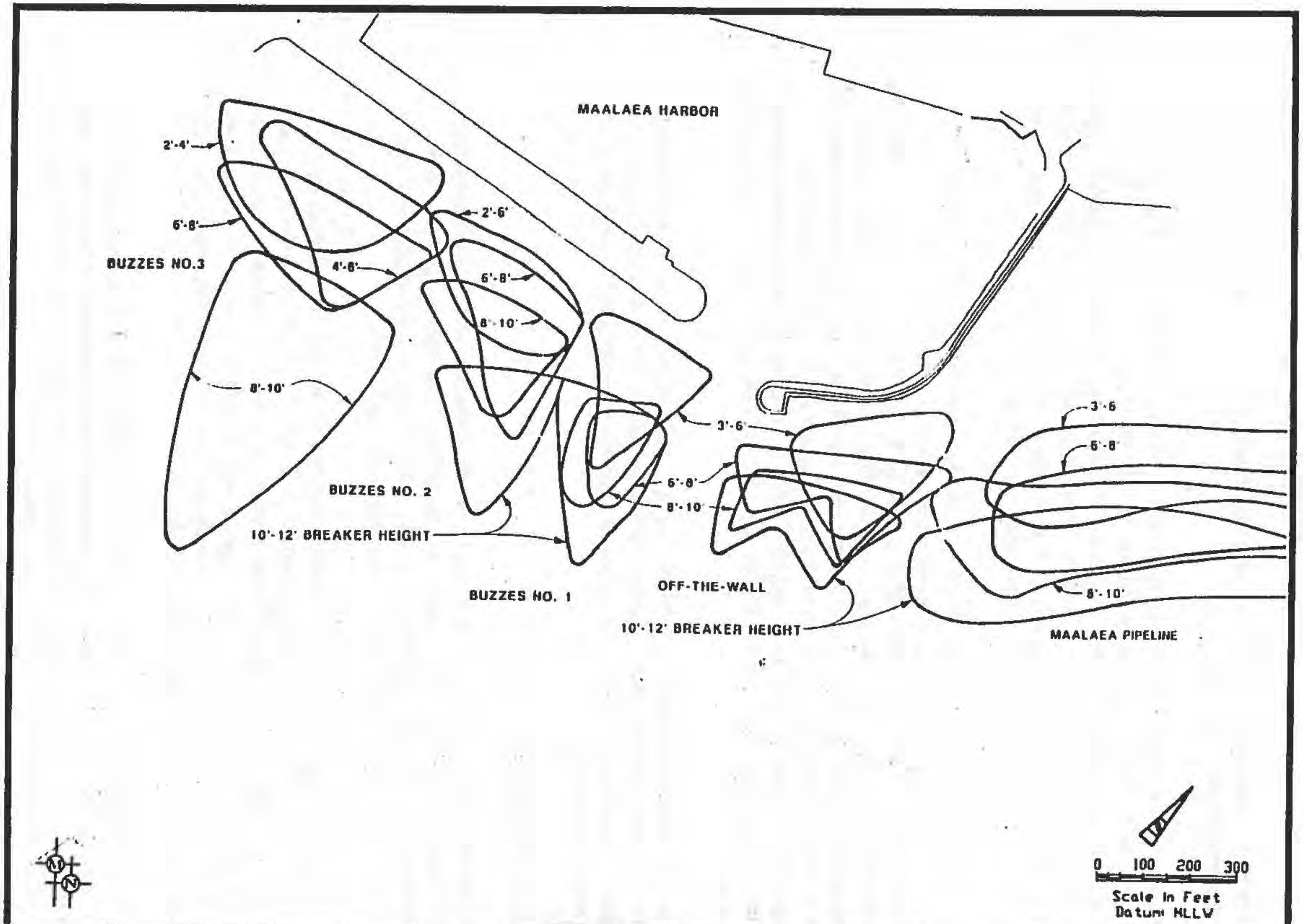
3.12.2 Sandy Beaches

A small beach located next to the east breakwater provides easy wading access to the harbor for fishermen and surfers, although a sign is posted prohibiting such activity. It is State property under the control of the State of Hawaii Department of Transportation, Harbors Division. The beach was incorporated into Ma'alaea Harbor in the 1960's to provide access for construction and maintenance of the east breakwater (Hawaii DLNR et al 1996).

3.12.3 Boating and Navigation

Of the 89 vessels having berths in Ma'alaea Harbor, 49 are recreation vessels, 13 are commercial (occupational) fishing, and 27 are charter fishing and commercial passenger vessels (Updated Economic Analysis, Appendix A). A few of these vessels occupy multiple boat slips. The most common size vessel ranges from 35 to 45 feet.

The mix of vessels at Ma'alaea Harbor is approximately 45 percent commercial (occupational) fishing and commercial passenger boats and 55 percent recreational craft. State restrictions limit the commercial passenger-carrying operations to not more than 27 permits in the harbor. In addition, there are authorized 20 permits for vessels moored elsewhere, but operating from the harbor. Currently there is an indefinite moratorium on the number of commercial passenger-carrying vessels moored elsewhere that can use harbor, and only 2 permits have been approved.



Prepared By: Civil Works Branch
Engineering and
Environmental Section

MA'ALAEA LIGHT-DRAFT HARBOR
Island of Maui, Hawaii

Figure 6. Surf Break Locations.

U.S. ARMY CORPS
OF ENGINEERS
Honolulu Engineer District

Commercial and charter operations offer opportunities for snorkeling, diving, whale-watching, fishing, and sightseeing.

Because of the harbor configuration and alignment of the harbor entrance channel, the harbor basin is subject to surge problems that prevent full utilization of the harbor. The alignment of the harbor channel entrance allows direct wave attack through the channel opening. Navigation is hazardous in the entrance channel when waves exceed about 6 feet. Wave heights exceeding 6 feet occur about 6.5 percent of the time (about 24 days per year), and waves exceeding 5 feet occur about 16 percent of the time.

Modeling performed for the 1994 FSEIS studied the harbor response to waves for existing conditions and for the proposed alternatives. The parameters studied were: (1) the percent occurrence of wave heights exceeding 1 foot in the berthing areas; and (2) the percent occurrence of wave heights exceeding 2 feet in the entrance channel, access channels, and turning basin. The threshold established was that these criteria would not be exceeded more than 10 percent of the time per year in order to be considered acceptable. Recently the Coastal and Hydraulics Laboratory updated the wave response study using an improved model (Hadley et al. 1997). The updated study is contained in Appendix K.

The new study found that for modeled existing conditions, wave heights exceeding the 1-foot criterion occurred about 33 percent of the time in the berthing areas, and wave heights exceeding the 2-foot criterion in the channels/turning basin occurred about 15 percent of the time.

3.12.4 FISHING

The harbor supports sport and subsistence fishing. Although fishing is not permitted within the existing harbor basin, hook and line fishing from the existing mole and breakwater are commonly practiced. Spear fishing occurs on the reef platform fronting the harbor. Various fish and shellfish are caught by local fishers.

Several species of edible algae are found in and around the harbor, including the culturally important "limu huluhuluwaena". Ma'alaea Bay is one of only a few areas in the Hawaiian islands where this species is locally abundant. The proposed project site is known to contain populations of this algae, as well as another species of edible red algae, "limu manauea", which is found on the seaward faces of the east breakwater and south revetted mole (U.S. Fish and Wildlife Service 1994b).

There are currently about 13 commercial (occupational) fishing vessels operated out of Ma'alaea Harbor. Additional commercial (occupational) fishermen without slips in the harbor trailer their boats to Ma'alaea for launching. Part-time fishermen make up about 2/3 of all the fishermen that use the launch ramp.

Statewide, the number of commercial (occupational) fishermen averaged 487 during any month in the June 1992-June 1993 time period. Total catch Statewide for the year was 1,719,416 pounds. Average catch for the year was 3,530 pounds per fisherman (DLNR DAR in NMFS 1997).

The number of commercial (occupational) fishermen from Maui County (Maui, Lanai, and Molokai) averaged 179 during any month during FY 1992-1993 (DLNR DAR in NMFS 1997). The amount of marine life landed by commercial (occupational) fishermen totaled 380,101 pounds from June 1992 through June 1993. The average catch for the year was 2,123 pounds per fisherman.

The number of commercial (occupational) fishermen using Penguin Bank averaged 35 per month during the June 1992 to June 1993 time frame. The total catch was 89,012 pounds. Average catch for the year was about 2,543 pounds per fisherman.

Commercial (occupational) fishing catch from Maui represents about 22 percent of the State's total. Many fishers from Maui use Penguin Bank, an area located west of Molokai and known for its fishery productivity. Fishing catch from Penguin Bank fishing area consisted primarily of pelagics (tuna, billfish, mahimahi, ono, etc.) and benthic fish. The U.S. Department of Commerce, National Oceanic and Atmospheric Administration (1997) cites the Western Pacific Regional Fishery Management Council's observed trend of catch per unit effort in the Penguin Bank, Maui/Molokai/Lanai bottomfishing grounds and found it highly variable. It appeared from a comparison of information from the 1940's and 1950's with recent data that there may be a decline in catch per unit effort for some species.

3.13 TRAFFIC

The State of Hawaii commissioned a traffic impact analysis for the 1994 FSEIS. It concluded that some of the intersections servicing Ma'alaea Harbor operate at low levels of service during peak hours. Future traffic conditions without a harbor expansion would result in low levels of service (E) from Ma'alaea Wharf Access Road onto Honoapiilani Highway at all times, and left turns from Honoapiilani Highway onto harbor access roads would also be at low levels of service. Detailed information on the traffic study for existing conditions and future projections can be found in Section 4.13 and Appendix D of the 1994 FSEIS.

The Maui Ocean Center, located adjacent to the harbor has constructed improvements to Honoapiilani Highway as well as a new entrance with a traffic signal. The State of Hawaii Department of Transportation also has plans to widen Honoapiilani Highway to four lanes between Ma'alaea and North Kihei Road.

3.14 LAND USE

The harbor area is under the control of the Hawaii Department of Land and Natural Resources, Division of Boating and Ocean Recreation. The land use designation for the project area is Business and Light Industrial. Adjacent land to the east along the shore is designated for multi-family use and contains a series of condominiums. Property along the shoreline to the west of harbor is designated for single-family homes.

Since the publication of the FSEIS in 1994, the National Oceanic and Atmospheric Administration has completed the Final Environmental Impact Statement and Comprehensive Management Plan for the Hawaiian Islands Humpback Whale National Marine Sanctuary. In accordance with the National Marine Sanctuaries Act, the Governor of Hawaii on June 5, 1997 agreed to include selected portions of State waters within the boundary of the Sanctuary, with certain conditions to be applied to the portions within State waters. Figure 5 shows the revised boundary. Although Ma'alaea Harbor is specifically excluded from the Sanctuary boundary, as are several other commercial ports and small boat harbors, the waters outside Ma'alaea Harbor are included within the Sanctuary.

Any activity not conducted in compliance with the terms or conditions of a required Federal or State permit or authorization for discharging or depositing materials or altering the seabed would be in violation of Sanctuary regulations.

Portions of the project area fall within the State Land Use Urban District. This includes the area proposed for parking/picnic area, and the areas for comfort stations on the south breakwater and near Old Ma'alaea Road.

Most of the additional project area falls within the State Land Use Conservation District.

As part of the State's CZM program, the County of Maui controls development in Special Management Areas (SMA). Areas along the coast inland of the shoreline are one such SMA. The County Department of Planning issues SMA use permits or variances for activities within the SMAs.

All the proposed project area falls within the State of Hawaii's coastal zone. The Coastal Zone Management (CZM) Act establishes objectives to provide coastal recreational opportunities accessible to the public; to protect and restore significant historic and prehistoric resources; to protect the quality of coastal scenic and open space resources; to protect valuable coastal ecosystems; to provide public or private facilities and improvements important to the State's economy; to reduce hazard to life and property from coastal hazards; and to improve the development review process in managing coastal resources and hazards.

Molokini Shoal Marine Life Conservation District is a State-protected area under the jurisdiction of DLNR/DAR, located about 11 miles south of Ma'alaea, and about 3 miles off the coast of East Maui. Hawaii Administrative Rules established the boundaries of this District, identified prohibited activities and allowed activities, provided for permits for prohibited activities under certain conditions, and established penalties for noncompliance.

At present there are 17 permanent moorings at Molokini, and access for commercial purposes is limited to 42 permit holders. Both commercial and private vessels must use the permanent moorings; anchoring in the area is not allowed because of the damage anchors cause to the coral substrate.

The Maui County General Plan sets forth the broad objectives and policies for meeting the long-term social, economic, environmental and land use needs of the County. Policies include: providing a wide range of compatible uses based on individual, community, regional and County needs; encouraging economic activity which will contribute to the social well-being of the County's residents; and guiding future commercial and industrial developments to geographical areas established and suitable for such uses.

The Kihei-Makena Community Plan provides a detailed plan for development in the Kihei-Makena region following the objectives and policies of the County General Plan, and includes the Ma'alaea Harbor area in its boundaries. The land use goal for the Ma'alaea area is a well-planned community with land use and development patterns designed to achieve the efficient and timely provision of infrastructural and community needs, while preserving and enhancing the unique character of Ma'alaea as well as the region's natural environmental, marine resources, and traditional shoreline uses. The environmental goal is the preservation, protection and enhancement of the area's unique environmental resources. The goal for economic activity is a diversified and stable economic base which serves resident and visitor needs while providing long-term residential employment.

3.15 SOCIOECONOMICS

The State of Hawaii CMZ Program includes various objectives to ensure that public and private facilities and improvements important to the State's economy are developed in suitable locations. Specifically, the policies seek to: (1) concentrate the location of coastal-dependent development in appropriate areas; (2) insure that coastal-dependent development such as harbors and ports, are located, designed, and constructed to minimize adverse impacts in the coastal zone; and (3) direct the location and expansion of coastal-dependent developments to areas presently designated for such if such locations are feasible for the proposed development.

3.15.1 COMMUNITY STRUCTURE

The resident population of Maui was estimated to be 91,400 people in 1990. Much of this population resides in Kahului and Wailuku, which is Maui's urban and commercial center. Maui's economy is based almost completely on its visitor industry and sugar plantations, with pineapple, diversified agriculture, and cattle ranching playing lesser roles. Ma'alaea Harbor is located approximately 9 miles south of Kahului and Wailuku, 17 miles east of Lahaina, and 4 miles west of Kihei. There are two major resort areas of Maui. In west Maui are the Lahaina, Kaanapali, and Kapalua resort complexes, while the Kihei-Wailea resort area on the south shore extends south from Kihei. About 17 percent of jobs in Maui are in hotels and 15 percent are in other service industries. About 8 percent are in agriculture and food processing. Finance, trade, and transportation sectors account for 34 percent of the jobs, while government jobs made up about 11 percent of the total.

Resident populations in the Kihei-Makena planning region are expected to increase from 11,500 in 1987 to 20,393 in 2000, and to 25,760 in 2010 (Maui County Council Planning Committee 1997).

3.15.2 INFRASTRUCTURE

Electrical power for the Harbor is provided by Maui Electric Company. The existing water systems to the harbor are provided by the County of Maui Department of Water Supply. The water source for Ma'alaea is located in Mokuhau where several wells provide a total capacity of 10 million gallons per day (mgd). Storage is provided by three tanks with a total capacity of 74,000 gallons. At present water consumption at the harbor averages about 621,000 gallons per month. This represents an average of about 7,000 gallons per month for each boat.

There are no sewage collection facilities in the Ma'alaea area. Existing single family residences use cesspools or septic tanks for sewage disposal. Condominiums and commercial establishments utilize small package treatment plants and septic tanks. The existing sewer system for the harbor consists of injection wells and cesspools.

Solid waste generated by commercial developments in the area is collected and disposed of by private contractors.

Postal service, healthcare facilities, and police and fire protection are provided in Wailuku.

3.15.3 ECONOMICS

For vessels using Ma'alaea Harbor, average labor costs and operation and maintenance costs involved in minimizing damages to commercial vessels total about $78,000 per year. Major repairs cost another $20,000 per year.

Recreational boaters moored at Ma'alaea harbor have experienced about $145,000 in damage prevention costs and $28,000 in average annual damages.

Commercial fishermen in the existing harbor experience an annual cost of $47,000 attributable to wave damage and prevention.

Costs associated with the surge and navigation problems in Ma'alaea Harbor average about $326,000 per year (Updated Economic Analysis, Appendix A).

4 ALTERNATIVES

4.1 INTRODUCTION

The HED and State of Hawaii have studied the problems at Ma'alaea Harbor several times over the past 30 years. The reports for these studies identified alternatives which were studied in detail as well as those which were eliminated or modified. The reports also identified pertinent environmental information and expected environmental effects. Section 4.2 below contains a brief discussion of these reports, and additional details can be obtained from the referenced documents.

The remainder of this chapter contains discussions about the latest studies and the present alternatives, including their description; how well they meet the project purposes and needs; and their environmental effects. Following are the definitions of some of the terms used in the paragraphs below.

Breakwater--A structure protecting a shore area, harbor, anchorage or basin from waves.

Entrance Channel--The avenue of access/egress to a harbor.

Access Channel--The avenue of access/egress within the harbor.

Turning Basin--The area within the harbor used to maneuver boats.

Harbor Basin--A naturally or artificially enclosed or nearly enclosed area of water where boats/ships are moored or berthed.

Revetted Mole--A fill area protected by a rock structure (revetment). It may be used as a protective structure or service area within a harbor.

Harbor Expansion—for the purposes of this document, expansion is defined as an increase in the number of berths, and not an increase in the physical size of the harbor.

4.2 PREVIOUS STUDIES

4.2.1 ORIGINAL HARBOR IMPROVEMENT PLAN

The Chief of Engineer's report, dated 11 April 1968 (House Document No. 353, 90th Congress, 2nd Session) authorized the original plan for construction of harbor improvements at Ma'alaea Harbor. The authorized plan included: (1) a 650-foot-long extension to the existing south breakwater; (2) a 780-foot-long, 150-foot-wide, 15-foot-deep main entrance channel; (3) a 6.9-acre turning basin; (4) a 700-foot-long, 80-foot-wide, 8-foot-deep access channel; (5) removal of portions of the east breakwater; and (6) tree plantings. This plan would have accommodated about 260 boats.

4.2.2 1980 General Design Memorandum/Final Environmental Impact Statement

The General Design Memorandum and Final Environmental Impact Statement, Ma'alaea Harbor for Light-Draft Vessels, Maui, Hawaii (U.S. Army Corps of Engineers, Honolulu District 1980) presents the results of the post-authorization studies for modification of the small boat harbor. The purpose of the post-authorization studies was to respond to changes in the physical, social, economic, and environmental conditions related to the project and to changes in environmental laws and in Corps water resources planning policies. In addition, information received and developed early in the process identified the need to investigate alternative locations for the authorized entrance channel; the desire to minimize changes to existing structures; and the need for additional parking and a bus turn-around on the modified breakwater. The local sponsor for the project was the State of Hawaii.

The 1980 updated planning objective was to contribute to navigation improvement of Ma'alaea Harbor for commercial and recreational purposes for the 1985 to 2035 period of analysis. Specific goals were to: (1) reduce surge within the harbor basin; (2) reduce navigation hazards in the entrance channel; and (3) provide opportunity for additional commercial and recreational berthing space and attendant harbor facilities.

The formulation and evaluation of alternatives were guided by technical, economic, and environmental criteria. Technical criteria included: (1) harbor improvements should provide safe navigation and protection for the largest vessel that reasonably could use such a facility (the "large design vessel", 110 feet long, beam 24 feet, draft 7.5 feet; the "medium-sized design vessel", 55 feet long, beam 12 feet, draft 4 feet) during all reasonably expected weather and sea conditions; (2) improvements should include a turning basin adequate for maneuvering of the design vessels, and berthing areas suitable for commercial fishing boats and pleasure boats; (3) the entrance channel should be of adequate depth and width to safely permit passage by the large design vessel and by the medium design vessel at the same time; and (4) protective structures should be designed to withstand the most severe combination of weather and sea conditions that are reasonably characteristic of the study area.

Economic criteria were: (1) the development of a quantitative comparison of costs and benefits; and (2) the maximization of the net benefits from the project.

Environmental criteria included: (1) minimization of short-term and long-term disturbances to the physical and biological environment; (2) the development of and adherence to effective environmental protection guidelines; (3) the minimization of impacts on surfing sites; and (4) the minimization of impacts on threatened and endangered species.

Three alternatives to the 1968 authorized plan were developed. Alternative 1 included an extension to the existing south breakwater, including a revetted mole, entrance channel, turning basin, removal of 80 feet of a portion of the east breakwater, and other improvements by the sponsor. Alternative 2 was similar to Alternative 1, except a wave absorber replaced the revetted mole on the existing south breakwater. Alternative 3 featured a detached breakwater instead of the south breakwater extension. These alternatives were developed because of unacceptable recreational and environmental impacts of the original authorized plan, primarily the impacts to the "Ma'alaea Pipeline" (Freight Trains).

Investigation of alternative harbor locations was not performed at that time because of the substantial investment already committed at the existing site; because of the need to upgrade the existing harbor, and because of anticipated extensive environmental and economic impacts of developing a new site. Alternative 1, which was the preferred plan, was favored by the local sponsor and was also the National Economic Development (NED) plan. The NED plan is the alternative that maximizes net economic benefits.

4.2.3 State of Hawaii 1982 Revised EIS

The Harbors Division of the Hawaii Department of Transportation developed a State plan for interior harbor improvements which would be made possible by development of the 1980 Federal plan. Features of the State plan included construction of a harbor center mole, an east mole, additional parking stalls and paved areas, a fueling dock, an administration building; additional berthing spaces, and new utilities (sewerage, water, and electricity).

The State prepared a revised EIS (R. M. Towill Corp. 1982) to address the environmental impacts of implementation of the State's plan for the harbor. The State plan identified impacts from increased traffic and from construction vehicles, temporary minor dust and vehicular emissions, noise, economic benefits, loss of marine life and habitat, adverse impacts to humpback whales, and a degradation in harbor water quality. Secondary impacts were beneficial social and economics effects and a degradation in harbor water quality.

4.2.4 1994 Supplemental Environmental Impact Statement

The HED prepared a Supplement to the Federal 1980 EIS and the State 1982 EIS in 1992 (DSEIS) and 1994 (FSEIS) in order to update the formulation and evaluation of alternatives, to consider more current needs and purposes of the local sponsor and affected publics, as well as to respond to changes in environmental conditions and regulations. The FSEIS was a joint Federal-State document.

Planning objectives and goals have not changed since the 1980 Federal studies or the 1982 State studies, and no major changes in technical design criteria for formulating and evaluating alternatives occurred. Although the U.S. Coast Guard has since 1980 replaced its 95-foot patrol boat with a small boat station operation, the harbor is occasionally used by two tour boats measuring approximately 100 feet long. Therefore, the large design vessel measurements did not change.

4.2.5 1996 LIMITED REEVALUATON REPORT

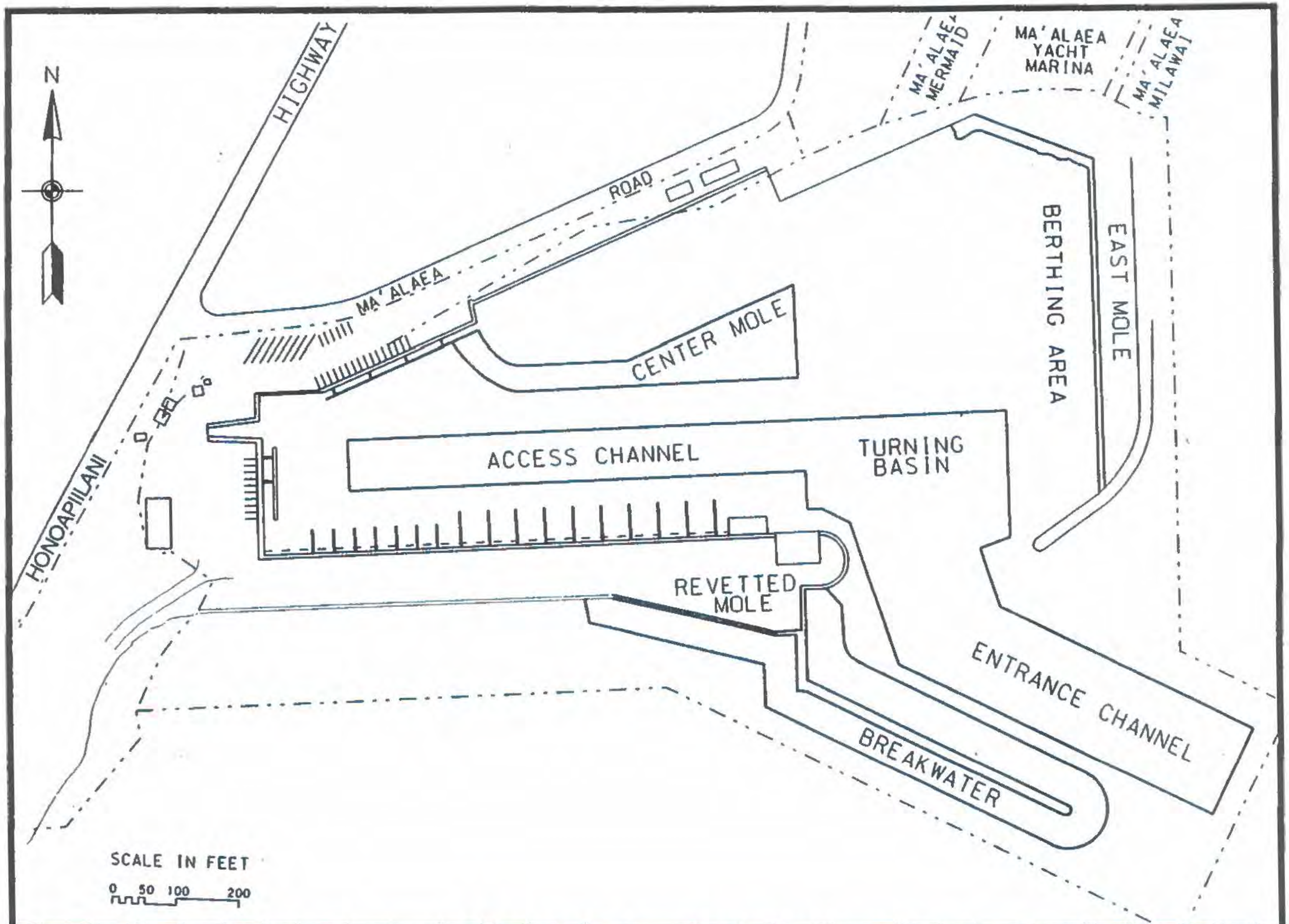
The Limited Reevaluation Report was prepared to provide an update of the economic analysis and environmental issues for the proposed project. Economic reevaluation showed that the construction of the project remained justified at the present economic conditions. At the time of the report, the remaining environmental issues were that the Federal Consistency Determination from the Hawaii CZM Program and a Water Quality Certification or waiver by the State Department of Health needed to be obtained.

4.3 DESCRIPTION OF ALTERNATIVES

4.3.1 FEDERAL ALTERNATIVES

The 1994 FSEIS considered the No Action alternative and four action alternatives as shown in Figures 7, 8, 9, and 10. These alternatives are evaluated below. In addition, Alternative 6, which was eliminated from detailed study in the 1994 FSEIS, is also further evaluated (Figure 11).

4.3.1.1 Alternative 1 (Figure 7). This plan is similar to that identified in the 1980 GDM/FEIS as the preferred plan. Features included an extension to the existing south breakwater, entrance channel, turning basin, main access channel, the addition of a revetted mole to the existing south breakwater for a bus turnaround. The south breakwater revetted mole was substantially reduced in area from the design in the 1980 selected plan to avoid and minimize impacts to surf sites and to aquatic habitat. This alternative would (1) alter approximately 11.89 acres of marine habitat, including approximately 4.8 acres of coral reef habitat; (2) cause the loss of a small sandy beach inside the harbor; (3) possibly cause an increase in turbidity in the harbor due to increased vessel traffic; and (4) cause the loss of one surf site. The configuration for this alternative would fully accommodate the State's proposed plan for improvement of the Harbor, and would increase harbor capacity to about 220 berths. The costs of this alternative are estimated at $9.3 million.



Prepared By: Civil Works Branch
Engineering and
Environmental Section

MA'ALAEA LIGHT-DRAFT HARBOR
Island of Maui, Hawaii

Figure 7. Alternative 1 (Proposed Plan).

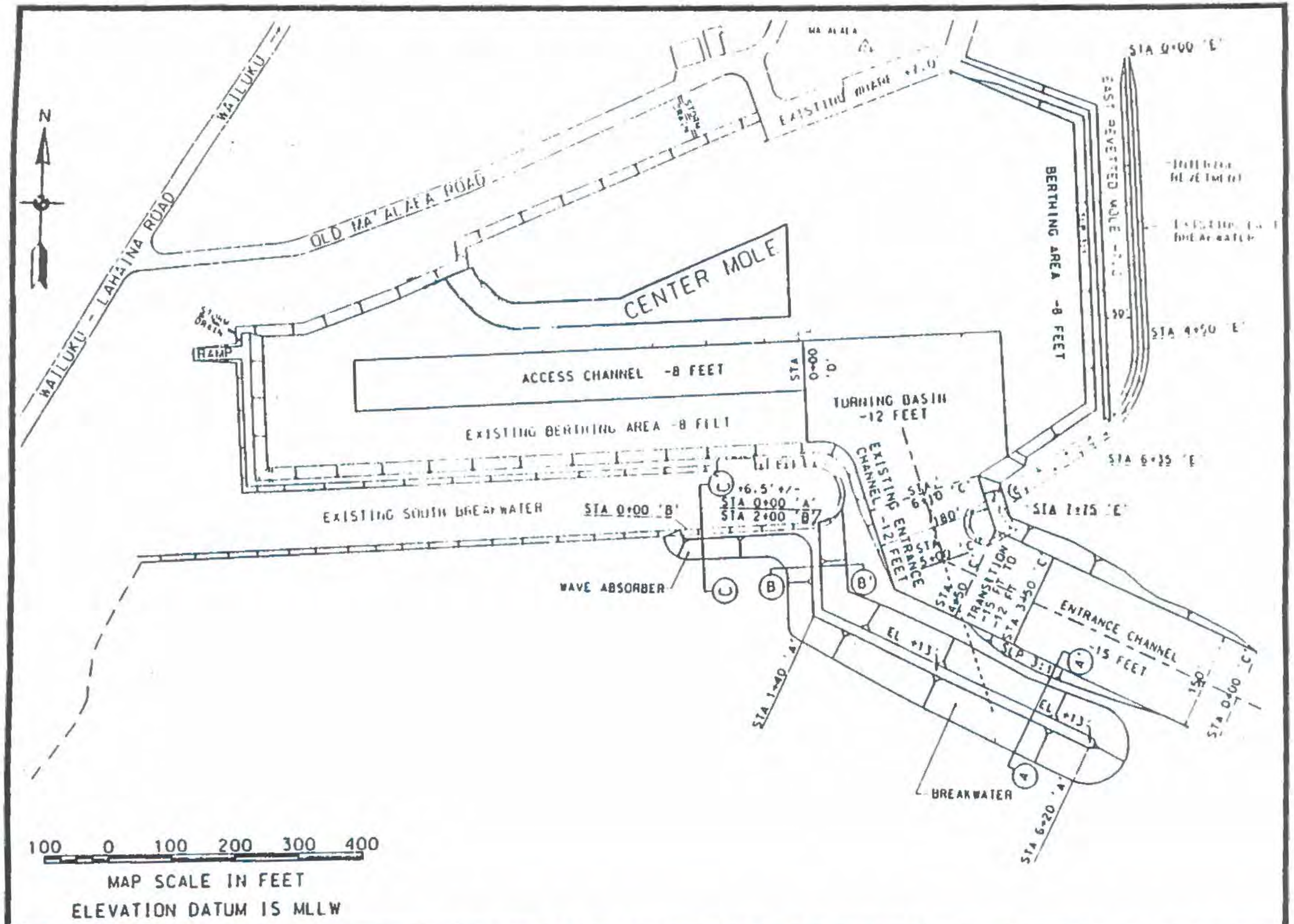
U.S. ARMY CORPS
OF ENGINEERS
Honolulu Engineer District

4.3.1.2 Alternative 2 (Figure 8). This alternative was developed to minimize the potential impacts to Buzz's surf sites and to minimize the amount of fill material used for the breakwater extension. This plan is the same as Alternative 1, except that the revetted mole on the south breakwater would be replaced by a wave absorber. This alternative would (1) alter approximately 11.48 acres of marine habitat, including approximately 4.7 acres of coral reef habitat; (2) cause the loss of a small sandy beach inside the harbor; (3) possibly cause an increase in turbidity in the harbor due to increased vessel traffic; and (4) cause the loss of one surf site. The configuration for this alternative would accommodate the State's proposed plan for improvement of the Harbor, except for the bus turn-around, and would increase harbor capacity to about 220 berths. The estimated costs of this alternative are $10.3 million.

4.3.1.3 Alternative 3 (Figure 9) is similar to Alternative 2, except that it consists of a detached breakwater instead of an extension to the existing south breakwater. This alternative would (1) alter approximately 11.69 acres of marine habitat, including about 4.7 acres of coral reef habitat; (2) cause the loss of a small sandy beach inside the harbor; (3) possibly cause an increase in turbidity in the harbor due to increased vessel traffic; and (4) result in the loss of the Off-the-Wall surf site, and Buzz's No. 1 and No. 2 surf sites would be modified in an unknown fashion. The configuration for this alternative would accommodate the State's proposed plan for improvement of the Harbor, except for the bus turn-around, and would increase harbor capacity to about 220 berths. This alternative would cost about $10.7 million.

4.3.1.4 Alternative 4 (Figure 10) was developed to minimize impacts to the surfing site located to the east of the existing entrance channel. It consists of an extension to the east breakwater, an entrance channel, turning basin, and main access channel. This alternative would (1) alter approximately 18.59 acres of marine habitat, including approximately 2.3 acres of coral reef habitat; (2) cause the loss of a small sandy beach inside the harbor; (3) possibly cause an increase in turbidity in the harbor due to increased vessel traffic; and (4) cause the loss of two surf sites and the modification of two others. The configuration for this alternative would accommodate the State's proposed plan for improvement of the Harbor, except for the bus turn-around, but would increase harbor capacity to something less than 220 berths. The estimated costs of this alternative are $12.5 million.

4.3.1.5 Alternative 6 (Figure 11) was initially suggested as part of the surf site study (Belt Collins & Associates 1992) commissioned by HED to assess the impacts of harbor modification on surf sites in the area and included in the 1994 FSEIS as Appendix E. The concept was suggested as a way to avoid any impacts outside existing harbor boundaries without regard to the project purpose and needs. This concept consisted of an internal breakwater to reduce wave action within the harbor, and two subalternatives for harbor expansion--inland to the north, or east along the shore. These inland expansion alternatives were determined to not be feasible from an economic standpoint because of

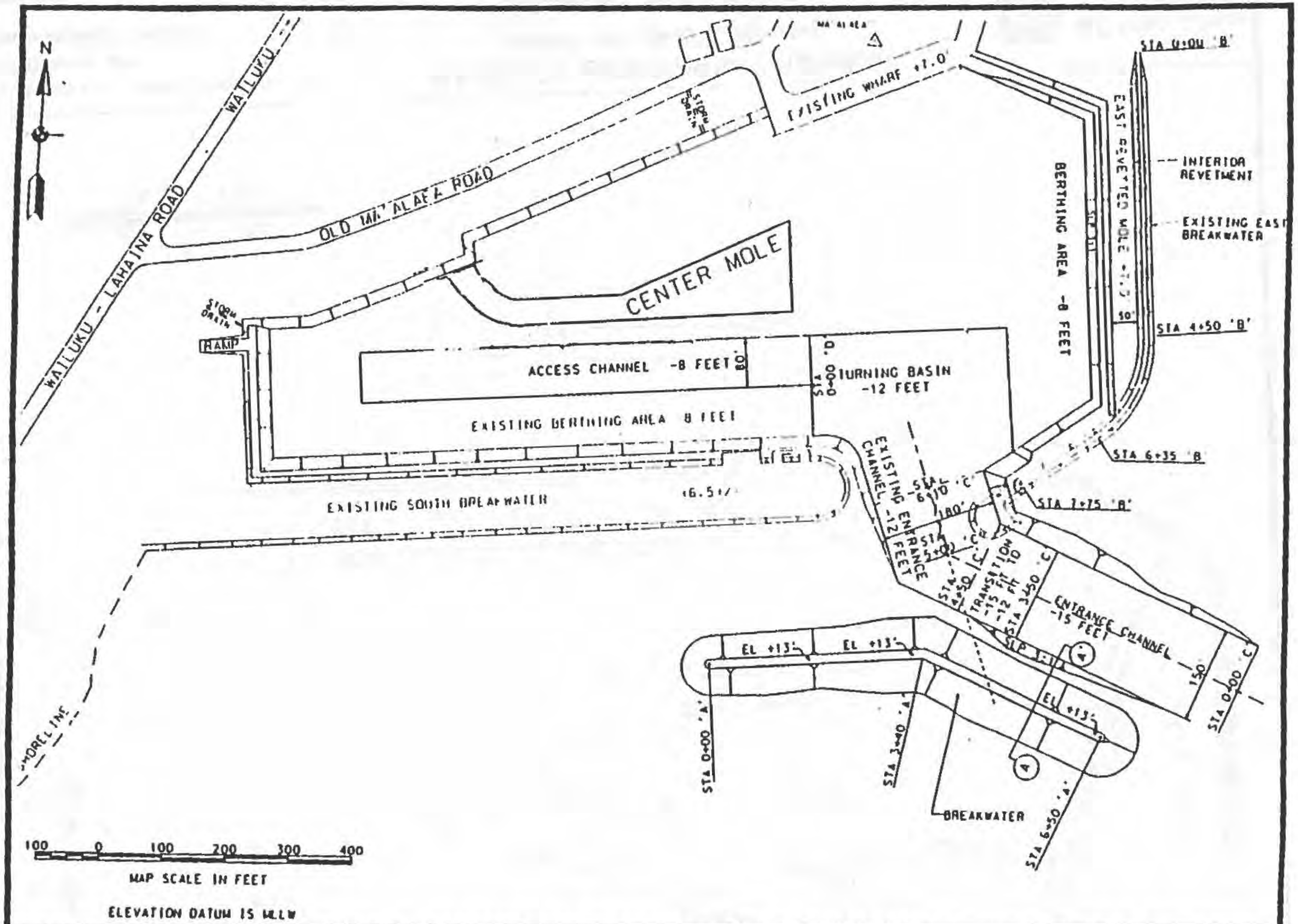


Prepared By: Civil Works Branch
Engineering and
Environmental Section

MA'ALAEA LIGHT-DRAFT HARBOR
Island of Maui, Hawaii

Figure 8. Alternative 2.

U.S. ARMY CORPS
OF ENGINEERS
Honolulu Engineer District

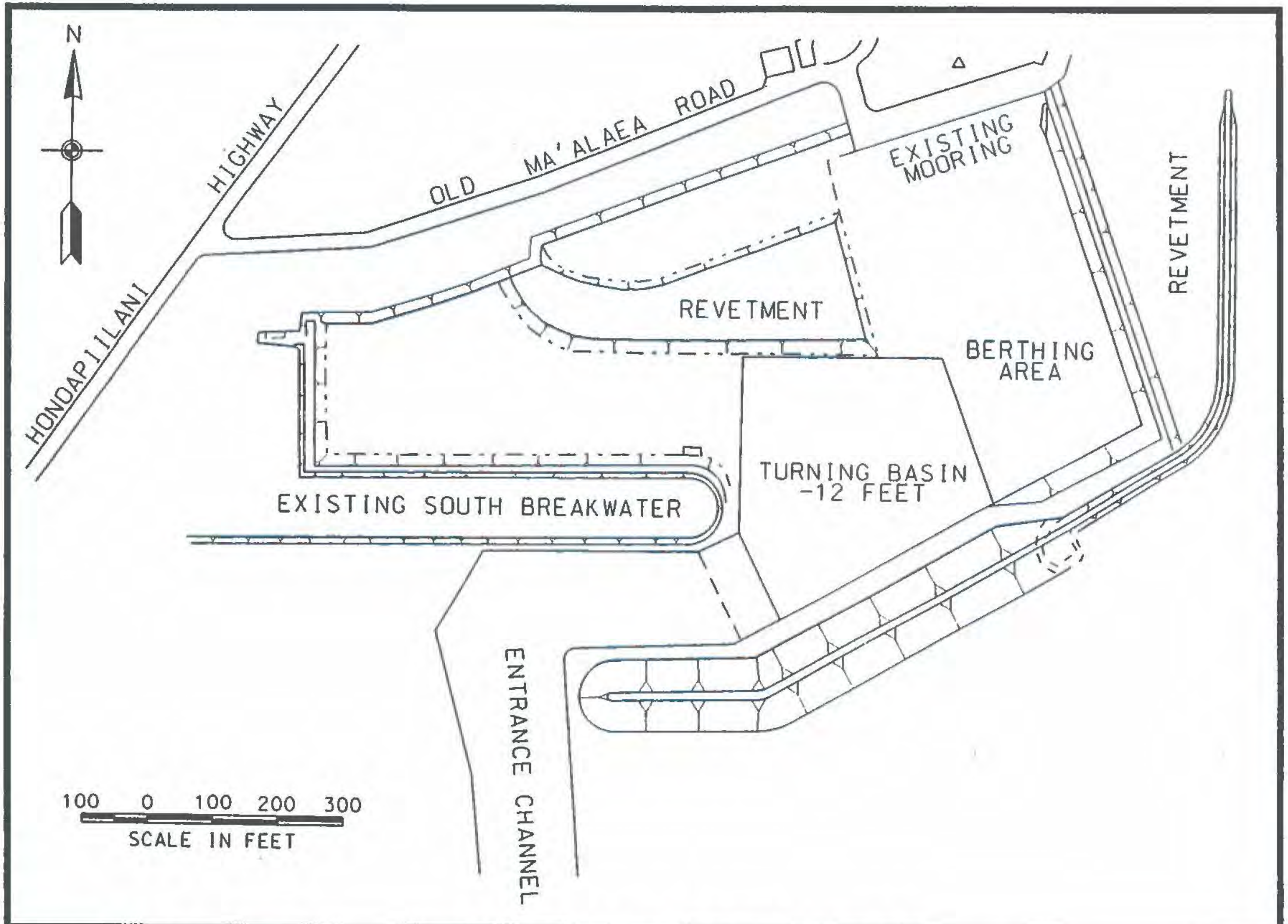


Prepared By: Civil Works Branch
Engineering and
Environmental Section

MA'ALAEA LIGHT-DRAFT HARBOR
Island of Maui, Hawaii

Figure 9. Alternative 3.

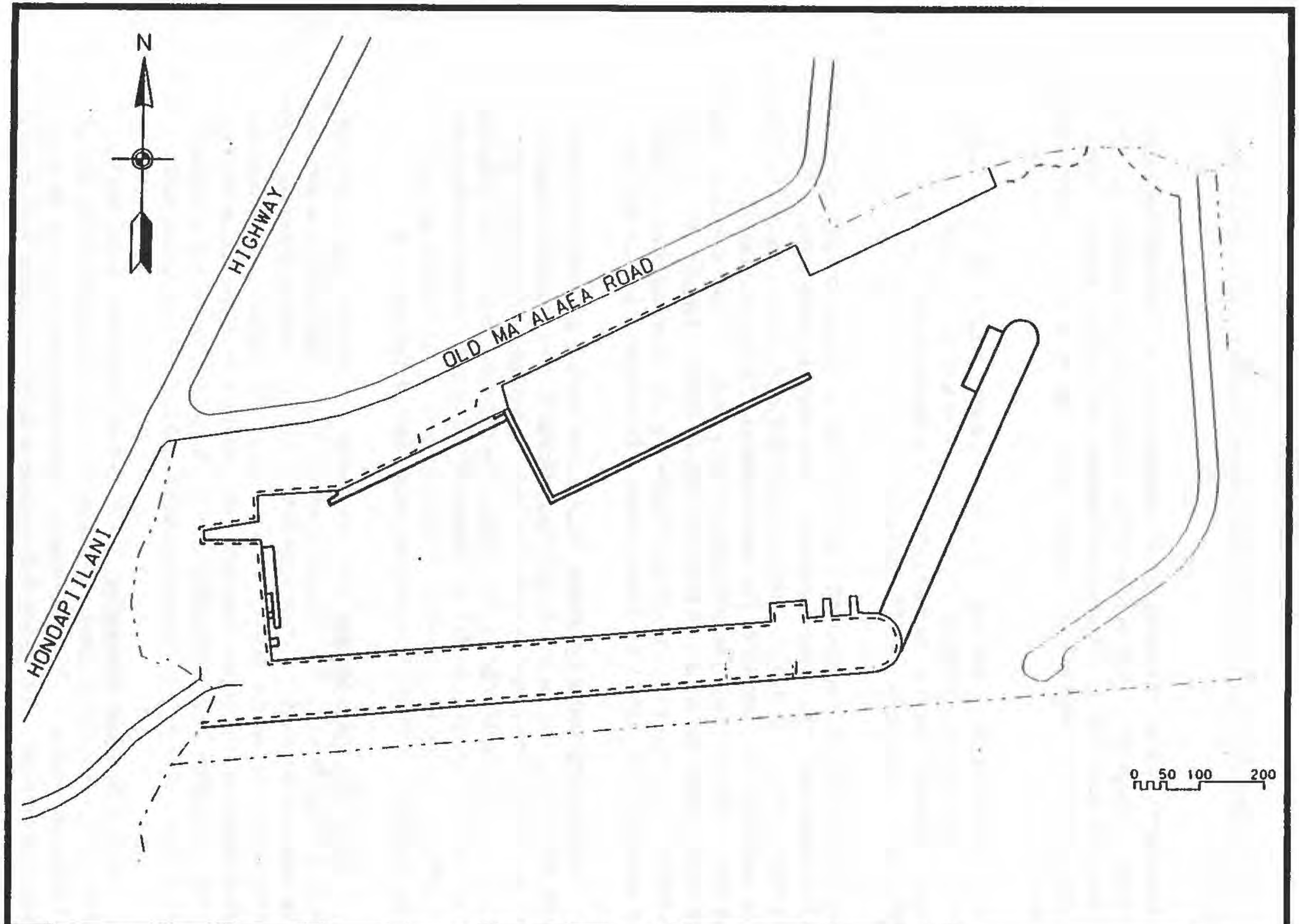
U.S. ARMY CORPS
OF ENGINEERS
Honolulu Engineer District



Prepared By: Civil Works Branch
Engineering and
Environmental Section

MA'ALAEA LIGHT-DRAFT HARBOR
Island of Maui, Hawaii
Figure 10. Alternative 4.

U.S. ARMY CORPS OF ENGINEERS
Honolulu Engineer District



Prepared By: Civil Works Branch
Engineering and
Environmental Section

MA'ALAEA LIGHT-DRAFT HARBOR
Island of Maui, Hawaii
Figure 11. Alternative 6.

U.S. ARMY CORPS
OF ENGINEERS
Honolulu Engineer District

prohibitive land costs and because it would eliminate needed space for harbor support facilities.

Alternative 6 was eliminated from further consideration in the 1994 FSEIS primarily because of navigational safety considerations. Because of the orientation of the entrance channel with respect to wave direction, utilization of the confined entrance channel during south swell conditions could result in loss of maneuverability for vessels entering the harbor.

This alternative would (1) alter approximately 8.54 acres of marine habitat, including about 1.0 acre of coral reef habitat; (2) cause the loss of a small sandy beach inside the harbor; (3) possibly cause an increase in turbidity in the harbor due to increased vessel traffic; and (4) result in the loss of a boat ramp.

This alternative would accommodate some of the sponsor's plans, including improvement to the loading dock, parking/picnic areas at the west end of the harbor, and construction of a comfort station. It would not accommodate other improvements planned for a center mole, east mole, and south mole. The sewage treatment facility would not be constructed. The fuel facility would replace existing berths near the Coast Guard station. The existing boat ramp at the west end of the harbor would be eliminated to make space for berths. This configuration would allow harbor capacity to be increased to a total of approximately 125 berths. The estimated costs of this alternative are $6.4 million.

4.3.1.6 Alternative Locations. HED did not consider an alternative location for a new harbor because of the greatly increased potential for environmental damage to previously undeveloped areas, as well as the costs for development compared to the proposed improvements to the existing harbor. The National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (FWS) strongly oppose development of new harbors, and such development is contrary to Hawaii CZM Program policy to consolidate harbor development to existing harbor sites whenever possible.

4.3.1.7 Dry Stack Storage. Dry stack storage consists of storing boats on land, usually in a large building. The boats are usually stored in multi-tiered racks and placed in the water and removed by a crane or forklift. It offers the potential of storing a large number of boats in a minimum footprint of land area. This alternative would meet the State of Hawaii purpose of providing additional berthing at the harbor; however, there is no land at the harbor suitable for such a facility. This alternative was not evaluated in detail because it would not meet project purposes with respect to navigation safety.

4.3.1.8 No Action Alternative. The No Action Alternative would leave the harbor as it is, without any Federal improvements, or State improvements that depend on the Federal improvements. The State would continue with plans to upgrade the existing sewage system, improve the loading dock adjacent to the Harbor Master's office on the south mole and improve the existing launch ramp. These three improvements are independent of the Federal improvements. The No Action Alternative would meet none of the identified Federal project purposes, nor would it meet any of the identified demand for additional berthing facilities.

4.3.2 STATE'S PLAN

The State's proposed development and berthing plan (Figures 12 and 13, respectively) is based on the construction of the harbor configuration of Federal Alternatives 1, 2, or 3. It includes construction of a harbor center mole; construction of an east mole; administration facilities; an increase in the number of berths for vessels ranging from 20 feet in length to 100 feet; an increase in the number of parking stalls and paved areas; fueling and service dock; and new utilities. The first element of the State's overall plan would be to upgrade the sewage disposal system. As the potential for additional wastewater is generated from the infrastructure expansion, including new pumpout and comfort stations, the system would be upgraded to handle treatment of the projected additional load.

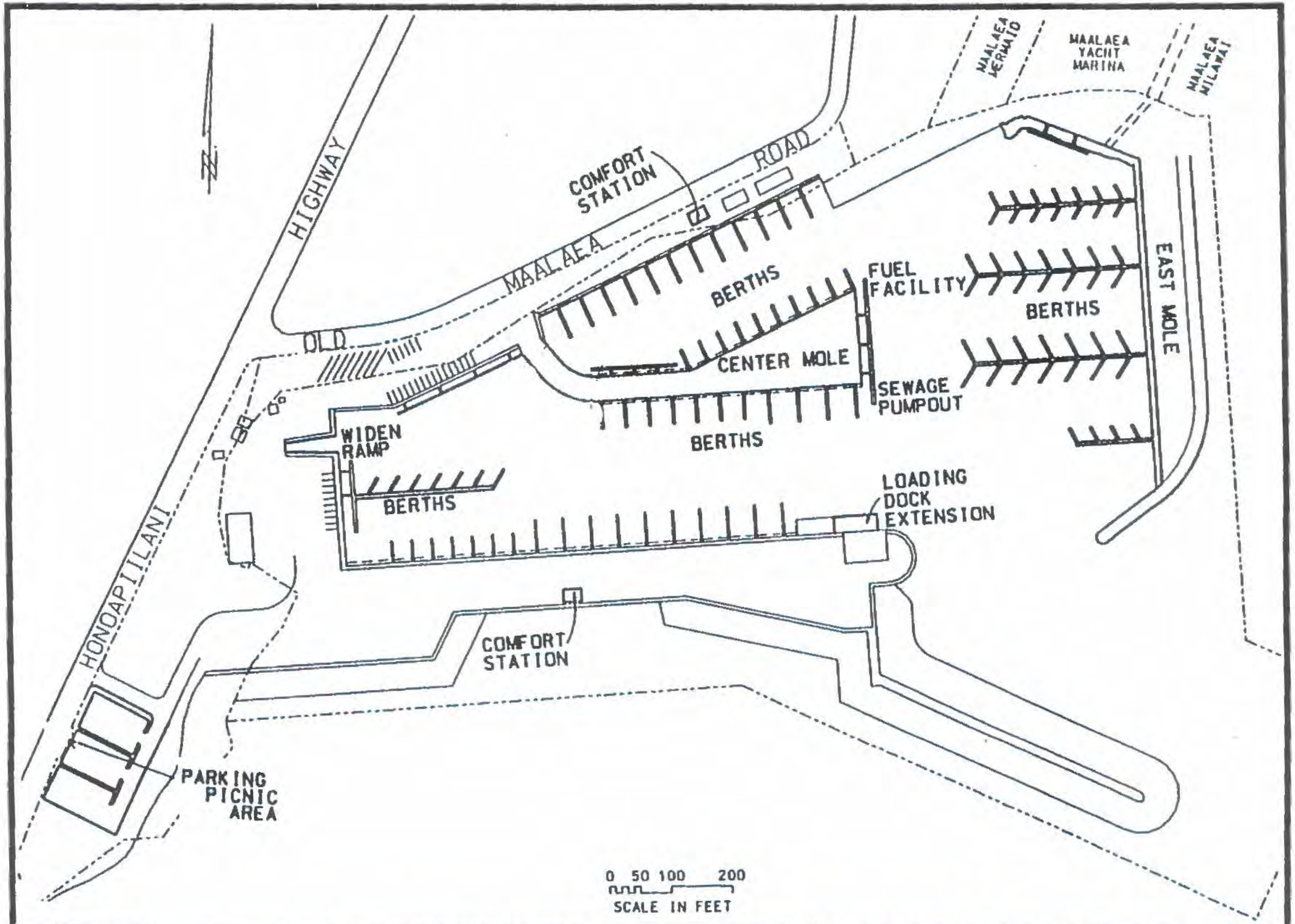
Improvements are planned to the loading dock and boat ramp. Berths, parking, sewage pumpout, and fuel facilities, and sewage wharf are proposed for a new center mole. Parking, berths and landscaping improvements are planned for the south mole. East mole improvements include construction of berths, access, and landscaping. A comfort station would be constructed near the Coast Guard station. Parking and picnic areas would be developed at the west end of the harbor.

More detailed information on the State's Plan is presented in Section 3.2.1 of the 1994 FSEIS.

4.4 PRESENT STUDIES

Comments received on the 1994 FSEIS indicated a need to further supplement the environmental impact statement. In 1997 the HED determined to prepare a second supplemental EIS in order to address public input, to present a draft mitigation plan, to make minor changes to the project since the first SEIS was circulated, and to more fully document the analysis of the interior mole alternative (Alternative 6). This supplement provides additional evaluation and discussion of various engineering studies and an economic analysis related to the number of berths and types of facilities that could be added with the various alternatives. Further studies regarding sediment composition, coral reefs, and mitigation plans were also completed.

The dimensions of project features, their construction footprints and their dredge and fill quantities have been clarified. Table 2 summarizes this information.

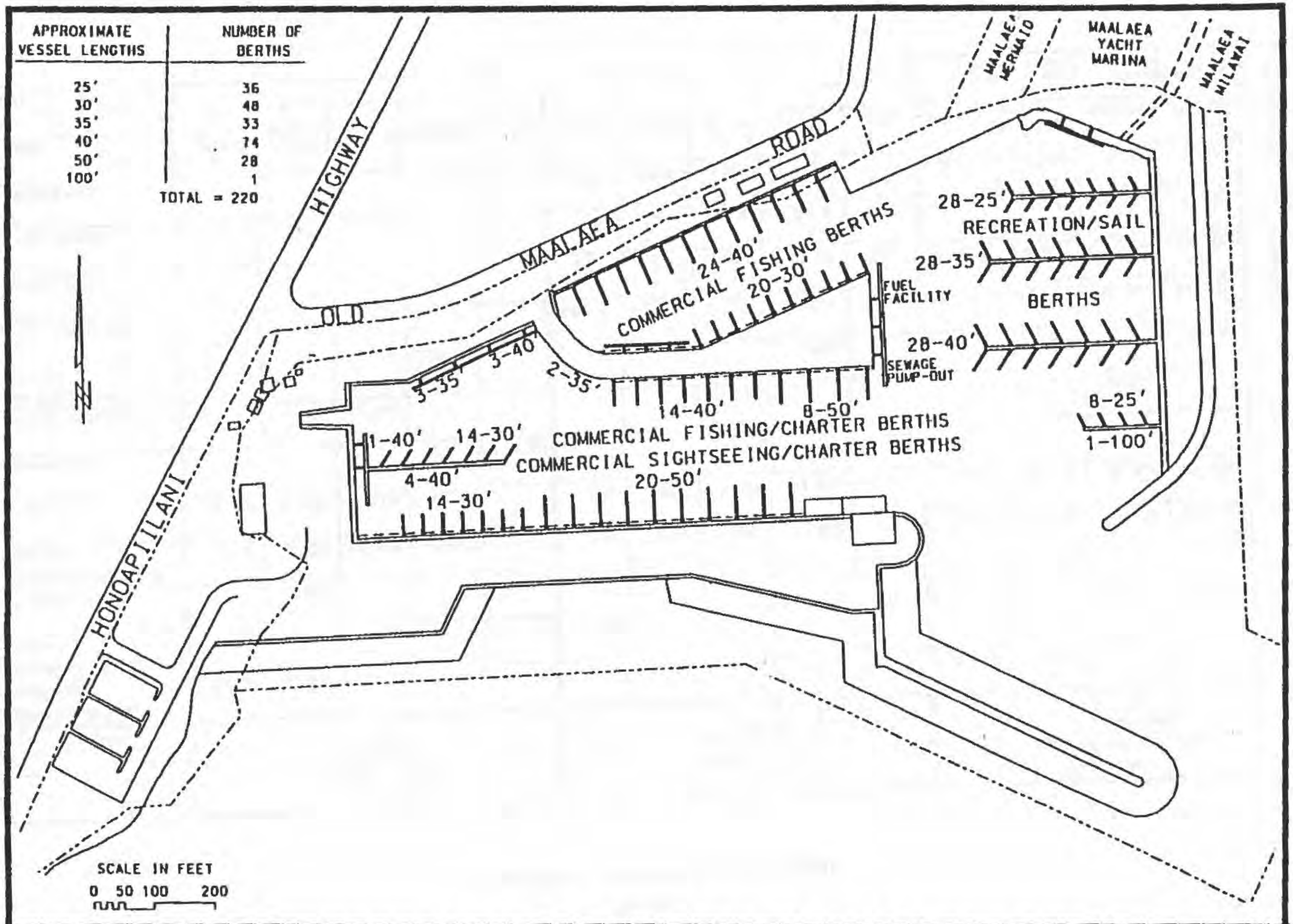


Prepared By: Civil Works Branch
Engineering and
Environmental Section

MA'ALAEA LIGHT-DRAFT HARBOR
Island of Maui, Hawaii

Figure 12. State Sponsored Improvements.

U.S. ARMY CORPS OF ENGINEERS
Honolulu Engineer District



Prepared By: Civil Works Branch
Engineering and
Environmental Section

MA'ALAEA LIGHT-DRAFT HARBOR
Island of Maui, Hawaii

Figure 13. Ma'alaea Harbor Berthing Plan.

U.S. ARMY CORPS
OF ENGINEERS
Honolulu Engineer District

Table 2
Quantities to be Filled and Dredged

	Amount of Fill (in cubic yards)					Amount of Dredging (in cubic yards)					Total Area Affected (in square feet)				
	Alternative					Alternative					Alternative				
Feature	1	2	3	4	6	1	2	3	4	6	1	2	3	4	6
South Breakwater Extension	28,400	33,600				2,560	2,610				57,600	72,500			
Revetted Mole – South Breakwater	12,300					370					38,400				
Wave Absorber		2,700										5,500			
Revetted Mole – East Breakwater	13,300	13,300	13,300	43,000		2,490	2,490	2,490	2,490		73,000	73,000	73,000	180,000	
Center Mole	21,500	21,500	21,500	21,500		1,800	1,800	1,800	1,800		82,000	82,000	82,000	82,000	
Interior Mole					10,500					600					69,000
Offshore Breakwater			32,600					1,180					87,000		
East Breakwater Extension				25,500					1,400					90,000	
Entrance Channel						14,270	14,270	14,270	59,000	29,900	96,500	96,500	96,500	247,000	206,00
Turning Basin						7,280	7,280	7,280	30,400	15,200	75,000	75,000	75,000	115,000	60,000
Access Channel						2,400	2,400	2,400	2,400	600	57,600	57,600	57,600	57,600	11,000
Berthing Area						10,080	10,080	10,080	10,080	3,300	38,000	38,000	38,000	38,000	30,800
Totals	75,500	71,100	67,400	90,000	10,500	41,150	40,930	39,500	107,570	49,600	518,100	500,100	509,100	809,600	371,800
Acres											11.89	11.48	11.69	18.59	8.54

4.4.1 Evaluation of Technical and Economic Factors

Public comments in support of further analysis of Alternative 6 were primarily based on its potential for confining construction impacts within the existing harbor facility, and not on its ability to provide increased navigation safety, surge protection or to increase the number of available berths.

4.4.1.1 Wave Response Studies (Surge Analysis). A wave response study was conducted by the U.S. Army Waterways Experiment Station (WES) in 1993 and 1994 (Lillycrop et al 1993; Thompson and Hadley 1994) to determine whether the proposed harbor design improvements meet the criteria that wave heights not exceed: (1) 1 foot in berthing areas; and (2) 2 feet in the entrance and access channels and turning basin more than 10 percent of the time per year. That study found that all alternatives would meet the designated thresholds for both the entrance channel and berthing areas.

In December 1997 the Waterways Experiment Station (WES) prepared a Draft Miscellaneous Paper entitled *Updated Wave Response of Proposed Improvement to the Small Boat Harbor at Ma'alaea, Maui, Hawaii* (Hadley et. al 1997). This study was conducted as a revision and extension of the previous study to assess the wave response of the various alternative plans for the harbor. The updated study, which is contained in Appendix K, utilizes more accurate data regarding wave conditions in the project area.

Procedures and methods for conducting this study improve on those used by Lillycrop et al. (1993) in several important ways. The most substantive improvement is the deep water wave estimates used in the study. In previous studies deep water wave estimates were based on measurements in the *Monitoring of Completed Coastal Projects Program Collected at Barbers Point, Oahu.* For the current study, incident wave data were obtained from National Data Buoy Center (NDBC) Station 51027, a deep water buoy located southwest of the island of Lanai. The availability of deep water data nearer the vicinity of Ma'alaea Harbor greatly improves the validity of the overall results. The current study also incorporates improved model technology. Since initial studies were conducted, spectral wave modeling capabilities for wind waves and swell have been added to the model and, as part of a Coastal Modeling System (CMS) update, several harbor modeling parameters have been investigated and optimized. These adjustments have a notable impact on model performance and have been included in the new Ma'alaea Harbor study. The current study also provides a complete long wave evaluation for each harbor plan as well as a navigation evaluation based on recent research. Table 3 summarizes the model results.

The results indicate that, according to the given threshold, modeled existing conditions exceed the threshold for both the berthing areas and entrance channel. All alternatives would substantially reduce the percent of time wave heights would exceed 1 foot in the berthing areas.

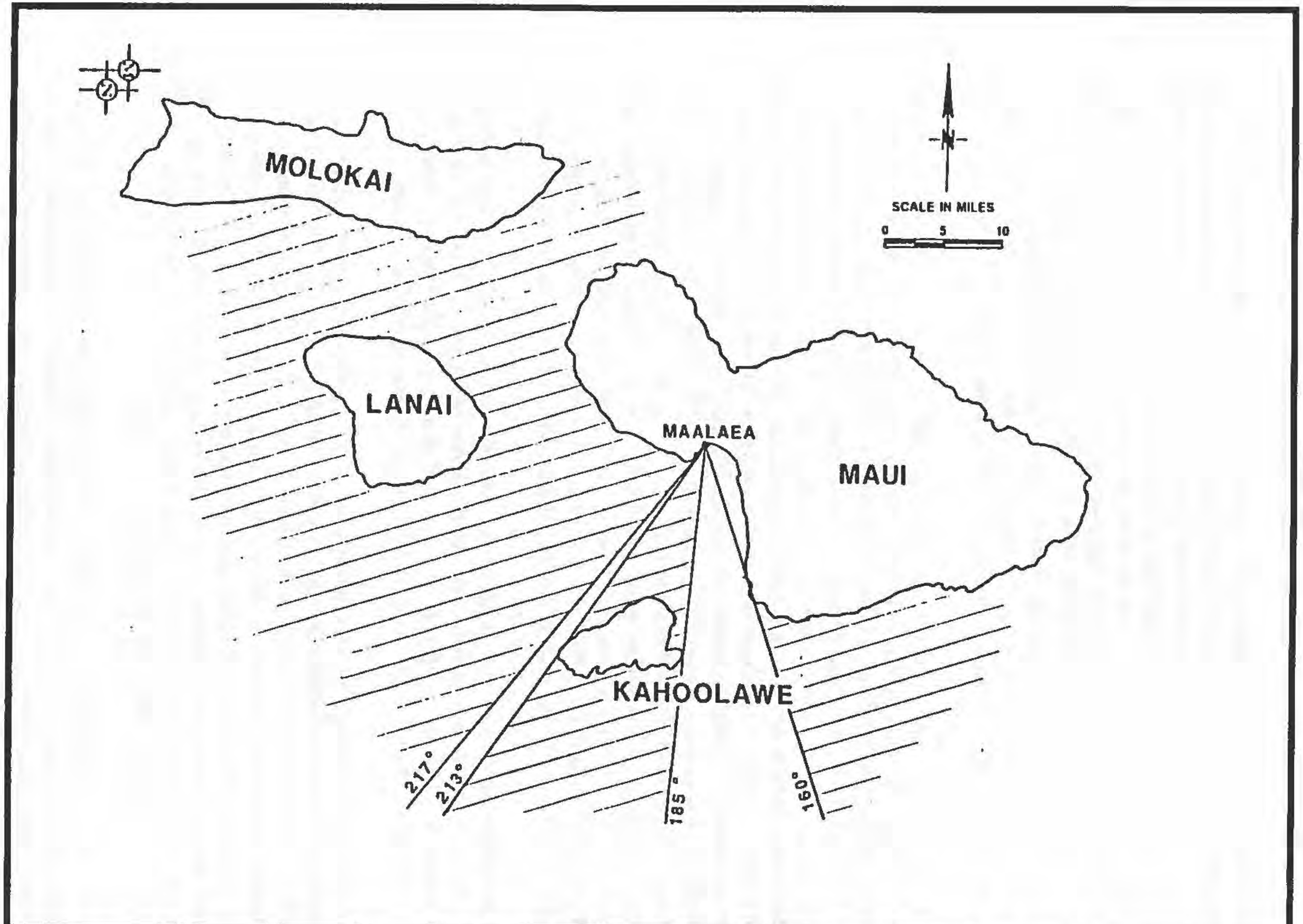
Table 3 Summary of Percent Occurrence of Wave Heights					
		Percent of Time Criterion is Exceeded			
Location	Threshold	Existing	Alternative 1	Alternative 4	Alternative 6
Berthing areas (1 ft. criterion)	< 10.0	32.8	0.6	0.6	0.6
Entrance Channel (2 ft. criterion)	< 10.0	15.4	0.6	0.6	8.8
Source: Hadley, et. al 1997. * Note Alternatives 2, and 3 were not separately evaluated due to their similarity with Alternative 1. The slight differences in structural characteristics relate primarily to effects outside the harbor and would not have had an appreciable effect on wave patterns entering the harbor, nor on wave heights within the harbor.					

All alternatives met the threshold for wave heights in the entrance channel. Alternatives 1, 2, 3, and 4 would reduce the occurrences of wave heights exceeding 2 feet in the entrance channel from about 59 days per year to about 2 days per year. Alternative 6 would reduce the occurrence of wave heights exceeding 2 feet in the entrance channel from 59 days to 32 days per year.

Alternatives 1, 2, 3, and 4 would provide the best conditions in the entrance channel with respect to surge (wave heights), and all the alternatives would provide excellent conditions in the berthing areas.

<u>4.4.1.2 Navigational Safety</u>. The Ma'alaea Harbor, located on the south side of the island of Maui, is exposed to waves from Kona storms, southern hemisphere swells and tropical storms and hurricanes. It is exposed to direct attack by waves generated from 160 degrees (south-southeast) through 185 degrees and from 213 degrees through 217 degrees (Figure 14) (Belt Collins & Associates 1992). Other southerly waves which are reflected and refracted by the land masses of Maui east and west of Ma'alaea Bay, and the Island of Kahoolawe also occur, but some of their energy is dissipated in the reflection/refraction process, so they are generally not as severe as those from 160-185 degrees and 213-217 degrees. The harbor entrance is exposed to attack by all these southerly waves, which causes the navigation hazards.

Although the conclusions of the 1994 and 1997 wave response studies showed that Alternative 6 met the threshold for wave heights in the entrance channel, there has been concern that the Alternative 6 configuration would not improve navigational safety in the entrance channel because incoming vessels would still be subject to navigating in a "following sea" environment. This is defined as waves that are traveling in the same direction as the vessel. Coast Guard Guidance (U.S. Coast Guard 1985) states that "Operation in a following sea, especially a breaking sea, involves the risk of having the stern lifted up and rammed forward by the onrushing swell or breaker. The result, surfing down the face of a wave has always been recognized as an extremely dangerous situation, one which is nearly impossible to control, and quite often ends up forcing the boat to broach and roll over or to pitchpole."



Prepared By: Civil Works Branch
Engineering and
Environmental Section

MA'ALAEA LIGHT-DRAFT HARBOR
Island of Maui, Hawaii

Figure 14. Wave Exposure at Ma'alaea.

U.S. ARMY CORPS
OF ENGINEERS
Honolulu Engineer District

While the harbor surge condition is affected by the HEIGHT of the wave, the navigational safety issue is not primarily related to wave height; it is primarily related to the wave length, vessel length, and vessel speed. WES found that "in following waves, wave height was not the most important parameter influencing the vessel's behavior. Vessel speed and wave length were the most influential parameters. No controllability problems were present at the highest speed (8 knots) or the shortest wave length (1/2 the length of the vessel). When the speed of the vessel is less than 8 knots and the wave length is greater than 1/2 the length of the vessel, the vessel begins losing maneuverability. At vessel speeds of 4 knots or less, the vessel stops responding to the rudder." (U.S. Army Waterways Experiment Station 1996; Hadley et al. 1997).

Wave lengths affecting the harbor entrance range from 21.9 feet to 439.5 feet. Nearly all of them range between the 9-second and 20-second wave period, translating to wave lengths of 197.8 to 439.5 feet. Vessels utilizing the harbor range from 20 feet to about 100 feet in length. The maximum speed allowed in the entrance channel is one that produces no wake--less than 5 knots. According to the U.S. Army Waterways Experiment Station, Alternative 6 does not provide any protection to the harbor entrance from waves coming out of the south, since the waves would be expected to move along the interior mole, creating a following wave environment (U.S. Army Engineer Waterways Experiment Station 1996; Hadley et al. 1997). Only vessels with lengths of 98 feet or more would be able to avoid losing control at the 197.8 foot wavelength. Therefore, vessels would be navigating in a following sea with wave lengths longer than 1/2 the vessel length approaching 100 percent of the time. This represents a very substantial increase in navigability hazards, which are further increased by adding a possible collision with the rock structures confining the entrance channel on both sides.

As the harbor entrance is now configured, vessels have some flexibility in their direction of approach to the harbor entrance, thereby frequently being able to avoid the following sea condition. With the alignment of the entrance channel for Alternative 6, there is no such flexibility. Vessels would nearly always be navigating in a following sea.

Because of the orientation of the entrance channel for Alternative 6, vessels in the channel are subjected to following waves (waves traveling in the same direction as the vessel). Hazards would be further increased by adding a possible collision with the rock structure by the vessel, as much of the entrance channel would be confined between two rock structures. Vessels entering the channel would always be traveling at slow (no-wake) speeds, and the wave lengths nearly always exceed the 1/2L threshold for the existing southerly wave conditions at the harbor site. Vessels would be routinely subjected to extremely hazardous navigation conditions.

It would make no difference how the interior mole is aligned for Alternative 6. No matter which interior orientation is considered, the entrance channel is still subjected to direct southerly wave attack and following sea conditions, because there is nothing to break the oncoming waves. It is not possible to develop a design for Alternative 6 that would rectify the navigational hazard conditions. The entrance channel would need to be oriented so that vessels could approach at 15 degrees (U.S. Coast Guard 1985) to avoid a following sea condition. Vessels will be unable to avoid these hazardous conditions. Therefore, additional detailed study on a potential modified design for Alternative 6 was not conducted.

Alternatives 1, 2, 3, and 4 would provide protection for a vessel approaching the entrance to the channel. A vessel would be able to approach the breakwater with sufficient speed to maintain rudder control and then, when it moves into the protection of the breakwater, reduce speed and enter the harbor at no-wake speed with full control for a wide range of wave conditions (U.S. Army Engineer Waterways Experiment Station 1996; Hadley et al. 1997).

4.4.1.3 Harbor Flushing. Adequate flushing will greatly reduce or eliminate the potential for stagnation of water in a marina and will help maintain biological productivity and aesthetics. It was therefore important to determine the flushing rates for the existing conditions and for the proposed alternatives, to assure that the selected design does not cause a significant water quality degradation.

A study to determine the effects of the proposed alternatives on the exchange rate for harbor waters (flushing) was completed by the WES (Wang et al. 1995). That study is reproduced in Appendix B of the 1994 FSEIS. The flushing study referenced a 1983 source by Clark which stated that a period of more than 10 days should be considered an unacceptable flushing time. WES subsequently provided additional information on flushing rates in a letter dated 14 July 1994, Subject: *An Additional Numerical Model Run for Modified Plan 2 in the Ma'alaea Harbor,* that cited a Region IV 1985 source for a 5-day threshold (Houston 1994). Present EPA guidelines now suggest that different flushing rates may be appropriate for different regions, depending on tide and position. (EPA 1993).

According to the two WES studies, existing harbor flushing is estimated to range from 2.1 to 2.9 days, with an average of 2.6 days. Alternatives 1, 2, and 3 would increase flushing time to a range of 3.8 to 4.4 days, with an average of 4.1. The range for Alternative 6 would be 5.3 to 6.3 days, with an average of 5.7 days. Alternative 6 would increase the flushing rate to outside the suggested 5-day threshold. In 1997 WES converted the flushing time in days to the newer method which reports flushing time as the amount of a conservative substance that is flushed from the basin over a 24-hour period (Wang 1998). For the existing condition the average flushing percentage is 50.3 percent; Alternative 1 would be 38.3 percent; and Alternative 6 would be 25.7 percent.

Although not specifically studied by Wang et al (1995), the flushing rate for Alternative 4 is not expected to increase significantly over existing conditions. The entrance channel in this alternative is in general alignment with the prevailing winds, and since the harbor flushing is primarily wind-driven, the prevailing winds would push the surface waters out of the harbor without restrictions, allowing bottom waters to flow into the harbor.

The flow of approximately one million gallons per day of filtered seawater from the Maui Ocean Center into the harbor was not included in the flushing studies. Although not a significant water source, it would improve the flushing slightly for all alternatives. Further, the flushing modeling studies did not include three 36 inch circulation culverts which would be built into the arm connecting the State's proposed center mole to the north side of the harbor. These three 36 inch circulation culverts are also expected to improve flushing slightly for all alternatives.

4.4.1.4 Harbor Oscillation. Because the Alternative 6 configuration would create several additional confined areas within the harbor, there was concern that this condition would result in problems associated with harbor oscillation (a rocking motion of the harbor water from one side to another). Therefore, it was subjected to a study to determine the potential for this problem to occur. That study (Thompson and Hadley 1994) can be found in Appendix G of the 1994 FSEIS.

In conjunction with the additional wave response studies, harbor oscillation studies were updated in 1997 in order to incorporate changes in the modeling technology and to evaluate the potential for harbor oscillation problems with the other alternatives

The results of the updated harbor oscillation study indicated that Alternatives 1 and 6 may be expected to experience stronger oscillations than the existing harbor particularly at lower frequencies. The increase is due to the addition of structures within the harbor, creating more confined corners. However, the study concluded that oscillation at lower frequencies do not present safety concerns (Hadley et al. 1997). That study can be found in Appendix K.

4.4.1.5 Project Economics. Although the Council on Environmental Quality's National Environmental Policy Act regulations do not require an economic analysis of alternatives, it does provide that economic information is properly included in an EIS when economic factors will be considered by decisionmakers in the choice between alternatives.

The HED completed an economic analysis for all alternatives in February 1998. (see Appendix A). The results of the analysis are summarized in Table 4. The benefit-cost ratio for Alternative 1 was estimated to be 2.59 to 1, the highest of the alternatives. The lowest benefit-cost ratio was 1.14 to 1 for Alternative 6.

Table 4 Project Economics					
	Alternative				
Item	1	2	3	4	6
Benefits ($000)	2,407	2,407	2,407	2,407	743
Costs ($000)	929	1,016	1,054	1,210	649
Benefit-Cost Ratio	2.59	2.37	2.28	1.99	1.14
Net Benefits ($000)	1,478	1,391	1,353	1,197	94

Alternative 1 has the highest benefit-cost ratio and Alternative 6 has the lowest, with benefits only marginally higher than the costs. The National Economic Development (NED) plan is Alternative 1.

4.4.2 ENVIRONMENTAL STUDIES

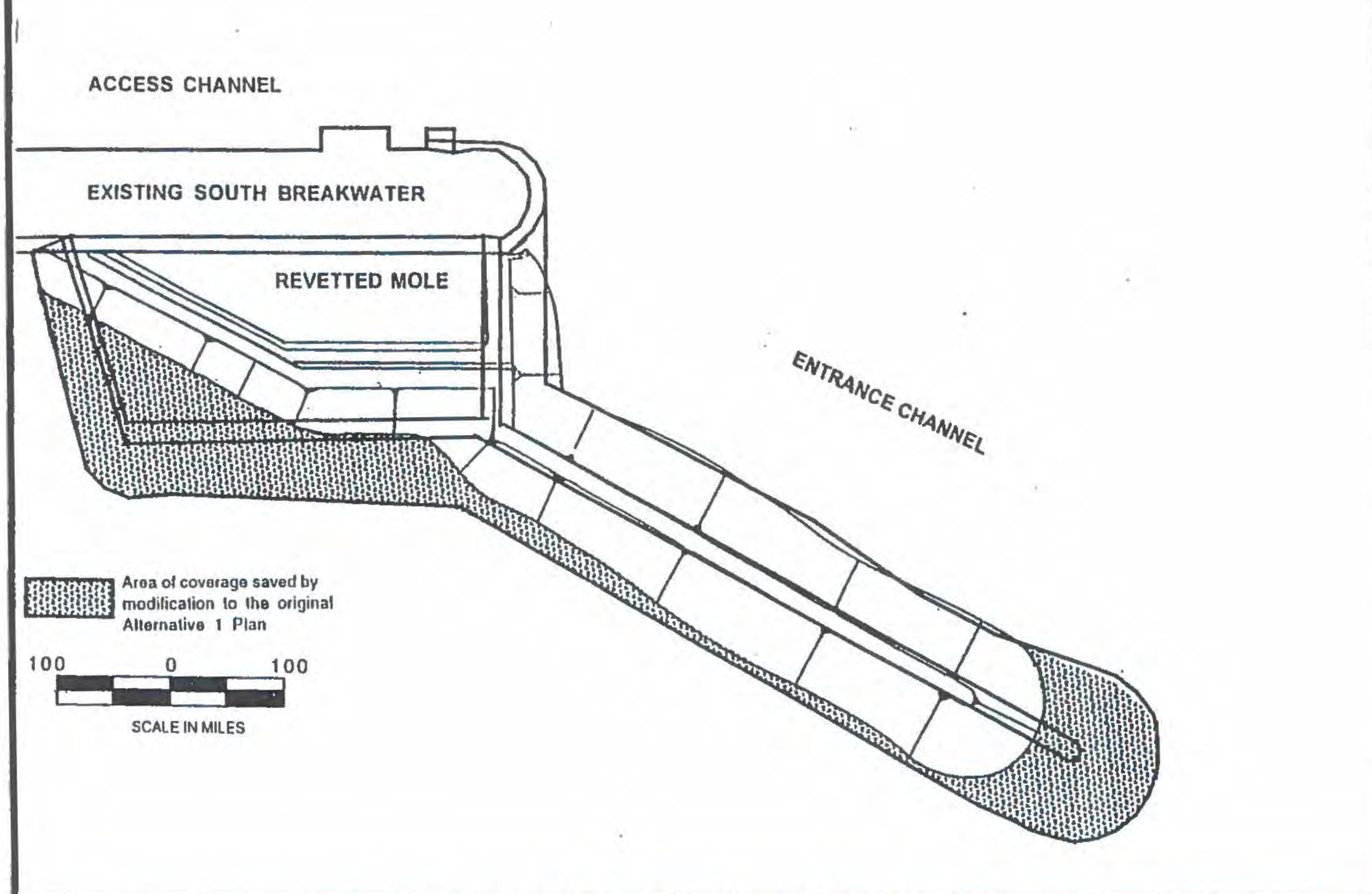
4.4.2.1 Design Modifications to Avoid/Minimize Adverse Impacts. Since release of the 1994 FSEIS, HED has modified the Alternative 1 to further reduce the amount of aquatic habitat directly impacted to the extent practicable (See Figure 15). The originally proposed plan would have directly affected 13.0 acres of aquatic habitat. The current proposal reduces those impacts to 11.89 acres of aquatic habitat, including about 4.8 acres of coral reef.

With design modifications, the impacts to Buzz' No. 1 and No. 2 surf sites have been largely eliminated by downscaling the size of the seaward extension of the revetted mole at the base of the south breakwater extension. The toe of the revetted mole is to be maintained within 100 feet of the existing structure, so that development is out of the Buzz' 2 riding area. The revetted mole will also be tapered from Station 0+00 to its full width at Station 3+70, providing additional maneuvering area for surfers.

In addition, instead of constructing the south breakwater extension with multiple layers of concrete armor units (dolos), a single layer of concrete armor units (core-loc) would be used. This change would reduce the breakwater footprint so that the area typically surfed at Buzz' No. 1 would not be impacted by construction of this feature.

Similar modifications were also made to Alternatives 2 and 3.

4.4.2.2 Mitigation for Unavoidable Adverse Impacts. In order to develop a plan to effectively mitigate the proposed project's unavoidable impacts on coastal resources, an interagency team was formed consisting of representatives from the Hawaii Coastal Zone Management (CZM) Program; Hawaii Department of Land and Natural Resources (DLNR) (Division of Aquatic Resources and Division of Boating and Ocean Recreation); National Marine Fisheries Service (NMFS); and U.S. Army Corps of



Prepared By: Civil Works Branch
Engineering and
Environmental Section

MA'ALAEA LIGHT-DRAFT HARBOR
Island of Maui, Hawaii

Figure 15. Comparison of 1980 Recommended Plan and the Present Plan

U.S. ARMY CORPS
OF ENGINEERS
Honolulu Engineer District

Engineers, Honolulu District (HED). Specifically, the mitigation plan addresses the proposed project's impacts on surf sites, a small beach area located within the existing harbor, the coral reef ecosystem within and outside the existing harbor, water quality both in and outside of the existing harbor, and threatened and endangered species. The mitigation plan contains numerous measures to enhance protection for these resources, and provided the basis for the determination by the Hawaii Office of Planning, DBEDT that the proposed project was consistent with the objectives and policies of Hawaii's Coastal Zone Management Program. The DBEDT provided that consistency determination on 12 September, 1996.

The details of the mitigation plan are presented in *Final Mitigation Plan for the Ma'alaea Harbor for Light Draft Vessels, Maui, Hawaii, 5 June 1996* contained in Appendix C. In addition the mitigation plans are discussed in *Chapter 5, Environmental Consequences*, to evaluate their probable effectiveness in mitigating the unavoidable adverse impacts.

4.4.2.3 Sediment Analysis. The harbor sediments were sampled and analyzed for the 32 hazardous compounds and eight metals specified in 40 CFR Part C 261.24, Table 1 in October 1996 in order to respond to public concern regarding the possible contamination of the harbor sediments. The laboratory results of the analyses are presented in Appendix B. None of the substances tested were above allowable limits, and most were below the detection limits.

4.4.2.4 Coral Studies. In accordance with the provisions of the mitigation plan described above, the University of Hawaii (UH), under contract by the HED, has performed a baseline assessment to quantify substrate types, coral cover, coral diversity, fish density and fish diversity. Based on the results of the survey and prior experience with coral transplantation, recommendations for mitigation measures were developed.

University of Hawaii (UH) researchers who assessed more than 50 transects found areas of coral cover outside the harbor in the range of 30-40 percent. Coral coverage within the harbor reached about 51 percent near the entrance channel of the harbor. As a result of the survey, the amount of coral reef that would be affected by each of the alternatives is higher than originally calculated by FWS in its Fish and Wildlife Coordination Report (4.8 acres vs. 3.7 acres). Section 3.10.2 describes in more detail the results of this study. The complete UH report is contained in Appendix D of this document.

The study also found that transplantation of corals to be impacted was not recommended because (1) the corals inside the harbor are adapted to low-motion energy and would not survive relocation to higher water motion regimes; and (2) coral colonies outside the harbor are too large for transplanting and cannot be easily fragmented into moveable sized pieces. It also found no areas within close proximity that are suitable for coral transplantation or artificial reef placement.

4.5 COMPARATIVE EVALUATION OF ALTERNATIVES

A brief comparison of the features and effects of each of the alternatives is presented in this section. In addition, Table 5 presents this information in a comparative matrix form.

4.5.1 EFFECTS COMMON TO ALL ALTERNATIVES

4.5.1.1 Achievement of Project Purposes. All alternatives would provide surge protection in the harbor and entrance channel and would increase the berthing capacity of the harbor. The beneficial effects of the State's plans to provide loading dock, fuel facility, and comfort stations would occur with any of the alternatives.

4.5.1.2 Other Effects. Boat traffic and fishing pressures in the area may be expected to increase for all alternatives. Vehicular land traffic would also be expected to increase in the harbor area. Because of the mitigation planned for this project, and the improvements already made by the Maui Ocean Center project and those planned by the State of Hawaii Department of Transportation, effects of the harbor improvements on traffic conditions in the project area are expected to be insignificant

The HED's analysis of baseline data suggests that the ongoing deposition of sediment into the harbor via three drainage channels will continue until construction and landscaping of the Maui Ocean Center complex and other developments are completed, even if no improvements to the harbor are constructed. These non-project effects on water quality could increase in the future as the area surrounding the harbor is developed; however, the County's imposition of Best Management Practices (BMPs) and other measures to make any new development meet applicable water quality standards could largely control or even reduce these prospective impacts. In addition, planned commercial and residential development in the drainage basin will result in a conversion from agricultural to commercial/residential uses. As more impervious surfaces are constructed, stormwater discharge will increase, but sediment input will decrease.

It appears that the harbor currently serves as a "trap" for the sediments introduced into the harbor, and that the impact on water quality is largely confined to the harbor itself. This will continue to be true under any of the alternatives.

The construction of the alternatives would also result in an increase in noise. The noise from dredging would attract some species, but may disturb others, such as the endangered humpback whale. In consultation with the National Marine Fisheries Service (NMFS), the HED has developed procedures to limit the effects of noise from blasting on the humpback whale; specifically, blasting would occur only during periods when humpback whales are not present in the Ma'alaea Bay area.

The construction of any of the alternatives will result in increased berthing capacity and thus increased vessel usage of the harbor. Increased vessel usage will increase the suspension of sediment within the harbor and may further degrade the water quality. However, due to the harbor's ability to act as a sediment "trap", these siltation effects are not anticipated outside the harbor. Additionally, the change in upland activity is expected to reduce the amount of sediment entering the harbor through the three storm drains, thus reducing the amount of sediment available to be resuspended by vessels.

The impacts of the construction of any of the alternatives and resulting increased usage of the harbor is not expected to jeopardize the continued existence of any threatened or endangered species. Humpback whales may be displaced from a portion of their habitat by increased boat traffic, and a small number of green sea turtles may be adversely affected by displacement, loss of some feeding habitat, or injury and mortality due to blasting, dredging and construction; however, the area known as "Turtle Town" is outside the area of potential effect and will not be affected. NMFS has determined that none of the alternatives would jeopardize these animals if appropriate safeguards are taken.

The construction of all alternatives would also destroy benthic organisms that currently exist in the footprint of the new structures and dredge areas. However, the new structures would provide new habitat for many marine species, and an increase in the populations of generalized reef-dwelling fish species after completion of the construction of any of these alternatives is expected. As a result, increased fishing should occur near the new structures. The soft bottom areas would be rapidly recolonized by organisms similar to those being lost.

Increased usage of the harbor from construction of any of the alternatives would also result in increased vehicular land traffic in the project area. The State has analyzed these traffic impacts in a study which was presented in Appendix D of the 1994 FSEIS. The study concluded that without mitigation, levels of service at the intersections of all three roads leading to and exiting the harbor would be reduced. With the planned mitigation and the improvements already made by the Maui Ocean Center and those planned by the State of Hawaii Department of Transportation, traffic impacts would not be significant.

It is expected that the State's improvements to the harbor facility would result in increased value to real property in the harbor area. As a result, associated property tax revenues could also increase.

4.5.2 EFFECTS UNIQUE TO ALTERNATIVES

4.5.2.1 Achievement of Project Purposes. Alternatives 1, 2, 3, and 4 would improve navigation conditions within the harbor. Alternative 6 would pose significant navigation hazards in the entrance channel because vessels would be continuously subjected to a dangerous "following sea" condition.

With Alternatives 1, 2, 3, and 4, the State would provide the full range of development described in Section 4.3.2. With Alternative 6, because of the smaller number of berths that could be provided as well as the lack of space for some facilities, only the loading dock, fuel facility, comfort station, and picnic facilities at the west end would be provided. The existing boat ramp would be eliminated to make room for additional berths. The sewage treatment facility would not be constructed, nor would the other facilities planned for the center, south, and east moles (parking, administration facilities, access, etc.).

The construction of any of the alternatives would have a temporary adverse effect on the water quality within the existing harbor, primarily through increased turbidity from dredging and construction activities. Since Alternatives 1 through 4 also require dredging outside of the existing harbor and entrance channel, their construction would also adversely affect water quality outside of the existing harbor. However, the HED will include in the contract specifications the requirement that silt containment devices will be used during construction activities which will effectively limit these effects to the immediate construction area.

For Alternatives 1, 2, 3, and 4, the number of boats berthed within the harbor basin would increase from 89 to about 214 (six vessels take up two slips) under the DBOR's proposed berthing plan, a 140 percent increase. This would meet about 60 percent of the current demand for additional berthing at Ma'alaea Harbor. Full development of the local sponsor's planned improvements could occur with Alternative 1. Alternatives 2, 3 and 4 would allow development of all the State's improvements with the exception of the bus turn-around on the south breakwater. Alternative 6 would allow an increase of 37 percent in the number of boats berthed within the harbor basin, from 89 to 122 (six vessels occupy two slips each). This would meet 11 percent of current demand. Partial development of the local sponsor's planned improvements could occur, including, improvements to the loading dock, construction of a fuel facility, construction of a picnic/park area, and addition of a comfort station. It would not accommodate planned improvements for the center mole, south mole, and east mole.

4.5.2.2 Harbor Flushing. According to the July 14, 1994 flushing model run by WES (Appendix B, 1994 FEIS), the average flushing rate would increase from 2.6 days to 4.1 days for Alternatives 1 - 3. For Alternative 6, the average flushing rate would increase to 5.7 days, which does not fall within EPA Region IV's suggested threshold of 5 days. Utilizing more recent EPA guidelines regarding harbor flushing (WES January 20, 1998; Appendix K), Alternatives 1 - 3 would reduce the flushing rate from about 50% to 38%; Alternative 6 would reduce it to about 26%. Mitigation to improve flushing for Alternatives 1 - 4 would include construction of three 36 inch circulation culverts in the arm connecting the north side of the harbor to the State's center mole/service facility.

4.5.2.3 Effects on the Aquatic Ecosystem. Alternative 1 would alter approximately 11.89 acres of coral reef, coral rubble, and sand bottom and associated benthic organisms. About 5.76 acres would be filled, and 6.13 acres would be dredged. About 4.8 acres of coral reef would be affected. Approximately 1.5 acres of habitat would be provided with the new structures, resulting in a net loss of 3.3 acres of coral reef habitat.

Alternative 2 would alter about 11.48 acres of coral reef, coral rubble, and sand bottom and associated benthic organisms. Approximately 5.35 acres would be filled, and 6.13 acres would be dredged. 4.7 acres of coral reef would be affected. About 1.5 acres of habitat would be provided with the new structures, resulting in a net loss of about 3.2 acres of coral reef habitat..

Alternative 3 would impact approximately 11.69 acres of coral reef, coral rubble, and sand bottom and associated benthic organisms. Fill would consist of 5.56 acres, and dredging would affect 6.13 acres. About 4.7 acres of coral reef would be affected. About 1.7 acres of habitat would be provided with the new structures, resulting in a net loss of about 3.0 acres of coral reef habitat.

Alternative 4 would result in effects to 18.59 acres of coral reef, coral rubble, and sand bottom and associated benthic organisms. Of this amount, 8.08 acres would be filled, and 10.51 acres would be dredged. 2.3 acres of coral reef would be affected. About 2.2 acres of habitat would be provided with the new structures, resulting in a net loss of about 0.1 acres of coral reef habitat.

For Alternative 6, 8.54 acres of coral rubble and sand bottom and associated benthic organisms would be lost. About 1.47 acres would be filled, and 7.07 acres would be dredged. About 1.0 acres of coral would be affected due to dredging within the harbor. An estimated 1.8 acres of new habitat would be created with the new structure, resulting in a net gain of 0.8 acres of coral reef habitat. No coral reef outside the harbor would be affected.

4.5.2.4 Effects on Surf Sites. Alternative 1 would result in the complete loss of the Off-the-Wall surf site. Impacts to other surf sites have been largely avoided by design modifications.

Alternatives 2 and 3 would also result in the complete destruction of the Off-the-Wall surf site. Design modifications similar to Alternative 1 would be made to avoid and minimize impacts. Further, Alternative 3 would result in the modification of Buzz's No. 1 and No. 2 surf sites.

Alternative 4 would completely destroy Buzz's Nos. 2 and 3 and result in a reduction of the quality of the waves at Buzz's No. 1 and Off-the-Wall.

Alternative 6 would have no effect on any surf sites.

4.5.2.5 Effects on Sandy Beach. Alternatives 1-4 would provide for an additional berthing area in the eastern part of the harbor. As a result, a small sandy beach at the base of the eastern mole would be lost due to the construction of these alternatives. The beach would also be directly impacted by construction of Alternative 6. Because the channel would not be protected, the beach would be heavily covered with rock to protect against wave action.

Table 5
Comparative Evaluation of Alternatives

Feature/Resource	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 6
Entrance Channel	610 feet long 150-180 feet wide 12-15 feet deep 2.22 acres	610 feet long 150-180 feet wide 12-15 feet deep 2.22 acres	610 feet long 150-180 feet wide 12-15 feet deep 2.22 acres	960 feet long 150-200 feet wide 12-15 feet deep 5.67 acres	1,330 feet long 150 feet wide 12-15 feet deep 4.73 acres
Turning Basin	12 feet deep 1.72 acres	12 feet deep 1.72 acres	12 feet deep 1.72 acres	12 feet deep 2.64 acres	12 feet deep 1.38 acres
Access Channel	720 feet long 80 feet wide 8 feet deep 1.32 acres	720 feet long 80 feet wide 8 feet deep 1.32 acres	720 feet long 80 feet wide 8 feet deep 1.32 acres	600 feet long 80 feet wide 8 feet deep 1.32 acres	950 feet long 60-80 feet wide 8 feet deep 0.25 acres
Berthing Area	0.87 acres	0.87 acres	0.87 acres	0.87 acres dredging	0.71 acres dredging
Breakwater	Seaward extension of existing south break-water; 620 feet long. Removal of 80 feet of existing east break-water	Seaward extension of existing south break-water; 620 feet long Removal of 80 feet of existing east break-water	Detached; outside harbor; 650 feet long. Removal of 80 feet of existing east break-water	Seaward extension of existing east break-water; 850 feet long	Inward extension of existing south break-water, within interior of the existing harbor
South Revetted Mole	400 feet long Tapered	Replaced by 200-foot-long wave absorber	NA	NA	NA
East Revetted Mole	Addition of revetted mole along seaward side of existing mole.	Addition of revetted mole along seaward side of existing mole	Addition of revetted mole along seaward side of existing mole	Addition of revetted mole along seaward side of existing mole	NA
Center Mole	82,000 square feet 1.88 acres	82,000 square feet 1.88 acres	82,000 square feet 1.88 acres	82,000 square feet 1.88 acres	NA
Volume and Area to be Dredged	41,150 cubic yards 6.13 acres	40,930 cubic yards 6.13 acres	39,600 cubic yards 6.13 acres	107,570 cubic yards 10.51 acres	49,600 cubic yards. 7.07 acres
Volume and Area to be Filled	75,500 cubic yards 5.76 acres	71,100 cubic yards 5.35 acres	67,400 cubic yards 5.56 acres	90,000 cubic yards 8.08 acres	10,500 cubic yards 1.47 acres
Total Area Affected	518,100 square feet 11.89 acres	500,100 square feet 11.48 acres	509,100 square feet 11.69 acres	809,600 square feet 18.59 acres	371,800 square feet 8.54 acres
Total Berths	214 Increase of 140%	214 Increase of 140%	214 Increase of 140%	214 Increase of 140 %	122 Increase of 37%
Surge Reduction	Yes	Yes	Yes	Yes	Yes
Safe Navigation	Yes	Yes	Yes	Yes	No

Table 5
Comparative Evaluation of Alternatives

Feature/Resource	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 6
Accommodates local sponsor's plans	Fully accommodates sponsor's plans. Allows 125 additional berths. Meets 60% of current demand.	Accommodates sponsor's plans except for bus turn-around. Allows 125 additional berths. Meets 60% of current demand.	Accommodates sponsor's plans except for bus turn-around. Allows 125 additional berths. Meets 60% of current demand.	Accommodates sponsor's plans except for bus turn-around. Allows 125 additional berths. Meets 60% of current demand.	Accommodates some of sponsor's plans, except for center, south, and east moles improvements. Allows 33 additional berths. Meets 11% of current demand.
Economics	Feasible. B-C Ratio is 2.59	Feasible. B-C Ratio is 2.37	Feasible. B-C Ratio is 2.28	Feasible. B-C Ratio is 1.99	Feasible. B-C Ratio is 1.14
Water Quality	May result in additional short-term exceedences in standards for turbidity.	May result in additional short-term exceedences in standards for turbidity.	May result in additional short-term exceedences in standards for turbidity.	May result in additional short-term exceedences in standards for turbidity.	May result in additional short-term exceedences in standards for turbidity.
Basin Flushing	Increased from 2.9 days to 4.4 days. Meets EPA 5-day criteria. Reduces 24-hour flushing rate from 50% to 38%	Increased from 2.9 days to 4.4 days. Meets EPA 5-day criteria. Reduces 24-hour flushing rate from 50% to 38%.	Increased from 2.9 days to 4.4 days. Meets EPA 5-day criteria. Reduces 24-hour flushing rate from 50% to 38%.	Not evaluated, but harbor interior is similar to alternatives 1,2, and 3.	Increased from 2.9 days to 6.3 days. Exceeds EPA 5-day criteria. Reduces 24-hour flushing rate from 50% to 26%.
Coral Reef Affected	4.8 acres	4.7 acres	4.7 acres.	2.3 acres	1.0 acres
Aquatic Habitat Affected	11.89 acres affected. Gain of 1.5 acres new habitat.	11.48 acres affected. Gain of 1.5 acres new habitat.	11.69 acres affected. Gain of 1.7 acres new habitat.	18.59 acres affected. Gain of 2.2 acres new habitat.	8.54 acres affected. Gain of 1.8 acres new habitat.
Endangered Species	May adversely affect humpback whale and green sea turtle. No effect on Hawksbill turtle or Hawaiian monk seal. Will not jeopardize continued existence of listed species.	May adversely affect humpback whale and green sea turtle. No effect on Hawksbill turtle or Hawaiian monk seal. Will not jeopardize continued existence of listed species.	May adversely affect humpback whale and green sea turtle. No effect on Hawksbill turtle or Hawaiian monk seal. Will not jeopardize continued existence of listed species.	May adversely affect humpback whale and green sea turtle. No effect on Hawksbill turtle or Hawaiian monk seal. Will not jeopardize continued existence of listed species.	May adversely affect humpback whale and green sea turtle. No effect on Hawksbill turtle or Hawaiian monk seal. Will not jeopardize continued existence of listed species.
Surf Sites	Off-the-Wall surf site lost.	Off-the-Wall surf site lost.	Off-the-Wall surf site lost. Buzz's No. 1 and No. 2 modified.	Buzz's No. 2 and No. 3 lost. Off-the-Wall and Buzz's No. 1 sites modified.	No effect.
Sandy Beach	Loss of small sandy beach	Loss of small sandy beach	Loss of small sandy beach	Loss of small sandy beach	Loss of small sandy beach..
Land Use	Consistent with all local, State, and Federal land and resource management plans.	Consistent with all local, State, and Federal land and resource management plans	Consistent with all local, State, and Federal land and resource management plans	Consistent with all local, State, and Federal land and resource management plans	Consistent with all local, State, and Federal land and resource management plans

5 ENVIRONMENTAL CONSEQUENCES

5.1 INTRODUCTION

This section summarizes the environmental effects that would be expected with the implementation of any one of the alternatives. Insignificant effects are summarized, while more significant effects are discussed in more detail. Additional information on the impacts of alternatives can be found in Chapter 5 of the 1994 FSEIS.

A team comprised of the CZM Program, DLNR's Division of Aquatic Resources, DBOR, HED and the NMFS developed the mitigation plan for the proposed project. The mitigation plan is intended to provide enhancement and protection of coastal resources sufficient to warrant the State's certification of the proposed project as being consistent with the CZM Program. The complete mitigation plan is contained in Appendix C.

5.2 AIR QUALITY

Construction activities would increase dust and vehicle exhaust emissions in the project area. These effects will be temporary, affecting the near vicinity of the project site, and the construction contractor would be required to comply with dust control and vehicle emission control regulations. After construction there would be an increase in exhaust emissions from vehicles and power boats, but effects would not be significant because of the low ambient air pollutant concentrations and the strong offshore winds which blow them out to sea.

5.3 NOISE

Noise levels will increase during construction because of construction equipment, but the contractor would be required to limit working hours to between 0730 and 1600 HST, Monday through Friday. There will also be an increase in noise after project completion because of the greater number of power boats and increased vehicle traffic. However, noise levels would be compatible with surrounding land use.

5.4 WATER QUALITY

During construction, turbidity would be increased while dredging, blasting, fill, and dredge spoil dewatering activities are completed. Exceedences in water quality standards for turbidity may be expected, both during construction, and as a result of increased turbulence caused by additional vessel traffic. Turbidity during construction activities would be controlled as strictly as possible, using silt curtains or other silt containment measures to restrict turbidity impacts to the smallest area possible. HED would implement additional measures, including the conditions which are expected to be required for the Water Quality Certification issued by the State of Hawaii Department of Health under Section 401 of the Clean Water Act, to ensure that water quality impacts are kept to a minimum. These measures are contained in Section 5.18 below.

The major cause of algae blooms and chlorophyll A exceedences is unknown. A DOH Task Force is studying the problems. The DBOR and DAR will organize and accomplish a shoreline cleanup of *Hypnea musciformis* in and adjacent to the harbor utilizing private and public resources.

Regardless of whether any new harbor project is constructed, runoff into the harbor will continue to degrade harbor water quality. At present, the uplands adjacent to the harbor are no longer being planted in pineapple as they were in the past. As planned development continues and weedy vegetation covers these area there will likely be less sediment in the runoff that finds its way into the harbor. Commercial and residential development planned for the area surrounding the harbor, and associated paved surfaces, will likely increase stormwater inputs contributed by the three ditches that drain into the harbor, although the amount of sediments in the runoff will likely decrease. In addition, the input of relatively clean seawater from Maui Ocean Center will further dilute stormwater runoff, and aid slightly in harbor flushing. Turbulence caused by increased boat traffic within the harbor will resuspend fine sediments, but the reduced sediment load would result in an increase in water quality within the harbor because there would be less sediment for boating traffic to resuspend. The effects on the harbor water quality of other potential components of the increased stormwater input, such as pesticides and herbicides for landscaping purposes and other urban constituents, would likely be adverse. However, the reduction in agricultural chemical inputs may offset those adverse effects.

Current exceedences of enterococci in the harbor may be caused by stormwater runoff from the three drainage ditches discharging into the harbor. Discharges would be expected to increase in the future with development of upland areas. The proposed harbor project would not contribute to further exceedences of this water quality parameter, and particularly with the construction of new harbor sewage facilities by the State.

Because flushing rates would be reduced for each of the alternatives relative to existing conditions, mixing and dilution with waters outside the harbor would be slowed; this may cause a slight degradation of water quality within the harbor. Alternatives 1, 2, and 3 would each add about 1-1/2 days to the existing flushing rate. Alternative 6 would add about 3-1/2 days, and would exceed the 1985 EPA Region IV suggested flushing rate threshold for a coastal marina. Additional information is presented in-the next section on harbor flushing.

Dredging, filling, and blasting activities are not likely to release hazardous or toxic contaminants into the aquatic environment. Testing of the harbor sediments showed that all contaminants for which the sediment was analyzed were at very low levels, and most were not detected.

An application was submitted to the Hawaii Department of Health to obtain certification under Section 401 of the Clean Water Act. Certification has not yet been received. The conditions likely to be imposed by this certification are listed in Section 5.18.2. A working draft of the certification is contained in Appendix H. If State 401 certification is received, water quality standard violations are not anticipated.

5.5 HARBOR FLUSHING

The threshold for coastal marina flushing suggested by EPA Region IV was 5 days (EPA 1985). Existing harbor flushing is estimated to range from 2.1 to 2.9 days, with an average of 2.6 days. EPA guidelines now suggest that different management measures for flushing rates may be appropriate for different regions, depending on tidal range and position. These more recent guidelines measure flushing as a percentage of a conservative substance that is flushed from the harbor in 24 hours (EPA 1993). The EPA provides guidelines for States to establish flushing criteria for harbors. The State of Hawaii has not yet established a flushing rate for coastal marinas. The flushing study performed by WES for the 1994 FSEIS characterized flushing by the older method of determining number of days to flush the harbor, rather than the newer method of determining the percentage of reduction in 24 hours. WES has subsequently supplemented its study by calculating flushing rates using the more recent guidelines (Wang 1998).

Flushing rates for each of the alternatives are presented in table 6. Alternatives 2 and 3 were not specifically modeled for flushing because their configurations are very similar to Alternative 1. All features differing from Alternative 1 are outside the harbor and would not affect circulation patterns within the harbor to a great degree. Therefore, it is assumed that flushing rates for Alternatives 2 and 3 are the same as Alternative 1.

In the modeling, for Alternatives 1, 2, and 3, the proposed breakwater deflects the incoming flow from the southwestward direction to straight south with an increased velocity. The original southwestward flow becomes a northward compensation flow behind the proposed breakwater. A noticeable eddy was generated around the tip of the proposed breakwater, which has an effect on the flow around the mouth of the harbor and its vicinity. Inside the harbor, the velocity pattern is similar to the existing condition. Comparing the direction of the surface and bottom flow, the wind-induced two-layer flow persists (surface layer flows outward while bottom layer flows inward). The flushing rate would be reduced from about 51 percent to about 38 percent. Because lower layers in confined places in the harbor can act as traps for fine sediment and organic detritus, these areas could develop low dissolved oxygen concentrations. Low DO concentrations can impact aquatic life when normal DO is lower, especially when temperatures are higher.

Table 6
Effect of Alternatives on Longest Predicted Harbor Flushing Rates (in days and percent in 24 hours)

Existing	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 6
2.9 days 50.3%	4.4 days 38.3%	4.4 days 38.3%	4.4 days 38.3%	NA NA	6.3 days 25.7%

Alternative 4 was not studied. However, based on wind and circulation patterns, the alignment of the new entrance channel would allow wind-induced exchange of waters similar to existing conditions. Wang did not compute 24 hour percentage for Alternatives 2 and 3, but they are assumed to be the same as Alternative 1. Source: Houston 1994; Wang 1998.

For Alternative 6, the flow in the bay hardly changed in comparison with the existing condition. Inside the harbor, velocity slightly increases along the tip and east side of the mole due to the new configuration. A restricted section is created between the mole and the north bank which act like a control section limiting the velocity variation otherwise possible. Also, the mole structure itself decreases the harbor area with which water can freely exchange (Wang and Cialone 1995). The flushing rate would be reduced from about 51 percent to about 26 percent, meaning that about ¼ of the harbor water is replaced in a 24-hour period. Effects of the reduction in flushing would be similar to Alternatives 1 through 4, but would be expected to occur to a greater degree.

5.6 Littoral Processes and Shoreline Structures

Based on site investigations and observations throughout the study period, there is no discernible longshore transport of sand within the project area. None of the proposed alternatives is likely to have an effect on littoral process; therefore. it is unlikely that any beaches east of the east breakwater will be affected.

5.7 Surface Drainage and Sediment Deposition Patterns

Coastal flooding in the area will not change as a result of any of the alternatives. The project would be designed to comply with applicable Federal, State, and county regulations regarding flood plain management.

Surface drainage and sediment deposition patterns are not expected to increase from the existing condition as a result of any of the alternatives.

5.8 BIOLOGICAL RESOURCES

5.8.1 TERRESTRIAL

There would be no adverse effects on terrestrial wildlife resources from any of the alternative plans.

5.8.2 MARINE RESOURCES

Details regarding impacts to marine resources are presented in the 1994 FSEIS, Section 5.10. Modifications have been made to the proposed project design to avoid and minimize effects, and revised information on the amount of marine habitat, and in particular coral reef to be affected by the proposed action and alternatives is presented in the following paragraphs.

Each of the alternative plans would result in direct and secondary adverse impacts to aquatic resources. The direct impacts of dredging and filling would include loss of corals, demersal fishes, sedentary macroinvertebrates, and benthic algae, as well as the permanent alteration of marine benthic habitat.

The new harbor entrance channel would provide additional edge habitat and increase habitat diversity within the project vicinity. Fisheries may be locally enhanced as a result of the placement of breakwater and revetment structures on barren sand or other depauperate substrate. The armor units and rocks would provide new habitat for some algae, benthic invertebrates, and reef fishes. According to the FWS (1994), reef surfaces exposed by dredging often become recolonized by reef-building species. Dredging within the harbor area could attract fish to feed on exposed benthic organisms. Dredging sediments will be contained within a silt curtain or other measure to limit turbidity effects.

Indirect impacts on corals and other filter-feeders and algae would be expected as a result of temporary degradation of nearshore water quality. These effects may include smothering caused by excessive sedimentation, abrasion of corals by current-driven suspended sediments, and reduced primary productivity from decreased light levels. This temporary degradation would be expected as a result of increased levels of suspended sediments and turbidity generated by project-related blasting and dredging of sea bottom, dewatering of dredged material, and discharging of fills. However, silt containment measures will be utilized during construction activities to restrict these effects to the smallest area possible. In addition, Jokiel and Brown (1998) stated that adverse sediment damage to adjacent reefs is not anticipated as long as best management practices are employed. Sediments carried out of the harbor would be kept in suspension by wave action and would be transported offshore.

Table 7 shows the amount of aquatic habitat that would be affected with each of the alternatives. Coral reef are broken out. Because of modifications made to the alternative plans to avoid and minimize impacts, these acreages have been recalculated since receipt of the Final FWCA report and differ from the figures provided therein. Because a baseline coral study recently completed (Jokiel and Brown 1998) provided more accurate information on existing coral resources, the loss of coral reef would be higher than originally estimated. Figures 16, 17, 18, 19 and 20 show the features of the alternatives with respect to existing coral resources.

Table 7
Amount of Aquatic Habitat Affected (in acres)

Type of Habitat	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 6
Total Aquatic Habitat	11.89	11.48	11.69	18.59	8.54
Coral Reef	4.8	4.7	4.7	2.3	1.0

<u>**5.8.2.1 Alternative 1.**</u> - Approximately 6.13 acres would be dredged for the entrance channel, harbor access channel improvement, turning basin, and berthing area expansion, as well as for toe excavation for the new structures and removal of a portion of the east breakwater. Dredging for the entrance channel would affect 2.2 acres of marine habitat. About 5.76 acres of marine bottom would be filled in construction of the east mole, center mole, revetted mole, and south breakwater extension. Because of project modifications to avoid and minimize aquatic impacts, The total aquatic habitat to be affected has been reduced from 13 acres to 11.89 acres affected by dredging and filling. Approximately 4.8 acres would be coral reef., an increase from previously-identified effects of 3.7 acres. The increase is due to a recent detailed survey which provided more accurate calculation of existing coral resources in the specific areas to be affected.

Widening of the south revetted mole would cover algal communities immediately seaward of the south breakwater and may temporarily impact green sea turtle potential foraging and resting habitat. However, surveys will be required prior to construction activities to ensure that no turtles are in the area.

Placement of fill for the east revetted mole would affect an area nearly completely covered by sediments. This would result in a loss of benthic residents and algae growing in and over the substrate. These resources provide food and shelter for some species of juvenile foodfishes. Placement of fill for the center mole would cover a shoal area with live coral, and some areas of soft substrate. The new structures and dredged channel slopes would provide about 1.5 acres of habitat for a different biological community.

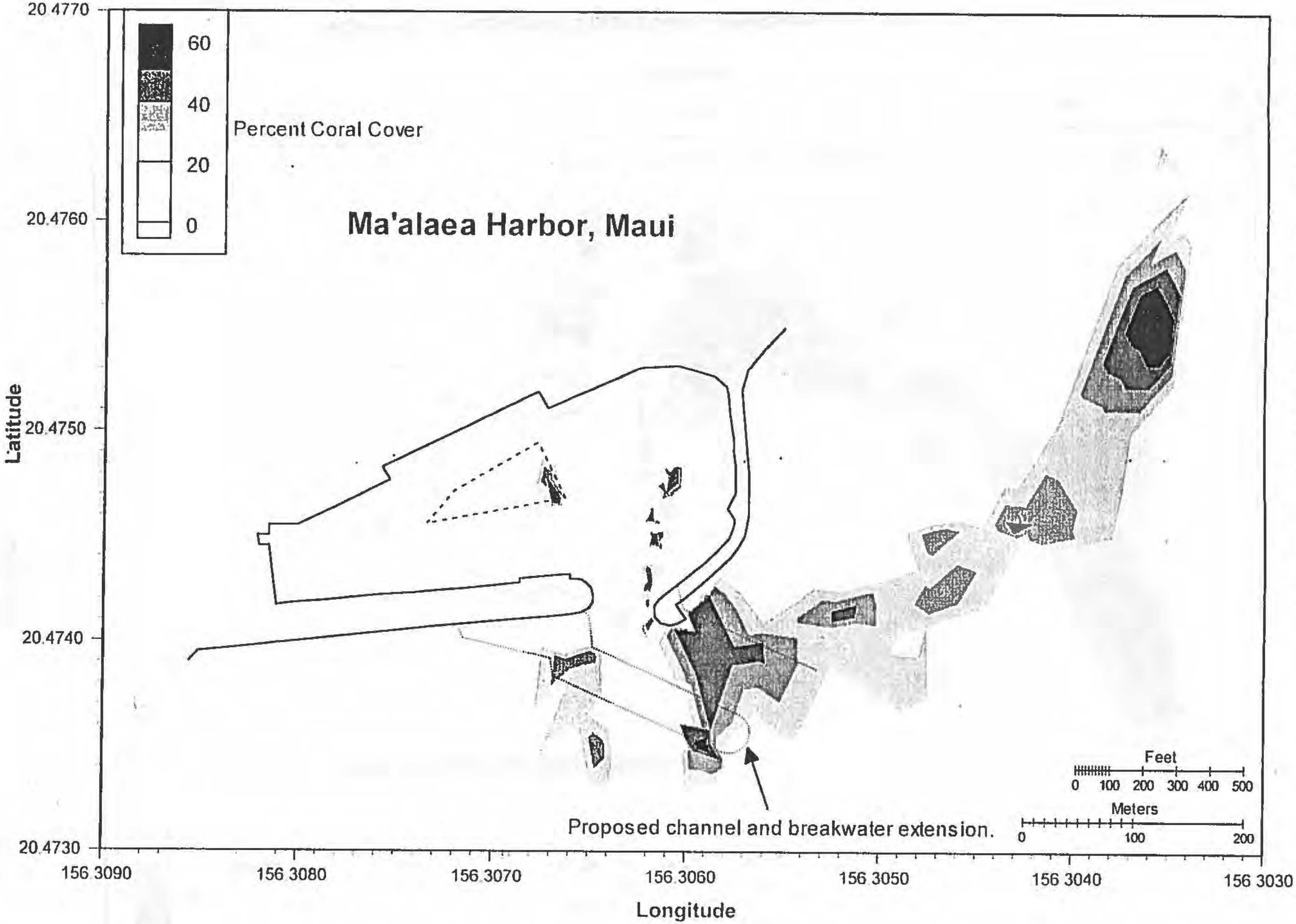


Figure 16. Location of Coral Reefs with Respect to Alternative 1.

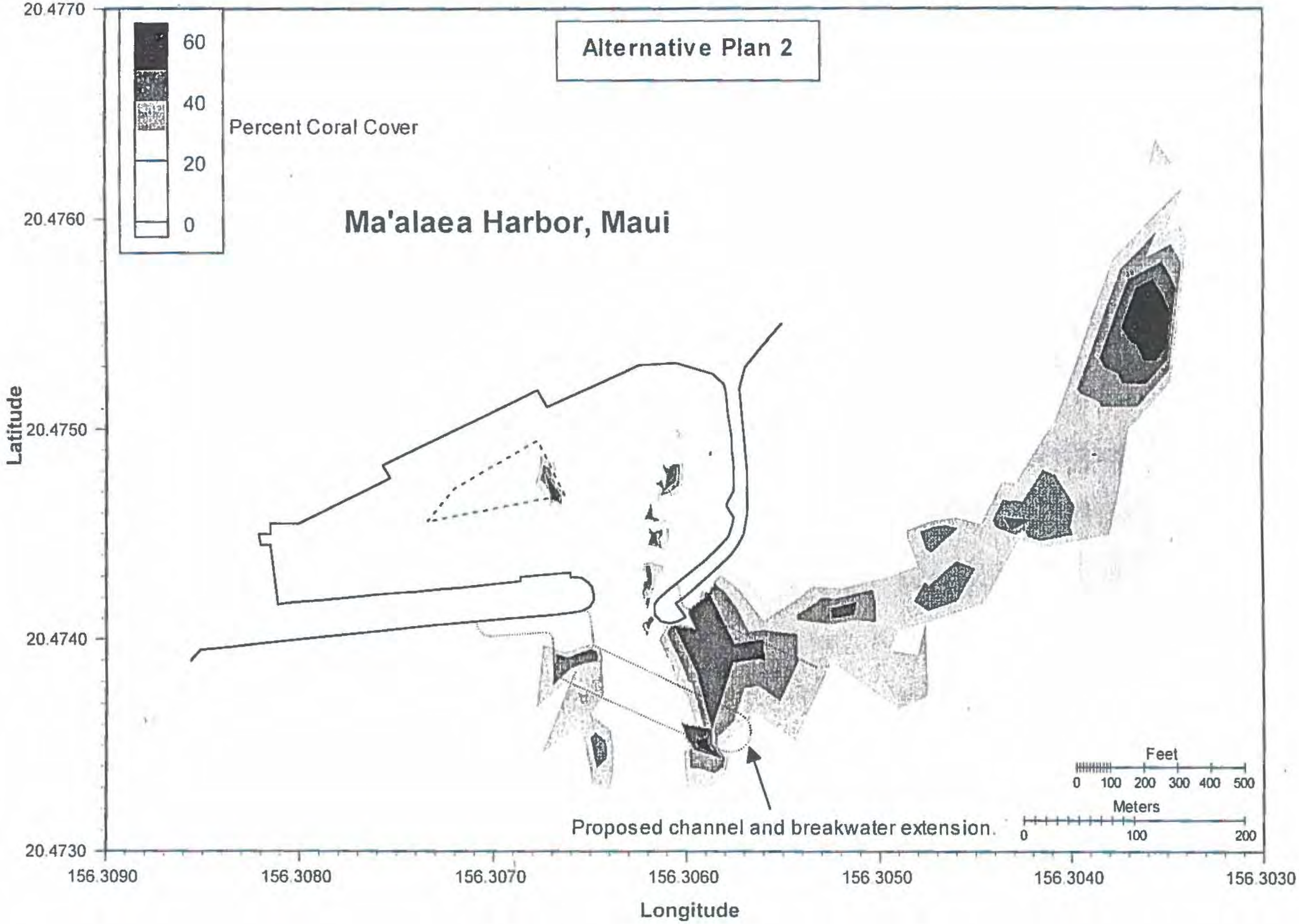


Figure 17. Location of Coral Reefs with Respect to Alternative 2.

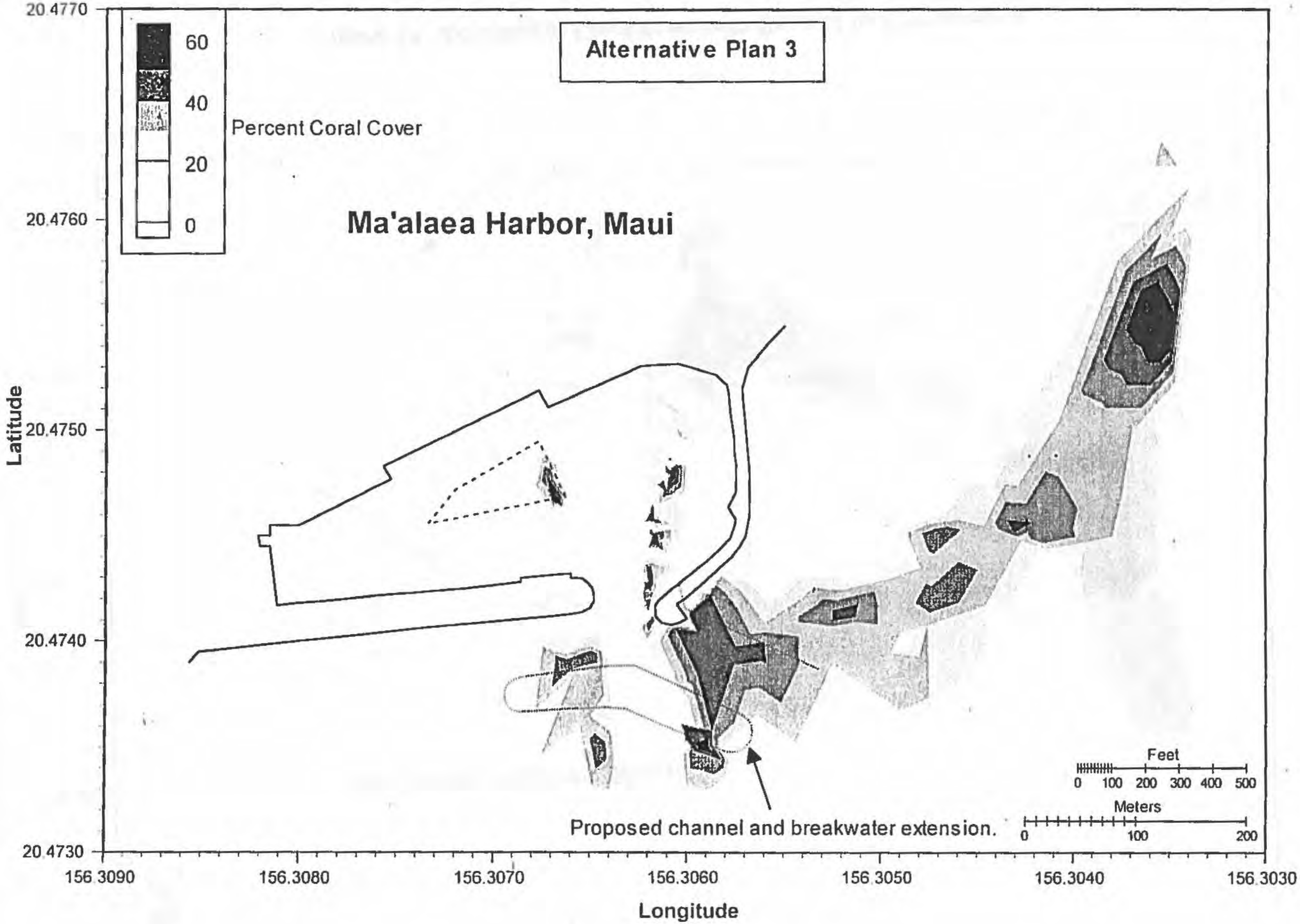


Figure 18. Location of Coral Reefs with Respect to Alternative 3.

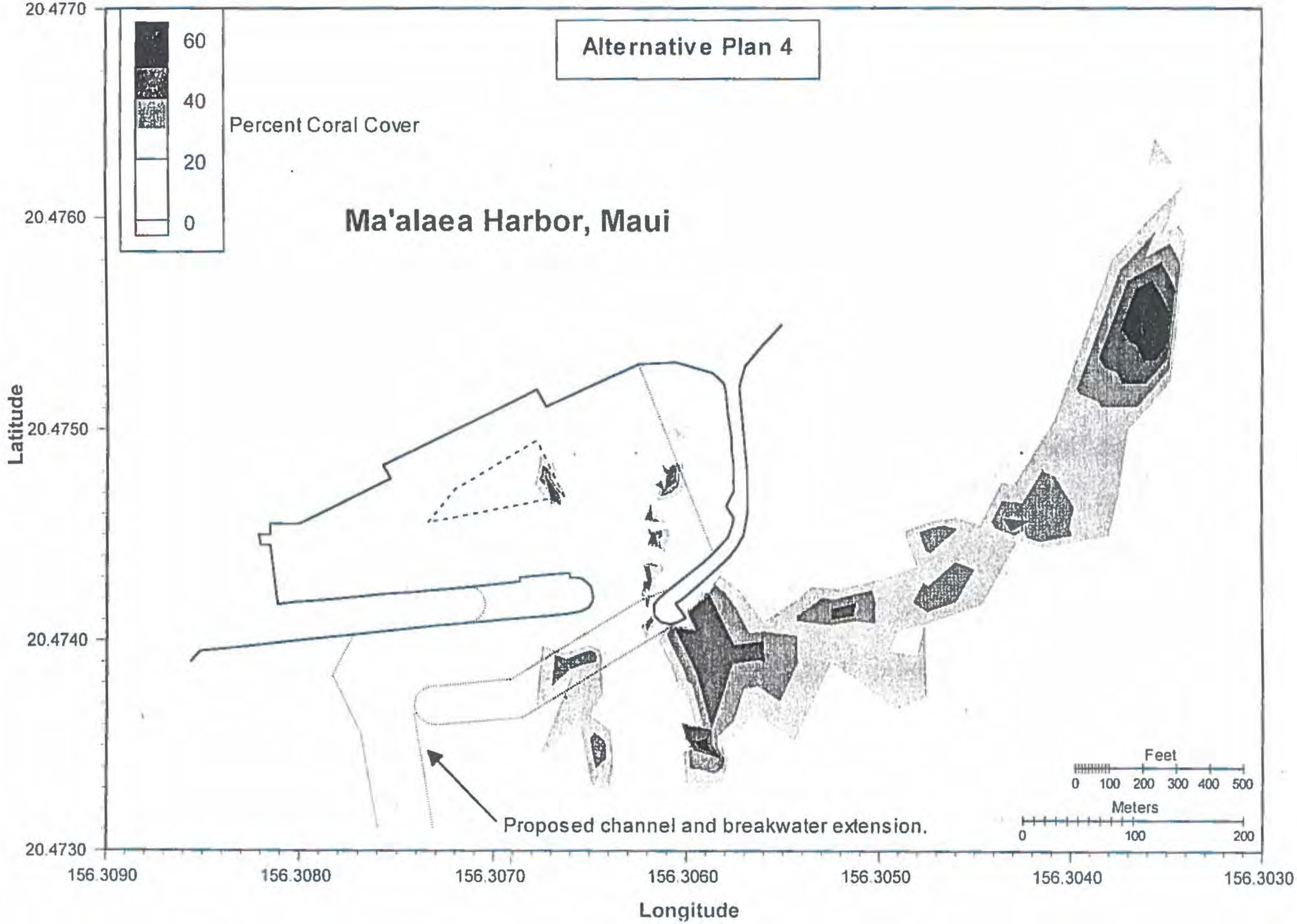


Figure 19. Location of Coral Reefs with Respect to Alternative 4.

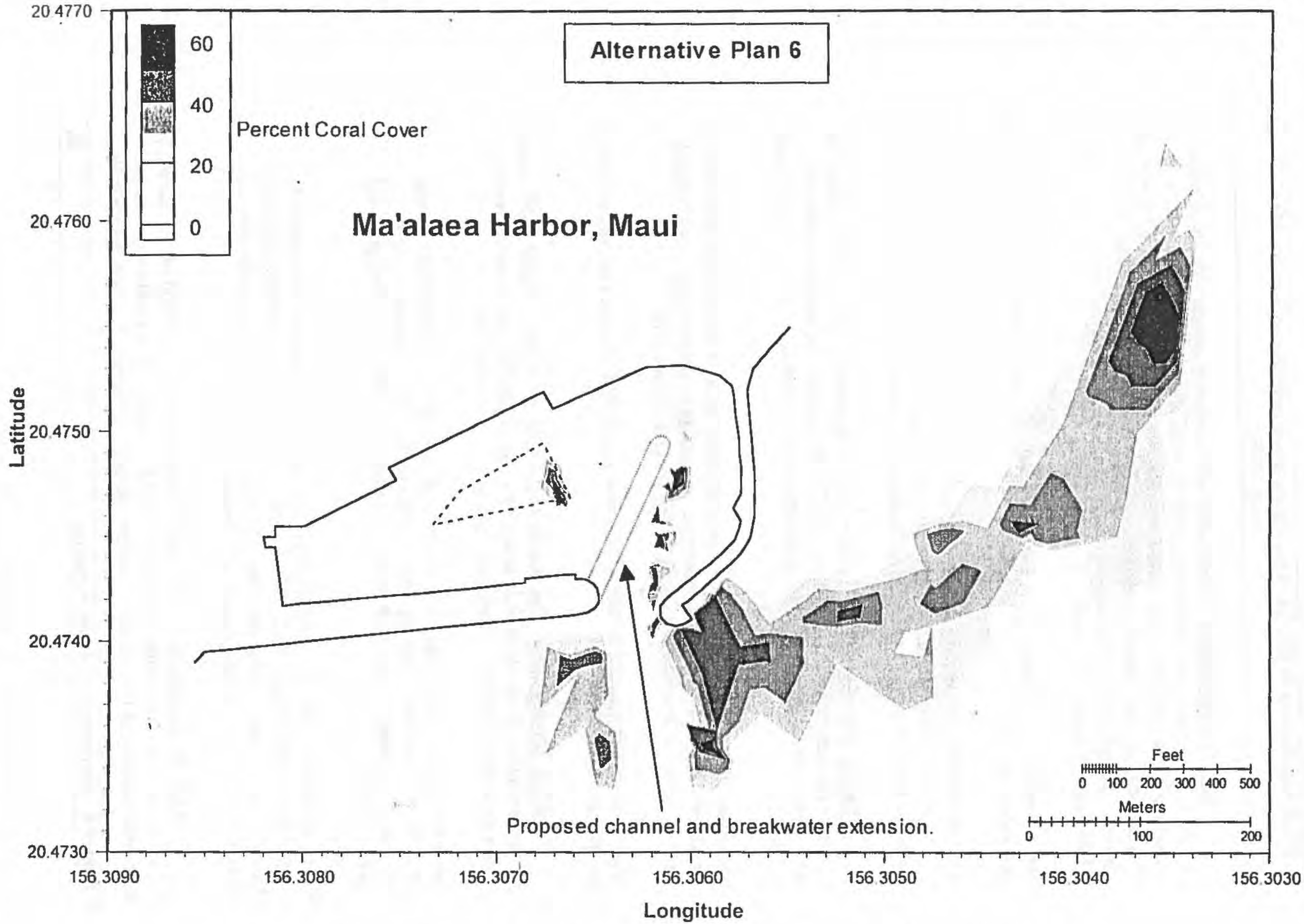


Figure 20. Location of Coral Reefs with Respect to Alternative 6.

5.8.2.2 Alternative 2. The amount and location of dredging for this alternative would be the same as for Alternative 1, and the same areas would be affected. The amount of fill material would be 0.41 acres less, because the south revetted mole would be replaced by a wave absorber. Because the same modifications could be made to shorten and taper the south breakwater extension, total habitat affected is reduced to 11.48 acres. About 4.7 acres of coral reef would be lost.

Algal communities seaward of the south breakwater would be covered by construction of the wave absorber.

Placement of fill for the east revetted mole and center mole would have the same effect as for Alternative 1 above. The new structures and dredged channel slopes would provide about 1.5 acres of habitat for a different biological community.

5.8.2.3 Alternative 3. The amount and location of dredging for this alternative would be the same as for Alternatives 1 and 2. Fill would cover approximately 5.56 acres. Total area affected would be approximately 11.69 acres, of which 4.7 acres would be coral reef.

Placement of fill for the east revetted mole and center mole would have the same effect as for Alternative 1 above. The new structures and dredged channel slopes would provide about 1.7 acres of new habitat for a different biological community.

Algal communities seaward of the south breakwater would be covered by construction of the off-shore breakwater

.

5.8.2.4 Alternative 4. The amount of dredging would be a total of 10.51 acres. and the amount of fill would be 8.08 acres, for a total of 18.59 acres of marine habitat. Of this total, approximately 2.3 acres of coral reef would be affected.

Creation of the new east breakwater extension and the entrance channel may impact potential green sea turtle foraging habitat fronting the south breakwater. Algal communities seaward of the south breakwater would be eliminated by the proposed improvements.

Placement of fill for the east revetted mole and center mole would affect areas nearly completely covered by sediments. This would result in a loss of benthic residents and algae growing in and over the substrate. The new structures would provide about 2.2 acres of habitat for a different biological community.

5.8.2.5 Alternative 6. The amount of dredging would be a total of 7.07 acres, and would be confined to within the existing harbor footprint. Fill for the new interior mole would consist of 1.47 acres, also within the existing harbor. No coral reef outside the harbor would be affected. About 1.0 acres of coral reef within the harbor would be lost. Total habitat affected would be 8.54 acres.

Placement of fill for the interior revetted mole would affect areas nearly completely covered by sediments. This would result in a loss of benthic residents and algae growing in and over the substrate. The new structure would provide habitat for a different biological community

5.8.2.6 Indirect Effects. Information from Wang and Cialone (1995) regarding changes in water circulation and velocities both within and outside of the harbor was used to make some determinations regarding potential effects on coral reefs and other habitats in the project area as a result of changes in sediment deposition due to resuspension of fines by the increased amount of boat traffic.

Outside the harbor, the steady north/northeast wind drives flow in the southwestward direction. Circulation within most small harbors is usually driven primarily by tides. The dynamics of Ma'alaea Harbor circulation is unusual because the wind is the dominant factor. Ma'alaea Harbor experiences a steady, wind-driven two-layer circulation. The wind pushes the water against the south breakwater inside the harbor, setting up a clockwise circulation. The surface circulation is opposite in direction from that at the bottom: the surface layer flows outward, while the bottom layer flows inward (Wang and Cialone 1995).

For Alternatives 1, 2, and 3, the proposed breakwater extension would deflect the incoming flow from its original southwestward direction into a straight south direction, and the original southwestward flow would then turn northward in the area between the proposed breakwater extension and the west coastline.

Inside the harbor, the circulation pattern would be similar to the existing conditions. The magnitude of the flow velocity would be reduced by 10 percent. The two-layered, wind-driven flow (surface layer flows outward while bottom layer flows inward) would persist.

Because surface flows differ in direction from the bottom flows in the harbor and harbor entrance, resuspended sediments within the harbor would not be expected to have a significant effect on the coral areas outside the proposed new harbor entrance. Bottom flows, where heaviest sediment would be entrained, flow into, not out of, the harbor; therefore, sediment laden bottom flows would not exit the harbor and would not impact corals outside the harbor. The surface layer of water flow carrying the resuspended sediments would flow out of the harbor and become entrained and move with the dominant southwestward surface flow caused by the north/northeast wind.

For Alternative 4 the alignment of the breakwater and entrance channel is nearly parallel to the prevailing wind, so that the wind driven water flow would be similar to the existing condition, with surface water flowing out and bottom water flowing into the harbor.

For Alternative 6, the interior mole would have very little effect on the outside bay water. Outside the mole, but within the harbor, the channel velocity at the harbor entrance would be reduced by 60 to 70 percent from existing conditions. Within the harbor, inside the mole the circulation pattern would be very similar to existing conditions. Outside the harbor, resuspended sediments would behave in a fashion similar to that previously discussed.

5.8.2.7 Bottom Sediment Testing. Dredging, filling, and blasting activities are not likely to release hazardous or toxic contaminants into the aquatic environment. The harbor sediments were sampled and analyzed for the 32 hazardous compounds and eight metals specified in 40 CFR Part C 261.24, Table 1 in October 1996. The laboratory results of the analyses are presented in Appendix B. None of the substances analyzed were above action limits, and most were below concentrations for detection.

5.8.3 THREATENED AND ENDANGERED SPECIES

Since completion of the 1994 FSEIS, additional information regarding the presence of the endangered hawksbill turtle and Hawaiian monk seal has been considered.

A summary of coordination and consultation with the FWS and the NMFS regarding listed endangered or threatened species is presented below.

NMFS prepared a Biological Opinion dated July 23, 1990, which concluded that the proposed activities are not likely to jeopardize the continued existence of humpback whales or green sea turtles in Hawaiian waters. Increased vessel activity associated with the expansion and operation of the harbor may adversely affect humpback whales, based on the likelihood of displacing whales from a portion of the cow/calf habitat. However, despite the potential for adding vessel traffic, the benefits of consolidating vessel activity in existing facilities and preserving nearshore cow/calf habitat in other areas of west Maui outweigh the possible adverse effects of displacement of humpback whales. NMFS believed that adverse impacts to whales from vessel traffic will be reduced compared to impacts from expected increases in vessel traffic without the project. The 1990 Biological Opinion can be found in Appendix A of the 1994 FSEIS.

NMFS determined that although the proposed action would not jeopardize the continued existence of these species, the proposed activity may result in the injury or mortality of green turtles. It established an incidental take by injury or mortality of one turtle during the course of construction. In addition, five turtles per day may be disturbed or temporarily displaced. Reasonable and prudent alternatives to minimize impacts were also provided. No incidental take for humpback whales was authorized.

Conservation recommendations provided in the 1990 Biological Opinion included: (1) the Statewide Boating Plan should be reviewed and harbor and boat ramp siting needs, as well as locations and capacities of designated mooring areas, should be revised with respect to listed species; (2) all non-permitted mooring structures in Ma'alaea should be removed; and (3) ingress/egress corridors for the expanded harbor and vessel speed limits within the cow/calf area of the bay should be developed and implemented. Although conservation measures are optional, the HED and DBOR intend to implement them.

The FWS by letter dated February 13, 1991, concurred with the HED determination that the construction and operation of the facility would not affect any listed, proposed or candidate threatened and endangered species within the FWS's jurisdiction. A copy of this letter can be found in Appendix A of the 1994 FSEIS.

Subsequent to completion of formal consultation in 1991, information came to light that an endangered hawksbill turtle nested in Ma'alaea Bay and a Hawaiian monk seal was observed basking on a beach in the vicinity of Ma'alaea Harbor. Hawksbill nesting on the beach fronting Kealia Pond National Wildlife Refuge was confirmed in July 1991 and August 1993. A pregnant female hawksbill attempting to cross the road was killed in 1993. There are no historical data to suggest that area had previously been used by this species for nesting (NMFS 1995). Known nesting sites for hawksbill turtles are on the Island of Hawaii and on Molokai, and these turtles are commonly found in proximity to these sites.

On February 8, 1993, the HED determined that because the occurrence of the hawksbill turtle and Hawaiian monk seal is so rare, that the proposed project was not like to affect these species. On February 25, 1993, NMFS concurred with the Corps determination that the proposed project is not likely to adversely affect either listed species, and that reinitiation of Section 7 consultation would not be necessary. A copy of this letter can be found in Appendix A of the 1994 FSEIS.

The FWS on December 5, 1994, reviewed information about the recent sightings of hawksbill turtles. Based on the rarity of land sightings at the Kealia Pond National Wildlife Refuge and the long distance of the sightings from the Ma'alaea Harbor, the FWS concurred with the HED determination that the proposed harbor improvements are not likely to adversely affect the hawksbill turtle on their terrestrial habitat. It also determined that formal consultation with the FWS did not need to be reinitiated. A copy of the FWS letter is included in Appendix F of this DSIIEIS.

On October 30, 1995, the NMFS stated that at least one or two hawksbill turtles may be present in Ma'alaea Bay during the nesting season and that adverse effects from construction could occur. Impacts could include disturbance, injury and mortality from blasting, similar to those evaluated for green sea turtles. A revised Incidental Take Statement was provided to supplement the July 23, 1990 Biological Opinion to include the hawksbill turtle. The conditions and terms of the incidental take statement allow for the incidental take of one hawksbill turtle and one green sea turtle during the course of construction. Also, five turtles per day of either species may be disturbed or temporarily displaced. A copy of NMFS letter and revised incidental take statement are included in Appendix F of this DSIIEIS.

The measures identified in the Incidental Take Statement to reduce the potential for injury and mortality to the listed turtles will be implemented in conjunction with the construction of the proposed project. Measures include: (1) blasting is restricted to the months of June through November; (2) NMFS will be notified 10 days before blasting in order to monitor blasting activities; (3) blast sites will be monitored by boats and divers to ensure the area is clear of marine mammals and turtles before blasting occurs; (4) consultation regarding charge size will occur with NMFS and the HED; (5) any disturbance or injury to listed species will be reported to NMFS within 24 hours; and (6) a report summarizing monitoring information will be submitted to NMFS.

NMFS October 30, 1995 letter also clarified a statement in the July 23, 1990 Biological Opinion about potential impacts to humpback whales. It stated that its primary concern regarding construction impacts was the effect of blasting and potential for injury and disturbance to humpback whales during the winter whale season. If dredging, filling, and construction of revetments are conducted with reasonable care, these activities could result in some adverse effects, but not likely significant enough to result in a "take". No incidental take provisions were provided for the humpback whale.

Federally protected species are included in Coastal Zone Management (CZM) Program objectives associated with coastal ecosystems. The CZM objective is to protect valuable coastal ecosystems from disruption and minimize adverse impacts on all coastal ecosystems. Based upon NMFS statement that "the project will help reduce the number of illegal moorings and consolidate vessel traffic so that adverse impacts to whales from vessel traffic will be reduced compared to impacts from expected increases in vessel traffic without the project", the CZM mitigation team predicted that "implementation of the harbor improvement project with the mitigation measures proposed by NMFS will promote rather than hinder the CZM Program's coastal ecosystems objective and policies." (Hawaii DLNR et al 1996).

Hawaiian Islands Humpback Whale National Marine Sanctuary. The Sanctuary implementing regulations rely heavily upon existing Federal, State and local laws and regulations to protect humpback whales. To provide supplemental protection, the Sanctuary has adopted existing NMFS humpback whale take and approach restrictions as Sanctuary regulations. To supplement and complement existing Federal and State regulations that address water quality and activities which would alter the seabed, the Sanctuary regulations prohibit any activity requiring a Federal or State permit or other authorization to be conducted without such permit or in violation of the permit. The proposed harbor project would be constructed and operated after issuance of required permits and authorizations, and would therefore be in compliance with the regulations of the Sanctuary.

5.9 CULTURAL RESOURCES

Information regarding the cultural history of the project area can be found in Section 4.11 and Appendix H of the 1994 FSEIS. The State of Hawaii Historic Preservation Officer concurred with the Corps' determination of "no effect" to cultural resources by letters dated November 17, 1989 and January 6, 1993 (see Appendixes A and C (p. C-21) of the 1994 FSEIS). In addition, in October 1997 approximately 60 letters were sent to Hawaiian organizations, knowledgeable individuals and the Office of Hawaiian Affairs (OHA) requesting information about the project site. As of May 6, 1998 only the Office of Hawaiian Affairs has replied to this request. Copies of letters sent to OHA and the other addressees as well as the mailing list are located in Appendix J. Implementation of the harbor improvement project is not expected to result in any restriction of Native Hawaiian gathering rights.

5.10 RECREATION

5.10.1 SURF SITES

A detailed analysis of expected impacts to surf sites is included in Appendix E of the 1994 FSEIS. However, the proposed project has been modified to avoid or minimize these impacts; therefore, some of the conclusions from that analysis have been revised. The anticipated impacts to surf sites, with the planned project modifications, are addressed below.

5.10.1.1 Alternative 1 - The proposed project, as modified, eliminates the previously identified impacts to Buzz's No. 1 and Buzz's No. 2 surf sites. Prior to the design modification, the south revetted mole extended seaward approximately 150 feet into Buzz's No. 2. By redesigning the toe of the revetted mole so that it is within 100 feet of the existing structure, development is limited to an area out of the Buzz's No. 2 riding area. The revetted mole would also be tapered to add additional maneuvering area for surfers. The previously identified impacts to Buzz's No. 1 have been eliminated by constructing the south breakwater extension with a single layer of concrete armor units (core-loc) instead of with multiple layers of concrete armor units (dolos). The Off-the-Wall site will still be lost. The Ma'alaea Pipeline would not be affected.

5.10.1.2 Alternative 2 - Design modifications similar to those with Alternative 1 could also be implemented with this alternative to reduce or eliminate previously identified impacts to Buzz's No. 1 and Buzz's No. 2. The site known as Off-the-Wall would still be lost. The Ma'alaea Pipeline would not be affected.

5.10.1.3 Alternative 3 - The Off-the-Wall site would be lost and Buzz's No. 1 and a portion of Buzz's No. 2 would be modified by the proposed detached breakwater. The Ma'alaea Pipeline would not be affected.

5.10.1.4 Alternative 4 - Buzz's No. 2 would be completely lost, and Buzz's No. 3 essentially lost by the new entrance channel and close boat traffic. Off-the-Wall and Buzz's No. 1 sites would be modified. The Ma'alaea Pipeline would not be affected.

5.10.1.5 Alternative 6 - No surfing sites would be affected.

Measures to mitigate for unavoidable effects to surf sites with the proposed alternative include: (1) amenities including easier access to the water via the east mole, as well as showers at the east and south moles will be provided for surfers; and (2) increased and diverse recreational opportunities for sport fishing, whale watching, diving, and snorkeling will also provide recreational mitigation for the loss of surfing opportunities. Replacement of the Off-the-Wall surf site is not recommended, since it would require modification of the sea bottom and result in adverse impacts to the marine ecosystem.

5.10.2 BOATING AND NAVIGATION

Alternatives 1, 2, 3, and 4 would allow approximately 125 additional vessels to be accommodated within the harbor. Of these, it is expected that 62 would be recreational, 39 would be for commercial (occupational) fishing and 24 would be commercial passenger. The eastern portion of the harbor, which is now unusable for berthing purposes, could be fully utilized.

Alternative 6 would allow for the addition of approximately 33 additional vessels. Of these it is expected that about 19 would be recreational, 9 would be for commercial (occupational) fishing, and 5 would be commercial passenger. The eastern portion of the harbor still be unsuitable for berthing purposes, and would make up a large portion of the entrance channel.

All alternatives would meet the HED criteria for reducing the percent occurrence of wave heights within the entrance channel and berthing areas, and would fulfill the stated project purpose of reducing surge within the harbor berthing areas.

Although the conclusions of the Wave Response Studies (Lillycrop et al 1993; Thompson and Hadley 1994) showed that the existing harbor configuration and Alternative 6 both met the threshold for wave heights in the entrance channel, that study did not investigate the unsafe conditions associated with navigating in a "following sea". An updated study (Hadley et al. 1997) did evaluate effects on navigation safety with respect to the "following sea" condition (waves traveling in the same direction as the vessel). When the wave length exceeds one half the length of the vessel ($1/2L_s$) and wave speed exceeds the vessel speed, the vessel will experience a loss of maneuverability.

Navigation conditions into the harbor would be safer with Alternatives 1, 2, and 3. The orientation of the south breakwater extension would allow vessels to enter the entrance channel and be protected from a "following sea" condition. Alternatives 1, 2, and 3, would provide protection for a vessel approaching the entrance to the channel. A vessel should be able to approach the breakwater with sufficient speed to maintain rudder control and then, when it moves into the protection of the breakwater, reduce speed and enter the harbor at no-wake speed with full control for a wide range of wave conditions (US Army Engineer Waterways Experiment Station 1996). Because of the orientation of the breakwater in Alternative 4, vessels should also be able to approach with sufficient speed to maintain rudder control until within the protection of the breakwater.

Navigation conditions in the entrance channel would be more hazardous than are currently experienced with Alternative 6, not because of wave heights, but because of the orientation of the entrance channel with respect to southerly wave direction. Placement of the interior mole along the entrance channel, without providing any protection from the southerly waves, would create a "following sea" condition that would be extremely hazardous. Because of the orientation of the entrance channel for Alternative 6, it does not provide any protection to the harbor entrance from waves coming out of the south, since the waves would be expected to move along the interior mole, creating a following wave environment. Hadley et al. (1997) found that 100 percent of the wave conditions in the entrance channel for Alternative 6 would give wave lengths longer than ½ the length of the vessels using the channel. Because vessels entering the channel would always be traveling at slow (no-wake) speeds, and the wave lengths exceed the $1/2L_s$ threshold for the existing southerly wave conditions at the harbor site nearly 100 percent of the time, vessels would be routinely subjected to extremely hazardous navigation conditions.

Construction of the harbor improvements is not expected to significantly restrict the boating community. Overall, both commercial and recreational boating would benefit from the expanded harbor facilities, improved navigation conditions, and enhanced shoreside amenities and support facilities.

5.11 FISHING

There are currently 13 commercial (occupational) fishermen now operating out of Ma'alaea Harbor. The waiting list contains 39 commercial (occupational) fishermen who are expected to get a slip. Twenty-nine of the 39 commercial (occupational) fishermen have ongoing operations from the harbor. Full-time commercial (occupational) fishermen go out approximately 200 times per year and part-time fishermen go out about 100 times per year. Part-time fishermen make up about 66 percent of all the fishermen using the boat ramp. It is assumed that most commercial (occupational) fishermen stay within 20 miles of the Maui County area. Over 3/4 of the catch in 1980-1990 was landed within 20 miles (NMFS 1997).

With Alternatives 1 through 4, an additional 10 commercial (occupational) fishermen would conduct operations out of Ma'alaea Harbor. It is anticipated that three new full-time and seven new part-time fishermen would operate. This corresponds to approximately 600 new trips attributable to full-time and 700 new trips attributable to part-time commercial (occupational) fishermen, for a total of 1,300 additional boat trips per year.

The additional 10 commercial (occupational) fishermen, from 487 to 497, would be an increase of 2 percent in the Statewide total average number of commercial (occupational) fishermen, and an increase of 6 percent (from 179 to 189) in the number from Maui County. Total average annual catch for the State would be expected to increase by 35,300 pounds (2 percent increase) and by 21,230 pounds (6 percent increase) for Maui County.

With Alternative 6, an additional 9 commercial (occupational) fishermen would conduct operations out of Ma'alaea Harbor. Six of these boats are already engaged in commercial fishing. Three of the vessels obtaining berths will begin commercial fishing operations. Of these 1 is assumed to be full-time and 2 part-time. This corresponds to approximately 200 new trips attributable to full-time and 200 new trips attributable to part time commercial (occupational) fishermen, for a total of 400 additional boat trips per year.

An additional 3 commercial (occupational) fishermen, from 487 to 490, would be an increase of about 0.6 percent in the Statewide total average number of commercial (occupational) fishermen, and an increase of about 1.7 percent (from 179 to 182) in the number from Maui County. Total average annual catch for the State would increase by 10,590 pounds (0.6 percent increase) and by 7,629 pounds (1.7 percent increase) for Maui County.

With respect to the Molokini Atoll Marine Life Conservation District, the DLNR Aquatic Resources Division has established a limit on the number of commercial permits allowed for the use of Molokini to ensure that increased boating activity will not place excessive pressures on the Conservation District.

Because the Penguin bank, Maui, Molokai and Lanai fishing areas appears to have experienced a decline in the fish populations over the last 40-50 years (NMFS 1997), additional fishing pressure could result in a further decline. The effects would be similar for Alternatives 1, 2, 3, and 4, and would be expected to be of lesser magnitude for Alternative 6. Bottomfishing regulations being proposed by the DLNR are intended to increase the stock of bottomfish.

Harvesting of edible algae from the seaward faces of the east and south breakwaters would not be adversely affected after completion of construction.

5.12 TRAFFIC

As presented in Section 5.13 and Appendix D of the 1994 FSEIS, the traffic impact study (Parsons Brinkerhoff Quade & Douglas 1994a; 1994b) estimated that the projected p.m. peak hour traffic increase for the alternatives which provide an additional 125 berths (Alternatives 1, 2, 3, and 4) would be 125 vehicles, which is about 5 percent of the projected peak hour count of 2,360 vehicles for Honoapiilani Highway. Traffic increase due to Alternative 6 would be an additional 33 vehicles, which is about 1.3 percent of the projected peak hour count. A summary of the traffic impacts that would be attributable to the proposed project follows:

The effects of the proposed harbor expansion would result in a decrease in the level of service for traffic exiting the harbor during the p.m. peak hour at all three unsignalized intersections. Traffic exiting the harbor during the p.m. peak hour would experience long traffic delays at the Old Ma'alaea Road (south) intersection with Honoapiilani Highway; very long traffic delays at the Old Ma'alaea Road (north) intersection with the highway; and extreme delays and severe congestion at the Intersection of Ma'alaea Wharf Access Road and Honoapiilani Highway. Levels of service (LOS) along Honoapiilani Highway itself would not change from the projected LOS E during the a.m. peak hour and LOS F during the p.m. peak hour.

The Maui Ocean Center recently constructed adjacent to the harbor has since constructed improvements to Honoapiilani Highway as well as a new entrance with a traffic signal to alleviate traffic problems.

Mitigation proposed for the project include a left-turn storage lane and traffic signals at the intersection of Honoapiilani Highway/Old Ma'alaea Road; acceleration and deceleration lanes on Honoapiilani Highway; and separate right- and left-turn lanes on Old Ma'alaea Road. For any of these measures that are not already constructed in conjunction with nearby development, the State would provide the remaining measures in conjunction with its portion of the proposed project. With these mitigative actions the Levels of Service would be improved over the projected project effects, as well as over the existing conditions.

With the mitigation planned for the project, the improvements already completed by the Maui Ocean Center, and the widening of Honoapiilani Highway planned by the State Department of Transportation, the traffic increase resulting from the harbor project would have negligible effects.

5.13 THE RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS, POLICIES, AND CONTROLS FOR THE AFFECTED AREA

There would be no deviation from the present land use as a result of any of the alternatives. Although the area immediately west of the harbor is shown as a park in the Kihei-Makena Community Plan, it is part of Ma'alaea Harbor, and is not under the control of Maui County for land use designation. This area is intended to be eventually used for harbor parking. The parking area would be designed to incorporate green areas and simple recreational facilities.

The small sand beach in the northeastern corner of the harbor would be lost with any of the alternatives. The beach is not suitable, nor is it safe, for use as a public beach. Therefore, the loss of the beach would not be in conflict with its intended uses.

The Hawaii DLNR, Board of Land and Natural Resources issued a Conservation District Use permit on October 28, 1994.

The proposed action has received a determination of consistency with Hawaii's Coastal Zone Management Program (Hawaii DBET 1996).

Construction of the proposed project, as modified, and with mitigation as identified in the Final Mitigation Plan, provides showers for surfers on the south and east breakwaters and provides better access to surf sites from both breakwaters. This would further CZM program's recreational resources objective to provide an adequate supply of shoreline parks and other recreational facilities suitable for public recreation and would encourage expanded public recreational use of County, State and Federally owned or controlled shoreline lands having recreational value. The harbor improvements would enhance coastal resources uniquely suited for recreational activities that cannot be provided in other areas.

The addition to the existing artificial reef would replace fishery, turtle and coral habitat lost at the project with habitat at the artificial reef. The project would be consistent with the CZM policy to minimize disruption or degradation of coastal water ecosystems by effective regulation of land and water uses, recognizing competing water needs. The proposed cleanup of *Hypnea* would serve to preserve valuable coastal ecosystems by providing sites where native seaweed species could flourish and support foraging by sea turtles. This would also serve to improve off-shore water quality. The mitigation plans for water quality effects would serve to minimize adverse impacts on all coastal ecosystems; improve the technical basis for natural resources management; and promote water quality and quality planning and management practices which reflect the tolerance of marine ecosystems, and prohibit land and water uses which violate state water quality standards. The proposed project would also be consistent with economic uses objective and policies.

The proposed project is consistent with the goals, objectives, and policies contained within the Kihei-Makena Community Plan and the Maui County General Plan. DBOR is seeking a confirmation from the County of Maui that an SMA is not required for this project. DBOR is further consulting with the County of Maui Planning Department to determine whether land side work consisting of connecting the breakwater improvements and center mole to the shoreline within the harbor will require a shoreline setback variance permit or any other County authorization.

The proposed action is consistent with the Hawaiian Islands Humpback Whale National Marine Sanctuary policies, goals, and objectives. The project is not likely to jeopardize the continued existence of the humpback whale and measures to protect whales from disturbance and injury would be taken during construction activities. It is consistent with the policies and objectives of the CZMA regarding coastal ecosystems and threatened and endangered species. It would help consolidate vessel traffic so that adverse impacts from expected increases in vessel traffic would be reduced compared to impacts from expected increases in vessel traffic without the project. It allows human uses of the Sanctuary consistent with the primary purposes of the Sanctuary. The proposed project complies with the Sanctuary implementing regulations, which prohibits construction activities without required Federal and State authorizations.

The proposed action is consistent with the Molokini Shoal Marine Life District's policies, goals, and objectives.

The proposed action will not adversely affect access to the harbor or any shoreline areas.

5.14 SOCIOECONOMICS

For the purposes of performing the economic analysis, the following assumptions were made. Of the new slips to be provided 36 will be 25-foot slips, 48 will be 30-foot slips, 33 will be 35-foot slips, 74 will be 40-foot slips, 28 will be 50-foot slips, and 1 will be 100-feet long. It was assumed that new permits for the harbor would be given out based on the vessels size, then its position on the waiting list.

It is assumed that only 214 vessels will go into the new 220-slip harbor, because large-sized vessels currently take up more than one slip. Of the 214 vessels; it is assumed that all vessels in the existing harbor will be accommodated in the new harbor. With the assumptions as stated above, an additional 125 vessels would be accommodated in the new harbor. Of these, 62 would be recreational, 39 would be commercial (occupational) fishing, and 24 would be commercial passenger. This corresponds to a 126 percent increase in recreational vessels, a 300 percent increase in commercial (occupational) fishing vessels, and a 89 percent increase in commercial passenger vessels, with an overall increase of 140 percent in vessels utilizing the harbor.

For Alternatives 1 through 4, total savings for the commercial (occupational) fishermen on the waiting list moving into the harbor are estimated at $137,380. This includes savings in time, reduced towing vehicle purchases and reduced fuel costs. Added costs are approximately $41,410 for slip rental. Total benefits were therefore estimated to be $95,970.

The estimated number of passengers accommodated on the 24 new commercial boats is approximately 566 passengers per day. The Unit Day Value method was used to calculate the recreational benefits generated by the expanded harbor, and are estimated to be $1.92 million. This method assigns a value to the recreational experience of each user, based on the characteristics of the facility being analyzed. The value assigned for this analysis was approximately $13.00 per passenger.

For Alternative 6, total savings for the commercial (occupational) fishermen on the waiting list moving into the harbor are estimated at $27,800. This includes savings in time, reduced towing vehicle purchases and reduced fuel costs. Added costs are approximately $8,700 for slip rental. Total benefits were therefore estimated to be $19,100.

The estimated number of passengers accommodated on the 5 new commercial boats is approximately 98 passengers per day. The Unit Day Value method was used to calculate the recreational benefits generated by the expanded harbor, and are estimated to be $332,000. This method assigns a value to the recreational experience of each user, based on the characteristics of the facility being analyzed. The value assigned for this analysis was approximately $13.00 per passenger.

The increased number of boats will generate a demand for increased water and electricity use. At the present time the harbor uses a total of about 621,000 gallons of water per month, for an average of 7,000 gallons per vessel per month. For Alternatives 1 through 4, assuming 125 new vessels enter the harbor and the per boat water consumption remains about the same, the harbor would require an additional 875,000 gallons per month. For Alternative 6, approximately 231,000 gallons per month of additional water supply would be needed. The Maui Board of Water Supply has indicated new sources may need to be developed to meet such a demand.

Maui Electric Company is presently in the final stages of planning for a new electrical generating unit at Ma'alaea. Construction is expected to start about November 1998. This will initially be a 20-megawatt unit, expandable to 56 megawatts (Ratte 1998). This new generating unit would be on-line well before the increase in the number of boats and is capable of supplying the harbor's increased electrical needs.

5.15 Irreversible and Irretrievable Commitments of Resources

The proposed action (Alternative 1) would result in the modification of about 11.89 acres of benthic marine habitat, including the loss of approximately 4.8 acres of existing coral reef. This loss would be partially offset by the creation of 1.5 acres of new marine habitat in the form of stone revetments and additions of about 3.3 acres to the State's existing artificial reef, but would still result in the net loss of coral reef. There would be some alteration of the existing water circulation patterns.

In order to construct access to the east breakwater, all or portions of the small beach would be developed into a roadway. The surf site known as "Off-the-Wall" would be lost as a result of the construction of the new entrance channel.

Pursuant to the Endangered Species Act, the NMFS developed a Statement Regarding Incidental Take which allows the injury or death of one green sea turtle and one hawksbill turtle during the course of construction of the project. In addition, NMFS has determined that five turtles of either species may be disturbed or displaced each day during the construction activities. However, the implementation of the measures NMFS has recommended during construction of the project should prevent such injury or loss, and minimize any disruption or displacement. See mitigation measures in Section 5.18.4

The proposed action would involve the irreversible and irretrievable use of human labor and a nonrenewable energy source (equipment fuel).

The harbor expansion would increase vessel traffic in the Ma'alaea Bay area.

5.16 The Relationship Between Local Short-Term Uses of the Human Environment and the Maintenance and Enhancement of Long-term Productivity

The expansion of an existing harbor and the resulting increases in land and sea traffic would meet the needs of the local community, while avoiding the development of new harbors with their associated environmental effects. Utilizing an existing harbor for needed facilities would limit adverse effects to an already-developed area, whereas the creation of new harbors to meet commercial and recreation needs would spread adverse impacts over a larger area.

As recommended by the NMFS in their Biological Opinion, review and revision of the State Boating Plan to avoid impacts to listed species would focus development of future harbor/boat ramp facilities at existing facilities.

The adverse effects associated with improvements and expansion at Ma'alaea Harbor would be offset by the recommended mitigation and leaving other marine ecosystems around Maui undeveloped.

5.17 ADVERSE EFFECTS WHICH CANNOT BE AVOIDED

Although silt curtains or other silt containment devices would be used during dredging, blasting, and filling operations to minimize water quality impacts and associated effects to aquatic life, there would be localized temporary adverse effects on the aquatic ecosystem as a result of increased turbidity during construction.

The water quality of the harbor may continue to degrade as a result of increased inland development unrelated to the proposed project. The increased vessel traffic anticipated as a result of the harbor improvements may contribute to turbidity in the harbor. However, because of the decreasing agricultural use of the upland lands in favor of developed areas, sediment inputs would likely to be decreased. In addition, the input of chemicals for agricultural purposes would decrease, possibly offsetting chemical inputs from urban development.

Depending upon alternative, between 8.54 and 18.59 acres of marine benthic habitat would be filled or dredged to create structures. This would include the unavoidable loss of up to 4.8 acres of coral reef. This loss would be partially offset by the creation of new marine habitat in the form of stone revetments, new dredged channel slopes, and additions to an existing artificial reef, but would still result in a net loss of coral reef.

A small sandy beach within the harbor would be lost by the construction of a road to the east breakwater.

The surf site known as "Off-the-Wall" would be lost.

5.18 MITIGATION FOR UNAVOIDABLE ADVERSE IMPACTS

During construction of both the Federal and State of Hawaii portions of the proposed project, the construction contractor would be required to adhere to applicable Federal, State and local environmental protection regulations. For the Federal portion of the project, the contractor would be required to develop and implement an environmental protection plan, which would detail the measures to be used to comply with these regulations and with the conditions set forth in the construction plans and specifications. The environmental protection plan would include details of how marine resources will be protected from direct and secondary effects of construction.

The unavoidable impacts of the proposed action would be mitigated as follows:

5.18.1 AIR QUALITY AND NOISE.

The construction contractor would be required to comply with all applicable Federal, State, and local regulations regarding these resources.

5.18.2 WATER QUALITY

Silt curtains and other means will be directed by the HED to confine suspended sediments during dredging of the entrance channel and construction of project features. Construction practices will be employed to prevent persistent turbidity and excessive transport into areas of living corals.

Fill materials would be free of pollutants, and no contamination should result from construction activities. A contingency plan for containing and controlling accidental spills of petroleum products at the construction site, including storing absorbent pads and containment booms on site to facilitate the cleanup of such spills, would be developed.

The contractor's environmental protection plan would contain the following measures: (1) lumber or other construction materials treated with creosote or other preservative substances will not be permitted to contact the water until after at least 1 week of drying; (2) construction materials, petroleum products, human wastes, debris, and landscaping substances (herbicides, fertilizers, pesticides) will not be permitted to fall, flow or leach into the ocean; and (3) construction and fabrication of dock assemblies, etc., will take place insofar as possible on fast land.

Water quality would be monitored during construction and after construction.

All dredged spoil temporarily stored at the project site would be placed behind watertight berms above the influence of the tides. No dredged spoil will be stockpiled in the marine environment. All construction-related materials would be placed or stored in ways to avoid or minimize disturbance to the reef, with the exception of the construction footprint.

Fills would be protected from erosion with armor stone as soon as practicable after placement to avoid additional effects of suspended sediments in the water column.

With the exception of design modifications made to avoid and minimize environmental impacts, breakwaters and revetments would be constructed of large boulders and/or core-locs to dissipate wave energy and resist erosion.

The State of Hawaii DLNR, Division of Boating and Ocean Recreation (DBOR) and Division of Aquatic Resources (DAR) would implement a shoreline cleanup of *Hypnea musciformis* in and adjacent to the harbor utilizing private and public resources.

The DLNR, DAR, would design, fund, and supervise field work and development of a predictive geographic model to forecast potential changes in sediment transport and water quality in response to changes in coastal topography and various terrigenous inputs. The study would encompass the greater Ma'alaea-Kihei coast. HED would contribute to this effort by supplying historical and recent data on existing models, current regimes and water quality in the area

The State of Hawaii DOH is expected to impose the following conditions as part of its 401 Water Quality Certification for the project (see working draft of WQC in Appendix H). The HED will:

- Submit the contractor's Environmental Protection Plan to DOH for review.

- Submit the Coral Mitigation Plan to DOH.

- Invite DOH to attend the pre-construction meeting, partnering meetings and other similar meetings.

- Require the construction contractor to comply with the contract environmental specifications, etc.

- Conduct water quality monitoring.

- Ensure silt containment is properly deployed.

- Ensure that all materials placed in the water are free of material potentially hazardous to marine life.

• Ensure construction debris is contained and prevented from entering or reentering the water.

• Report any spills or other contamination to DOH promptly.

• Discontinue work during flood conditions.

• Minimize clearing and grubbing activities to those absolutely necessary.

• Remove all temporarily constructed facilities or structures, including silt containment, immediately after completion of work in the water and ensure that water quality has returned to its pre-construction condition.

5.18.3 Aquatic Resources

Construction of the new portions of the breakwaters and revetted moles would provide partial replacement of habitat lost by providing increased vertical habitat.

The measures identified to protect water quality and threatened and endangered species would also protect other aquatic resources. As identified in the mitigation plan, HED, by contract with the University of Hawaii, performed a baseline assessment to quantify coral coverage and potential sites for coral transplantation or other appropriate mitigation. Coral transplantation was determined to be not feasible for several reasons. Coral inside the harbor have adapted to a low motion water regime and would not survive relocation to higher motion regimes on the outside of the harbor. Corals outside the harbor are too large or encrusting and cannot be readily fragmented into smaller moveable pieces. In order to mitigate for the net loss of habitat, additions to the existing artificial reef would be made. Jokiel and Brown (1998) suggest that construction of artificial reefs is the most attractive and cost-effective option. They estimated that an artificial reef equivalent to about 3.3 acres would be required.

The Hawaii DLNR, DAR, would design a field study to evaluate Ma'alaea Bay's uniqueness in terms of flora and fauna.

5.18.4 Endangered and Threatened Species

To avoid adverse effects on the humpback whale, green sea turtle, hawksbill sea turtle, and Hawaiian Monk seal, the following measures would be adhered to:

• If blasting is required the contractor would be required to prepare a blasting plan, to be developed in coordination with and approved by the HED and NMFS. The plan would include the measures to be implemented to protect sea turtles and marine mammals from the adverse effects of blasting. A survey and monitoring methodology shall be included to ensure that blast-affected areas are clear of these animals before blasting occurs.

• Blasting would be restricted to the months of June through November, to the extent possible. Necessary blasting would be confined to small charges, and sound suppressing measures such as bubble curtains or heavy tamping would be employed, as well as other measures to reduce the effects of blasting on marine animals. Shaped or directional charges should be used to minimize impacts on marine organisms. Charge size would be limited to the smallest practicable for each shot, and explosives would be placed in drilled holes to reduce blast damage. Maximum charge size would be determined for each activity allowed through consultation with the HED, NMFS, and Hawaii DBOR.

• If blasting is required, the Contractor will be required to conduct a survey for turtles and marine mammals in the vicinity. Blast sites must be monitored and surveyed by small boats and divers and considered to be clear of these animals before blasting can occur.

• NMFS will be notified at least 10 days before initiation of blasting activities, so NMFS personnel can monitor construction activities.

• Any incidents of disturbance or injury/mortality to listed species will be reported to NMFS within 24 hours of occurrence.

• A final report summarizing information gathered regarding listed species during monitoring of the project site will be submitted to NMFS within 30 days after the completion of the project.

• The Hawaii DLNR would designate one or more mooring areas in Ma'alaea Bay and would cause all vessels moored in Ma'alaea Bay to move into the harbor or designated mooring areas (there are presently no designated mooring areas for the Island of Maui).

• DBOR, NMFS, and HED will consult with the U.S. Coast Guard to develop and implement ingress and egress corridors for the expanded harbor. Vessel speed limits within the cow/calf area of Ma'alaea Bay would be evaluated and implemented upon the recommendation of NMFS.

• The Hawaii DLNR, in consultation with the HED and NMFS, would review the State Boating Plan for current and future harbor and boat ramp needs, as well as the locations and capacities of designated mooring areas with respect to their potential impact on listed species. These plans would be revised to avoid adverse impacts to listed species.

5.18.5 SURF SITES

Design modifications were made to the proposed project to avoid as much as possible impacts to surf sites. These include tapering the south revetted mole from Sta. 0+00 to its full width at about Sta. 3+70. Instead of multiple layers of concrete armor units (dolos), a single layer of concrete armor units (core-loc) would be used on the south breakwater extension. In addition, the seaward extension of the revetted mole at the base of the breakwater extension would be maintained within 100 feet of the existing structure.

DBOR would provide better access for surfers to the water from the east mole. In addition, showers would be provided on both the south and east moles for the use of surfers.

5.18.6 TRAFFIC

If the Hawaii DOT or others have not made improvements to the intersections of Honoapiilani Highway and access roads to Ma'alaea Harbor when the proposed project is constructed, the DBOR would provide interim improvements which consist of: left-turn storage, acceleration and deceleration lanes on Honoapiilani Highway; separate right- and left-turn lanes on Old Ma'alaea Road; and installation of traffic signals at the intersection of the highway and Old Ma'alaea Road.

The DOT recommended that conduits for traffic signals be installed as part of required intersection improvements. In addition, it recommended that DBOR conduct and submit periodic traffic signal warrant studies.

Construction plans for work within the State highway right-of-way would be provided to the Hawaii DOT.

5.19 CUMULATIVE IMPACTS

5.19.1 DEFINITION.

Cumulative impact is the impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions (40 CFR 1508.7). The impacts reported elsewhere in this document constitute the incremental impact of this project when added to all the actions in the past and present. The following paragraphs discuss future actions.

5.19.2 REASONABLY FORESEEABLE FUTURE ACTIONS

The following developments which are reasonably foreseeable were considered in the analysis of cumulative impacts.

- Maui Ocean Center
- Ma'alaea Generating Unit (new electric plant)
- Ma'alaea Village Project District
- Ma'alaea Mauka Project District
- DLNR Division of Aquatic Resources plans
- DLNR Division of Boating and Ocean Recreation and DOT Division of Highways plans for Honoapiilani Highway

5.19.3 FUTURE CONDITIONS WITHOUT THE PROPOSED PROJECT

Maui Ocean Center. The Maui Ocean Center/Ma'alaea Triangle is a large aquarium and shopping complex immediately adjacent to Ma'alaea Harbor. The triangle is 18.5 acres in size, and the land was previously used for sugar cane cultivation. Three acres will be left in open space. The anticipated average daily water demand for the proposed development is 90,000 gallons per day. A package sewage treatment facility would be located at the northern portion of the development area to treat the estimated 60,000 gallons per day of wastewater. Effluent would be used for landscape irrigation or be discharged into seepage/leach fields. Offsite runoff would continue to be directed into Ma'alaea Harbor. Onsite runoff is calculated to be 14.5 cfs and will increase to 44.4 cfs. The majority of the onsite surface runoff will be conveyed to new subsurface detention/sedimentation facilities which will temporarily store and slowly release the water into deep soils. Some runoff would be directed to existing drainage channels. Construction is complete for the Maui Ocean Center; it opened in March 1998. The Center uses a flow-through seawater system, with the intake outside Ma'alaea Harbor and the discharge through an existing drainage ditch which empties into the Harbor. Flow is about one million gallons per day. Water quality modeling conducted for the Maui Ocean Center indicated that water quality is significantly improved in the immediate vicinity of the discharge, and that aquarium water accumulating in the harbor improves flushing slightly.

The Center is expected to generate 143 vehicle trips entering and 85 leaving the Center during the morning peak hour and 471 trips entering and leaving during the afternoon peak hour. Traffic projections for the Center were included in the traffic study for the harbor contained in Appendix D of the 1994 FSEIS. In addition to the improvements already made, several traffic improvements are planned, including traffic signals, construction of turning lanes, and highway widening.

Ma'alaea Generating Unit. The Ma'alaea Generating Unit is a new electric generating facility to be located east of Ma'alaea Harbor. Construction is expected to begin in November 1998. The facility will initially have one 20-megawatt generator, but as demand increases a second 20-megawatt generator will be added and a waste heat turbine which will bring the capacity to 56-megawatts.

Ma'alaea Village Project District is a planned residential development of approximately 650 acres immediately east of the harbor complex (A&B Properties, Inc. 1996). Approximately 1,500-2,000 residential units would be developed over a 15-20 year period, along with a golf course, community parks and open space systems and a wastewater treatment infrastructure. The average density would be 2.3 to 3 units per acre. About 290 acres of integrated open space is planned. About 52 acres of park would be provided, 38 acres of that along the coastline of Ma'alaea Bay to Kihei, and pedestrian and bike trails are also planned. The golf course would be irrigated with wastewater effluent. The golf course and related open space buffers will be designed to be integrated with overall drainage requirements and provide retention areas to protect Ma'alaea Bay's nearshore water quality. Along Ma'alaea Bay, the existing ½-acre beach park would be expanded to approximately 16 acres and would be a buffer for the Kealia Pond National Wildlife Refuge Area. The Maui County Council has approved including this project in the Kihei-Makena Community Plan, but no other approvals have been given. It is estimated that construction could not begin for 5-10 years, and will be dependent upon demand for housing. There is not enough information available to determine impacts, but it is likely that there will be a considerable increase in vehicle traffic.

Ma'alaea Mauka Project District is a planned residential development of about 260 acres on the upland side of Honoapiilani Highway, extending from the western portion of Ma'alaea Harbor east to slightly past North Kihei Road (C. Brewer Homes, Inc. 1997). The project would consist of about 1,150 housing units, community center, and park and open space. The overall density proposed is 4.4 units per acre. The community would be designed to provide open space buffers along Honoapiilani Highway. The Maui County Council has approved including this project in the Kihei-Makena Community Plan, but no other approvals have been given. It is estimated that construction could not begin for 6-8 years or longer, and will be dependent upon demand for housing. There is not enough information available to determine impacts, but it is likely that there will be a considerable increase in vehicle traffic.

Day Use Mooring Rules/Bottomfish Management. DLNR Division of Aquatic Resources (DAR) has developed day use mooring rules, adopted as Chapter 13-257, Hawaii Administrative Rules on September 5, 1995. The purpose of the day use mooring rules is to reduce damage to coral and other marine life as a result of repeated use of anchors by commercial and recreational vessels in zones of high dive and mooring activity Statewide. These rules establish, among other provisions, restrictions in the use of Molokini, requiring commercial vessels to have a permit to moor at Molokini. At present there are 42 permits, and DAR has no plans to issue more.

DAR is also developing plans for bottomfish management, and has held more than 35 public meetings since February 1995. When adopted, the rules will specify catch limits, gear restrictions and establish prohibited fishing areas to protect spawning and nursery areas.

One of the proposed project's mitigation measures to conserve threatened and endangered species is to review and revise the State Boating Plan to ensure that current and future needs and locations, as well as capacities of designed mooring areas, boat ramps, etc., would avoid any impacts to listed species. It is anticipated that the results of that revision would be to avoid and minimize adverse effects to all marine resources, including listed species.

Traffic Improvements. DLNR Division of Boating and Ocean Recreation (DBOR) and DOT Division of Highways (DH) have plans to improve Honoapiilani Highway in the vicinity of Ma'alaea Harbor. DBOR will improve access and egress at the harbor as part of the harbor infrastructure improvements to mitigate the increased vehicle traffic generated by the increased berthing. These improvements are explained in the traffic study contained in Appendix D of the 1994 FSEIS and listed in paragraph 5.12 of this document. DH has plans to improve the highway to four lanes with a median strip between North Kihei Road and Ma'alaea. This highway widening will likely be completed before harbor construction is complete.

5.19.4 INCREMENTAL IMPACT OF PROPOSED PROJECT

Cumulative effects on water quality would be both beneficial and adverse. The input of stormwater drainage to the harbor from upland areas is expected to increase in the future as more impervious surfaces are developed. However, the sediment load of that drainage is expected to decrease significantly, as more agricultural land is converted to developed, landscaped, and paved areas. Although additional harbor traffic, depending on the location and frequency, may increase turbidity, this may be offset by non-project related sediment reductions. The effects of other potential components of the increased stormwater input, such as pesticides and herbicides for landscaping purposes and other urban constituents, would likely be adverse. However, the reduction in agricultural chemical inputs may offset those adverse effects.

Incremental traffic increase from the harbor project is estimated to be less than 10 percent of the peak hour morning and afternoon traffic volume projected for year 2001. The projection includes the Maui Ocean Center/Triangle project, but not Ma'alaea Village or Ma'alaea Mauka. When (or if) these developments are completed, the increased traffic from the harbor will be an even smaller percentage of the total volume. Significant traffic improvements are planned in conjunction with these projects to ensure future development and its associated traffic increases can be accommodated.

The increased electricity demand from the completed harbor project will be an undetermined but a very small increment of the total electricity demand on the Island of Maui, and will not be a large component of the new Ma'alaea Generating Unit.

Cumulative effects on economic factors will be beneficial. Construction from several large-scale developments would generate employment opportunities. Infrastructure improvements would improve traffic circulation and drainage to the benefit of the Ma'alaea Bay area. New tax revenue sources would be generated for the State and county.

In light of the State's Day Use Mooring Rules to protect corals and other marine life, the incremental effect of the increase in vessel traffic on corals and marine life is not expected to be significant. These additional vessels using high activity areas would be required to use permanent mooring facilities.

The DLNR will continue to add to artificial reefs, increasing vertical habitat for marine life.

The incremental impact of increased fishing activity is difficult to predict because of the new bottomfishing rules being established by DAR. If the protection provided by the rules results in more fish and a return to a better catch-per-unit-effort, there may be no impact of increased fishing compared to the present. The incremental impact of the proposed action would be an estimated increase of between 0.6 and 2 percent in the statewide catch and an increase of between 1.7 and 6 percent in the annual catch for Maui County fishermen.

NMFS stated in its Biological Opinion (NMFS 1990): "Future development of new harbors and boat ramps along the west Maui coast may likely exceed the jeopardy threshold. No new moorings outside of State designated mooring areas should be authorized, and no new harbors, marinas or boat ramps should be built in west Maui." (NMFS 1990). Because of this statement, it is very unlikely that any such new facilities would be constructed in west Maui unless it is demonstrated that threatened and endangered species would not be jeopardized.

Cumulative effects to threatened and endangered aquatic life would be primarily related to increased vessel traffic. Despite the potential for adding vessel traffic, NMFS believes that the benefits of consolidating vessel activity in existing facilities and preserving nearshore humpback whale cow/calf habitat in other areas of west Maui outweigh the possible adverse effects of displacement of humpback whales. NMFS stated that adverse impacts to whales from vessel traffic will be reduced compared to impacts from expected increases in vessel traffic without the proposed action. Since ingress/egress corridors for the expanded harbor and vessel speed limits within the cow/calf area of the bay would be developed and implemented, effects of the existing and added vessel traffic on humpback whales should be reduced.

The proposed action contains a conservation measure for threatened and endangered species which calls for the State Boating Plan to be reviewed. Current and future harbor and boat ramp needs, as well as the locations and capacities of designed mooring areas, would be revised to avoid adverse impacts to listed species. NMFS stated that no new moorings outside of State designated mooring areas should be authorized, and no new harbors, marinas, or boat ramps should be built in west Maui. The reason is that future development of new harbors and boat ramps may likely exceed the jeopardy threshold for threatened and endangered species. It is unlikely that any additional facilities of this type will be developed, unless it is demonstrated that threatened and endangered species would not be jeopardized.

6 PUBLIC INVOLVEMENT AND AGENCY CONSULTATION

6.1 SCOPING

The HED utilized comments from the public as well as other State and Federal agencies to frame the scope of this Draft Supplement II EIS (DSIIEIS). A primary focus for this DSIIEIS effort was to address and respond to the comments received on the 1994 FSEIS and to further analyze specific issues that were raised. These issues include (1) the efficacy of an alternative (Alternative 6) that does not extend the existing footprint of the harbor and limits aquatic impacts to the existing harbor area; (2) potential water quality impacts; (3) potential impacts on threatened and endangered species; and (4) an update and clarification of the information on the various alternatives.

Scoping issues identified during previous EIS processes are described in detail in the 1994 FSEIS, Chapter 7, Public Involvement, Review, and Consultation.
A Notice of Intent to Prepare a Supplement II EIS was published in the Federal Register on July 9, 1997. Scoping comments in response to that notification were received from only the U. S. Environmental Protection Agency (EPA) Region IX stating that the new document contain an analysis of project impacts on water quality, endangered species, purpose and need for the project, and impacts to Clean Water Act Section 404 resources.

6.2 AGENCY COORDINATION

In addition to receiving comments from various Federal and State agencies on the 1994 FSEIS, the HED closely coordinated with the Hawaii Department of Land and Natural Resources (DLNR) throughout the process in order to obtain information regarding the status of resources, to obtain clarification on the State's proposed project and on its positions regarding project modifications, and to develop agreements to protect important resources.

HED, NMFS, and Hawaii DLNR, Divisions of Aquatic Resources and Boating and Ocean Recreation, with the assistance of the Hawaii Coastal Zone Management (CZM) Program, participated in a team to evaluate the proposed project's impacts, to develop and commit to methods to avoid and minimize those impacts, to develop feasible plans to mitigate for unavoidable adverse impacts, and to evaluate the proposed action for consistency with Hawaii's Coastal Zone Management Program. The mitigation plan was transmitted by DLNR to CZM for its determination of whether the proposed project is consistent with its Coastal Zone Management Program. The Hawaii Department of Business, Economic Development and Tourism (DBET) issued a CZM program consistency determination on September 12, 1996.

Section 7 of the Endangered Species Act requires consultation with the U.S. Fish and Wildlife Service (FWS) and NMFS when a Federal agency determines that its proposed action may adversely affect Federally-listed threatened and endangered species. The results of the consultation is presented in more detail in Section 5.8.3, and associated documents and correspondence are shown in Appendix F of the current DSIIEIS and in the 1994 FSEIS, Appendix A. The proposed action is in compliance with the Endangered Species Act.

HED applied for certification pursuant to Section 401 of the Clean Water Act from the Hawaii Department of Health on February 28, 1997. In order for the proposed action to be authorized under Section 404 of the CWA, the State must issue or waive 401 certification. The certification will list conditions that must be followed to comply with the certification.

HED and DOH held a joint public hearing in September 1997 in conjunction with pending Clean Water Act Section 404 and 401 actions.

The HED has completed the National Historic Preservation Act Section 106 process. HED has coordinated with the State Historic Preservation Officer and has obtained the SHPO's concurrence with its determination that the proposed project will have "no effect" on historic and cultural properties. In addition, in October 1997 approximately 60 letters were sent to Hawaiian organizations, knowledgeable individuals and the Office of Hawaiian Affairs (OHA) requesting information about the cultural resources of the project site. As of May 6, 1998 only the Office of Hawaiian Affairs has replied to this request. A copy of the letters sent to OHA and the other addressees as well as the mailing list is located in Appendix J.

Table 8 shows the status of compliance with applicable environmental laws and regulations.

6.3 List of Agencies/Individuals Providing Comments on 1994 Final Supplemental EIS

The following agencies and individuals submitted comments on the 1994 FSEIS. Those letters are reproduced in Appendix G, along with the HED's and DBOR's responses to those comments.

6.3.1 Federal Agencies

U.S. Department of Transportation, Coast Guard, Station Maui, Maalaea Harbor, Maui, Hawaii

U.S. Department of the Interior, Office of Secretary, Washington, D.C.
U.S. Department of the Interior, Geological Survey, Honolulu, Hawaii

6.3.2 STATE AGENCIES

Hawaii Office of the Governor, Office of State Planning
Hawaii Department of Business, Economic Development and Tourism, Land Use Commission
Hawaii Department of Defense
Hawaii Department of Health
Hawaii Department of Land and Natural Resources, Division of Water and Land Development
Hawaii Department of Transportation

6.3.3 MAUI COUNTY AGENCIES

Linda Crockett Lingle, Mayor, County of Maui
County Council Members
Department of Public Works and Waste Management
Board of Water Supply
Department of Parks and Recreation
Department of Planning

6.3.4 PRIVATE ORGANIZATIONS AND INDIVIDUALS

Paul H. Achitoff, Sierra Club Legal Defense Fund, Inc., Honolulu, Hawaii
John C. Baldwin, Makawao, Hawaii
James B. Cash, Honolulu, Hawaii
Roy S. Genatt, D.C., Wailuku, Hawaii
Issac Davis Hall, Attorney for Protect Maalaea Coalition, Wailuku, Maiu, Hawaii
Michelle C. Kremer, Coastal Issues Coordinator, Surfrider Foundation, San Clemente, California
Anthony J. Lannutti, Honolulu, Hawaii
Randy and Rosalind Mason, Honolulu, Hawaii
Jack F. Mueller, P.E., Wailuku, Hawaii
Steve Pezman, Publisher, The Surfer's Journal, San Clemente, California
Tim Slack, Kihei, Maui, Hawaii
Mark Smaalders, Resource Analyst, Sierra Club Legal Defense Fund, Inc., Honolulu, Hawaii
Steven Taussig, Haiku, Maui, Hawaii

6.4 LIST OF AGENCIES AND INDIVIDUALS RECEIVING A COPY OF THE DRAFT SUPPLEMENT II EIS

6.4.1 CONGRESSIONALS

Senator Daniel Akaka
Senator Daniel K. Inouye
Representative Neil Abercrombie
Representative Patsy Mink

6.4.2 FEDERAL AGENCIES

U.S. Department of Commerce, National Marine Fisheries Service
U.S. Department of the Interior, Office of the Secretary
U.S. Department of the Interior, Fish and Wildlife Service
U.S. Department of the Interior, Geological Survey
U.S. Deparment of Transportation, Coast Guard
U.S. Environmental Protection Agency

6.4.3 STATE AGENCIES

Governor Benjamin J. Cayetano
President of the State Senate
Senators from Maui County
Speaker of the State House
Representative from Maui County
Hawaii Office of the Governor, Office of State Planning
Hawaii Department of Business, Economic Development and Tourism, Land Use Commission
Hawaii Department of Defense
Hawaii Department of Health
Hawaii Department of Land and Natural Resources, Divison of Water and Land Development
Hawaii Department of Transportation
Hawaii Office of Environmental Quality Control
Office of Hawaiian Affairs
University of Hawaii, Environmental Center

6.4.4 COUNTY OF MAUI AGENCIES

Linda Crockett Lingle, Mayor, County of Maui
County Council Members

County of Maui, Department of Public Works and Waste Management
County of Maui, Board of Water Supply
County of Maui, Department of Parks and Recreation
County of Maui, Department of Planning

6.4.5 NATIVE HAWAIIAN ORGANIZATIONS AND INDIVIDUALS

Jimmy Cockett
Charles Maxwell, Sr.
Klope Raymond
Lori Seblas
Ahahui Ka'humano
Ahubua'a Maui Island
AluLike, Inc.
Friends of Moku'ula
Hale O Na Ali'i
Hana Canoe Club
Hana Cultural Center
Hana District Pohaku
Hawaiian Patriotic Action Association
Hawaiian Homes Commission, Maui Office
Honokohau Valley Association
Hui Aina 'O Hana
Hui Alanui 'O Makena
Hui Kalai Aina
Hui No Ke Ola Pono
Hui O Wa'a Kaulua
Hui of Hawaiians
Imi I Luko I Kou Piko Partnership
Ka Imi Na'auao O Hawaii Nei
Ka Lahi Hawai'i Maui Island
Kahana Canoe Club
Kahuna La'au Lapa'au O Maui
Kamehameha Schools/Bishop Estate, Maui Office
Keawala'i
Kula Kaiapuni
La'au Lapa'au
Lai Ula'O Kai
Lokahi Pacific
Maluhia Church
Po'okela Program
Maui Historical Society
Maui/Lana'i Islands Burial Council
Moolele
Na Hoaloha 'O Laie
Na Hoaloha Lele
Na Kai 'Ewalu
Na Keiki O Ke Kai, Inc.
Na Kupuna O Maui
Na Leo Kako'o
Na Leo O Na Kupuna
Na Mele O Maui
Na Po'e Kokua
Na Po'o Kohau
Na Pua No'eau
Napili Canoe Club
Nation of Hawaii
Office of Hawaiian Affairs
Paukukalo Community Association
Paukukalo Hawaiian Homes
Pohaku Association
Protect Kahoolawe 'Ohana
Proud Hawaiian Society
Punana
Queen Lili'uokalani Childrens Center
Waiehu Kou Hawaiian Homesteads
Waiohuli-Keokea Homesteaders
Waiola Congregational Church
West Maui Taro Growers Association

6.4.6 PRIVATE ORGANIZATIONS AND INDIVIDUALS

Paul H. Achitoff
Hans Antal

John C. Baldwin
Marc Bedard
Mac Blaker
Ben Bland, III
Brian Bludell
Chris Ann Bows
Barry Brown
Eric Brown
Lesley Ann Bruce
Ellen Bruno
Robert K. Burns
Nancy Callahan
Cosco Carlbom
James B. Cash
Scott Castil
Stephie Cawood
Gordon A. Chapman
Walter G. Chuck
Billy Choy
George Clark
Craig Comen
R. B. Coon, Jr.
J. Scott Cumming
Mike Cumming
Joe Dandrea
Douglas/Theodore Deponte
Daniel Dixon
Peter Figgis
Regina Finnegan
Chris Ford
Paul Forestell
Hugh Gallagher
Ada and Raymond Galli
Roy S. Genatt, D.C
Gene E. Guthrie
Issac Davis Hall. Esq.
Paul Hanada
Doug Harms
Skijppy Hau
Barbara and Brian Henderson
Steven Hogan
Jamie G. Hunter
N. Edward (Ted) Ion
Scott Iverson
Jill Izumigawa
Allston James
Dickston James
Grove Jeane
Scott Jenkins
Jody Jones
Jerome Kaiser
Fred Ketteman
Mary Kiehn
Laura King/Ann Nottoff
Rodney Kilborn
Donna and Jim Klingler
Ralph Kohler
Michelle C. Kremer, Surfrider Foundation
Anthony J. Lannutti
Betty J. Leggerup
Dick and Jane Lewis
Bog Liddell
Andrew L. Lissner
Bobby Luuwai
John Luuwai
Loren Malencheck
Randy and Rosalind Mason
Mark A. Massara
Craig Mathison
Al Matson
Charles K. Maxwell, Sr.
John K. McCandless III
Jeanne D. McJannet
James Medeiros
William Meyer
Gilbert J. Morales
Michael Moyers
Jack F. Mueller, P.E.
Edward Murai
Donna Neal
Al Oakey
Bert Oliveira
Rich Olson
Wendy Oram
Steve Pezman, The Surfer's Journal

Tom Pratte
Shawn Reid
Eve Samuel
Patrick L. Santos
Marjorie Schmiege
Teri Schulz
Ralph Sharpe
Seymour Shiner
Tim Slack
Marsha Smith
Mari A. Smultea
Lois H. Stark
Chris C. Svendsen
Brad Tarr
Steven Taussig
Mike Trotto
Anthony Ventura
Conrad Ventura
David Ventura, Jr.
Eric Ventura
Paul J. von Hartman
Mike Wilson
Reeve Woolpert
Wallace Yost
Life of the Land
Ma'alaea Community Association
Protect Ma'alaea Coalition
Sierra Club, Hawaii Chapter, Maui
Group
Sierra Club Legal Defense Fund, Inc.

Table 8
Compliance with Federal and State Environmental Protection Laws

Federal Statutes	Applicable	Status of Compliance
American Folklore Preservation Act	No	NA
Anadromous Fish Conservation Act	No.	NA
Antiuqities Act of 1906	No	NA
Bald Eagle Act	No	NA
Clean Air Act	Yes	Full
Clean Water Act	Yes	Partial
Coastal Zone Management Act	Yes	Full
Endangered Species Act	Yes	Full
Estuaries Protection Act	No	NA
Federal Environmental Pesticide Control Act	No	NA
Federal Water Project Recreation Act	No	NA
Fish and Wildlife Coordination Act	Yes	Full
Historic Sites Act	No	NA
Hawaiian Islands National Marine Sanctuary Act	Yes	Full
Land and Water Conservation Fund Act	No	NA
Marine Mammal Protection Act	Yes	Full
Marine Protection, Research and Sanctuaries Act	Yes	Full
Migratory Bird Conservation Act	Yes	Full
Migratory Bird Treaty Act	Yes	Full
National Environmental Policy Act	Yes	Partial
National Historic Preservation Act	Yes	Full
Native American Graves Protection and Repatriation Act	No	NA
Native American Religious Freedom Act	No	NA
Resource Conservation and Recovery Act	Yes	Full
River and Harbor Act of 1899	Yes	Partial
Submerged Lands Act	No	NA
Surface Mining Control and Reclamation Act	No	NA
Toxic Substances Control Act	Yes	Full
Watershed Protection and Flood Control Act	Yes	Full
Wild and Scenic Rivers Act	No	NA
EO 11514, Protection and Enhancement of Environmental Quality	Yes	Full
EO 11593, Protection and Enhancement of the Cultural Environment	Yes	Full
E. O. 11988, Floodplain Management	Yes	Full
E. O. 11990, Protection of Wetlands	Yes	Full
E. O. 12088, Federal Compliance with Pollution Control Standards	Yes	Full
E. O.12898, Environmental Justice	Yes	Full
State of Hawaii Statutes		
HRS Chapter 343 - EIS Rules	Yes	Partial
HRS Chapter 6E - Historic Preservation	Yes	Full
Ocean Resources Management Plan	Yes	Full
Hawaii Coastal Zone Management Program	Yes	Full

Notes:
Yes. Statute is applicable, and compliance is required.
No. Statute is not applicable or resource covered is not in the project area.
Partial. Having met all requirements of the statute for the *current* stage of planning, but anticipate future obligations.
Full. Having met all requirements of the statute.

7 REFERENCES CITED

A&B Properties, Inc. 1996. Kihei-Makena Community Plan Update, Master Plan for Maalaea Village Project District, Maalaea, Maui. August.

AECOS, Inc. 1994. Maalaea Triangle and Maui Ocean Center Draft Environmental Assessment for a Sea Water System and Drainage Improvements. Prepared for MOC/MTP, Wailuki, Maui.

Associated Laboratories. 1996. Analysis of Sediment Samples from Ma'alaea Harbor, Maui, Hawaii. October 1996.

Belt Collins & Associates. 1992. Assessment of Recreational Surfing Activities, Maalaea Small Boat Harbor. Prepared for U.S. Army Corps of Engineers, Contract No. DACW83-91-D-0016. September.

C. Brewer Homes, Inc. 1997. Concept Plan for Maalaea Mauka Project District, Kihei-Makena Community Plan Update. May.

Federal Emergency Management Agency. 1981a. Flood Insurance Rate Map, Maui County, Hawaii, Panel 235 of 400, Community Panel Number 150003 0235 B, Effective Date; June 1, 1981.

Federal Emergency Management Agency. 1981b. Flood Boundry and Floodway Map, Maui County, Hawaii, Panel 235 of 400, Community Panel Number 150003 0235 B, Effective Date; June 1, 1981.

Hadley, L.L., E.F. Thompson, D.C. Wilson. 1997. Updated Wave Response of Proposed Improvements to the Small Boat Harbor at Maalaea, Maui, Hawaii. Prepared by Coastal and Hydraulics Laboratory, Waterways Experiment Station, for the U.S. Army Engineer Division, Pacific Ocean, Draft Miscellaneous Paper CERC-97xx, December, 1997. Vicksburg, Mississippi.

Hawaii Department of Business, Economic Development & Tourism. 1996. Letter from Rick Egged, Director, Office of Planning dated September 12, 1996, to Mr. Ray Jyo, U.S. Army Engineer District, Honolulu, subject: Hawaii Coastal Zone Management (CZM) Program Federal Consistency for Improvements to the Maalaea Harbor, Maui.

Hawaii Department of Health. undated. Hawaii Air Quality Data, January 1988-December 1990. A report by the State of Hawaii, Department of Health, Clean Air Branch. Honolulu, Hawaii.

Hawaii Department of Health. undated. Hawaii Air Quality Data, 1991-1993. A report by the State of Hawaii, Departmnet of Health, Clean Air Branch. Honolulu, Hawaii

Hawaii Department of Health. 1997. Storet data.

Hawaii Department of Land and Natural Resources, Division of Aquatic Resources; Hawaii Department of Land and Natural Resources, Division of Boating and Ocean Recreation; National Marine Fisheries Service; U.S. Army Engineer District, Honolulu; Hawaii Coastal Zone Management Program Division. 1996. Final Mitigation Plan for the Maalaea Harbor for Light Draft Vessels, Maui, Hawaii. 5 June 1996.

Houston, J. R. 1994. CEWES-CR-O memo dated 14 July 1994, subject: An additional numerical model run for modified plan 2 in the Maalaea Harbor. Prepared for Commander, U.S. Army Engineer Division, Pacific Ocean.

Joerger, P.K. and M.W. Kaschko. 1979. A cultural history overview of the Kahoma Stream Flood Control Project, Lahaina, Maui and Ma'alaea Small Boat Harbor Project, Ma'alaea, Maui, Hawaii. Prepared by Hawaii Marine Research for the U.S. Army Corps of Engineers, Honolulu. Contract DACW84-79-C-0012

Jokiel, R. L. and E. K. Brown. 1998. Coral baseline survey of Ma'alaea Harbor for Light Draft Vessels, Island of Maui. Draft final report for DACW83-96-P-0216, for U.S. Army Engineer District, Honolulu. Hawaii Institute of Marine Biology.

Lillycrop, L. S., Steven M. Bratos, Edward F. Thompson, Panola Rivers. 1993. Wave Response of Proposed Improvements to the Small Boat Harbor at Maalaea, Maui, Hawaii. U.S. Army Waterways Experiment Station. Vicksburg, MS.

Lindsey, E. 1997. In Transcript of Proceedings, Public Hearing, September 24, 1997, for Joint Section 404/401 for Ma'alaea Harbor.

Marine Research Consultants. 1998. Water Quality Baseline Monitoring Program, Maalaea Harbor Expansion Project, Maalaea, Maui, Hawaii. Final report prepared for U.S. Army Engineer District, Honolulu.

Maui County Council Planning Committee. 1997. Kihei-Makena Community Plan.

McDermid, Karla J., Ph.D. 1990a. Ma'alaea Boat Harbor Algal Survey. Submitted March 12, 1990 to the U.S. Army Engineer District, Honolulu.

McDermid, Karla J., Ph.D. 1990b. Ma'alaea Boat Harbor Algal Survey Addendum. Submitted July 32, 1990 to the U.S. Army Engineer District, Honolulu.

National Marine Fisheries Service. 1990. Biological Opinion for Expansion and Improvement of the small boat harbor at Ma'alaea, Maui, Hawaii. Silver Spring, MD. July 23, 1990.

National Marine Fisheries Service. 1995. Letter to Mr. Ray H. Jyo, U.S. Army Engineer District, Honolulu, dated Oct 30 1995, regarding section 7 consultation for proposed improvements to the Ma'alaea Small Boat Harbor.

National Marine Fisheries Service. 1997. Report of the Workshop to Assess Research and Other Needs and Opportunities Related to Humpback Whale Management in the Hawaiian Islands. NOAA Technical Memorandum MNFS-OPR-11, February.

Parsons Brinkerhoff Quade & Douglas. 1994a. Final Traffic Impact Study, Maalaea Triangle, Maalaea, Maui, Hawaii. A study prepared for the Maalaea Triangle Partners, January, 1994. Honolulu, Hawaii

Parsons Brinkerhoff Quade & Douglas. 1994b. Final Revised Traffic Impact Study, Maalaea Harbor Expansion, Maalaea, Maui. A report prepared for the State of Hawaii Department of Transportation, Harbors Division, May 17, 1994. Honolulu, Hawaii

R.M. Towill Corp. 1982. Revised Environmental Impact Statement for Improvements to the Maalaea Boat Harbor, Maalaea, Maui, July 1982. Harbors Division, Dept. of Transportation, State of Hawaii.

Ratte, Marc. 1998. Personal comunication via telephone, February 26,1998. Mr. Ratte is a staff Engineer with Maui Electric Co.

Thompson, E. F., and L. L. Hadley. 1994. Wave Response of Proposed Improvement Plan 6 to the Small Boat Harbor at Maalaea, Maui, Hawaii. Draft Miscellaneous Paper CERC 94-xx, May 1994. U.S. Army Waterways Experiment Station, Vicksburg, MS.

U.S. Army Corps of Engineers, Honolulu District. 1980. Ma'alaea Harbor for Light-Draft Vessels, Maui, Hawaii. General Design Memorandum and Final Environmental Impact Statement. September.

U.S. Army Engineer District, Honolulu. 1994. Final Supplemental Environmental Impact Statement for Ma'alaea Harbor for Light-Draft Vessels. July.

U.S. Army Engineer District, Honolulu. 1996. Limited Reevaulation Report, Ma'alaea Harbor for Light-Draft Vessels.

U.S. Coast Guard. 1985. Boat Crew Seamanship Manual. U.S. Coast Guard Commandant Instruction, dated 6 July 1985.

U.S. Department of Commerce, National Oceanic and Atmospheric Administration. 1997. Hawaiian Islands Humpback Whale National Marine Sanctuary, Final Environmental Impact Statement/Management Plan. February 1997.

U.S. Environmental Protection Agency. 1985. Coastal marina assessment handbook. Region IV, Atlanta.

U.S. Environmental Protection Agency. 1993. Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Washington, DC.

U.S. Fish and Wildlife Service. 1994a. Letter dated December 5, 1994 from Brooks Harper, Pacific Islands Office, to Mr. Ray Jyo, Director of Engineering, U.S. Army Engineer District, Ft. Shafter, Hawaii.

U.S. Fish and Wildlife Service. 1994b. Final Fish and Wildlife Coordination Act Report, Maalaea Harbor for Light Draft Vessels, Ma'alaea, Maui, Hawaii. Pacific Islands Office, Honolulu. December 1994.

US Army Engineer Waterways Experiment Station. 1996. Letter dated 9 April 1996 from Richard A. Sager, Acting Director, Hydraulics Laboratory, to Commander, U.S. Army Engineer Division, Pacific Ocean, subject: Evaluation of Navigation Conditions at Maalaea Small Boat Harbor.

Wang, H. V. and A. Cialone. 1995. Numerical hydrodynamic modeling and flushing study at Maalaea Harbor, Maui, Hawaii. Miscellaneous Paper CERC-95-8, September 1995. U.S. Army Waterways Experiment Station, Vicksburg, MS.

Wang, Harry V., Alan Cialone, and Panola. River. 1995. Numerical Hydrodynamic Modeling and Flushing Study at Maalaea Harbor, Maui, Hawaii. Miscellaneous Paper CERC-95-8, U.S. Army Waterways Experiment Station, Vicksburg, MS.

Wang, Harry V, 1998. Memorandum for Record, Subject: Flushing Percentage in Maalaea Harbor, Maui, Hawaii, 20 January 1998.

8 LIST OF PREPARERS

Name	Specialty	Experience	Action
William Lennan	Ecology	BS Political Science, BA Zoology; 2 years grad studies; 3 yrs environmental studies USFWS; 18 years environmental studies, Corps of Engineers	EIS Preparer
Candace Thomas	NEPA, Biology	BS Biology, 1 yr grad studies; 13 years environmental studies, Corps of Engineers	EIS Preparer
George Young	Engineering	BS, MS Civil Engineering; 16 years project engineering, Corps of Engineers	Technical Manager
Stanley J. Boc	Engineering	BA, MS Marine Science; 18 years project engineering, Corps of Engineers	Project Engineer
Patricia Billington	Environmental Law	BA, MA Philosophy, JD; 10 years environmental law, Corps of Engineers	EIS Reviewer
Ron Pang	Cost Engineering	BS, Civil Engineering; 22 years cost estimating, Corps of Engineers	Cost Estimating
Russell Iwamura	Economist	BA, MA Economics; 8 years economic analyses, Corps of Engineers	Economic Analyses
University of Hawaii	Ecology	Environmental Contractor	Coral Survey
Marine Research Consultants	Marine Ecology	Environmental Contractor	Sediment Analysis

9 INDEX

4

A

B

C

D

E

APPENDIX A

UPDATED ECONOMIC ANALYSIS

MAALAEA HARBOR STUDY

UPDATED ECONOMIC ANALYSIS

18 February 1998

1. PURPOSE.

This is an update of the economic analysis for the expansion of the Maalaea Harbor on Maui's southern coast. It addresses any major changes that have taken place since the completion of the July 1980 General Design Memorandum (GDM). The benefits and costs discussed are for six proposed plans of improvement to the existing facility. All six plans involve modifying the breakwater, entrance channel, and the number of slips in the harbor.

2. EXISTING HARBOR AND FLEET.

The present harbor facilities at Maalaea are not significantly different from those discussed in the July 1980 GDM. In 1980, there were 93 mooring spaces in the harbor. Today, the harbor consists of 95 slips and one mooring spot in the basin for a total of 96 berths. In October 1994, 89 vessels were listed as harbor occupants. A majority of those vessels occupied single slips, but there were also a few boats occupying two slips. Table 1 gives a breakdown of the number of craft in the harbor by type. This information can be found in harbor use reports maintained by the Department of Land and Natural Resources (DLNR). The numbers in Table 1 are for October 1994.

TABLE 1.
EXISTING FLEET MOORED AT MAALAEA SMALL BOAT HARBOR

Type of Craft	In Harbor
Recreation	49
Commercial Fishing	13
Commercial Passenger 1/	27
TOTAL	89
1/ Tour boats and charter fishing boats are included in this category.	

The mix of vessels moored at Maalaea Harbor has changed somewhat since the completion of the 1980 GDM. In 1980, commercial fishing and commercial charter boats were 32 percent of all the boats in the harbor while recreational craft made up 68 percent. In October 1994, 45 percent of the vessels in the harbor were engaging in commercial fishing and charter boat activities and the remaining 55 percent were recreational craft.

While the composition of the fleet in the harbor is different, the conditions in the harbor have not changed. The harbor basin is still subject to surge problems that prevent the full utilization of the available 11.3 acres of dredged water area. It is still difficult to navigate the entrance channel when the harbor is experiencing the rough conditions generated by the surge.

The proposed plans to modify the facility will address these problems and increase the usability of the harbor basin. The Maui Boating Advisory Group and the DLNR have developed a master berthing plan for Maalaea Harbor. Once the wave and surge problems in the harbor are eliminated, the plan provides for an increase in berthing capacity to 220 slips. Of the six plans analyzed in this study, five will increase the berthing capacity to 220 slips as called for in the master berthing plan. The sixth alternative will increase the number of berths to 128 slips. The proposed project in the 1980 GDM included berthing for 310 vessels. This reduction is due to changes in the sizes of the boats that are expected to use the harbor.

3. HARBOR WAITING LISTS.

The DLNR maintains a waiting list for mooring slips at Maalaea Harbor which is constantly being updated. The particular list used in this study contained 208 applicants for slips in the harbor. Table 2 provides a distribution of the types of vessels on the waiting list. This information was derived from the individual applications for each boat on the waiting list.

TABLE 2.
VESSELS WAITING FOR A SLIP AT MAALAEA HARBOR

Type of Craft	Number on Wait List
Recreation	111
Commercial Fishing	55
Commercial Passenger	42
TOTAL	208

The State has imposed two restrictions to limit the commercial passenger activity at Maalaea. No more than 30 percent of the total slips can be occupied by commercial passenger operations. Also, there is an indefinite moratorium on the number of commercial passenger vessels moored elsewhere that can temporarily use Maalaea's docking facilities. Maalaea is allowed 20 such permits, but only two have been issued. This moratorium has been imposed to minimize the overcrowding at Maalaea. As a result, there are 44 vessels on the waiting list for permits to operate commercial passenger operations out of Maalaea.

In alternatives 1 through 5, there will be slips for up to 66 commercial passenger vessels and 154 recreation or commercial fishing craft once the improvements to Maalaea are complete. In alternative 6, there will be 38 slips available for commercial passenger vessels and 90 slips for recreational and commercial fishing vessels. Combining the number of craft already in the harbor with those on the waiting list shows that there is ample demand to fill the harbor. The harbor will be at maximum capacity upon completion of the federal and nonfederal improvements regardless of whether it has 128 slips or 220 slips.

4. PRESENT AND NEAR TERM COMMUNITY STRUCTURE.

The resident population of Maui was estimated to be 91,400 people in 1990. A majority of this population resides in the adjacent communities of Kahului and Wailuku located on Maui's north shore. The Kahului-Wailuku area is Maui's urban and commercial center with the island's only deep draft harbor located at Kahului.

Maui's economy is based almost completely on its visitor industry and sugar plantations with pineapple, diversified agriculture, and cattle ranching playing lesser roles. About 17 percent of Maui jobs are generated by hotels while another 15 percent are in other service industries. Another eight percent of the jobs on Maui are in agriculture and food processing. Government jobs make up about 11 percent of the total while the finance, trade, and transportation sectors account for 34 percent of the jobs.

There are two major resort areas on Maui. The Lahaina, Kaanapali, and Kapalua resort complexes are located in West Maui while the Kihei-Wailea resort area is located along Maui's south shore. The West Maui resorts extend north from Lahaina town approximately 10 miles. The Kihei-Wailea resort area extends south for about 10 miles from Kihei town. Maui has a total of approximately 18,000 hotel, bed and breakfast, and condominium units for transient accommodations. The Lahaina, Kaanapali, and Kapalua resort areas have 9,900 rooms while the Kihei-Wailea area has 7,400 rooms. There are another 540 rooms for visitors in the Kahului-Wailuku area. Maalaea Harbor is located in the middle of these three areas. It is approximately 17 miles east of Lahaina, four miles west of Kihei, and nine miles south of Kahului and Wailuku.

5. BENEFIT CALCULATIONS

5.1 General.

This economic analysis measures the benefits generated from the enhanced commercial and recreational boating opportunities provided by improving and expanding Maalaea Harbor. The benefits consist of the measured differences between conditions without an improved small boat harbor and those with the improvements in place. Benefits and costs are measured at an October 1995 price level and annualized over the 50-year project life using a prescribed discount rate. That discount rate is currently set by the Policy and Planning Division of the U.S. Army Corps of Engineers at 7-3/4 percent.

The analysis of the various benefit categories conforms to the guidelines set forth in Chapter 6 of the December 1990 version of the ER 1105-2-100. The differences that may exist between the analysis in this update and the 1980 GDM can be attributed to revisions in these guidelines.

5.2 Without-Project Conditions.

The present conditions in the study area are taken as the without-project conditions for this analysis. The 89 boats currently moored in the harbor will remain there over the study period. The harbor will continue to experience wave and surge problems. There will be, on average, 208 applicants on the waiting list throughout the 50-year study period.

5.3 With-Project Conditions.

The wave and surge problems now plaguing the harbor will be eliminated once the modifications are in place. The improved small boat harbor will be able to accommodate additional slips for boaters in the area.

The benefits to each group of boaters as a result of improving and expanding Maalaea Harbor are presented in the following sections.

5.4 General Navigation Improvements.

5.4.1 Commercial Passenger Vessels

Due to the present alignment of the entrance channel, large south swells cause rough conditions at Maalaea. Waves breaking in the entrance channel during these swells send turbulence throughout the harbor. Some parts of the harbor are more exposed than others, but all the boats are affected to some extent. Boat owners cope with these rough conditions by either evacuating the harbor or securely anchoring their vessels. The larger vessels will leave the harbor during severe conditions as it is safer for these vessels to be out at sea. The boats remaining in the harbor are tied down with extra lines to keep them from striking boats and shoreside facilities. It is common practice for boat owners to stay on their boats until the rough conditions subside.

Under without-project conditions, large south swells will continue to cause instability in the harbor. As they have in the past, boat owners will take extraordinary measures to prevent damages to their vessels. This includes either leaving the harbor or securing their vessels and staying on board to ensure the moorings remain intact.

Boat owners must contend with the added costs associated with these emergency measures. To estimate these costs, a survey of boat owners was conducted. This survey revealed that the frequency that boaters must go to the harbor varies depending on the size of the boat and the slip location. All commercial and recreational boaters contacted said they go to the harbor at least once a year to secure their boats. A boat owner in the most exposed part of the harbor stated that she must watch over her boat 100 times during a typical year. This increases the labor cost of operating these boats as either the boat owners are there themselves or someone has to be paid to watch the boat during rough conditions. In addition, there are high maintenance costs to contend with as more and thicker lines are needed and minor repairs are made. For those boats that leave Maalaea, there are expenses related to operating the boat such as fuel costs. Many boaters are frustrated at the conditions in the harbor and the added costs that these conditions engender.

Average annual costs were calculated from the responses of commercial boaters moored at Maalaea Harbor. They supplied information on the labor costs and operation and maintenance costs involved in minimizing the damages to their boats. The average cost is about $3,000 per boat every year. Responses ranged from a low of $80 to a high of $16,000. This average cost was multiplied by the number of boats not interviewed and added to the sum of the actual responses from boaters that were interviewed. The total average annual cost for commercial boaters equals about $78,000 a year.

No matter how diligent these boat owners are, major damages are inevitable given the present conditions in the harbor. Collisions with other boats and shoreside facilities are rare, thanks to the efforts of the boaters, but they do occur and with costly consequences. Over the past 10 years, commercial boaters surveyed spent, in October 1995 dollars, about $73,000 for major repairs to their vessels and docks. For those vessels not interviewed, an average of about $5,000 was applied for another $59,000 in damages. This brings the total damages to $132,000. It is assumed that $132,000 is the typical amount of damages that commercial boaters incur at Maalaea every 10 years. Over the 50-year study period, $132,000 in cost every 10 years translates into an average annual cost of about $20,000.

The total average annual cost generated by the rough conditions for commercial boaters is $98,000 ($78,000 + $20,000).

5.4.2 Recreational Vessels.

Input from recreational boaters moored at Maalaea Harbor show an average cost of approximately $3,000 with responses ranging from $200 to $9,000. Applying the $3,000 average to those boaters not interviewed and adding it to the sum of the actual responses gives a total of about $145,000 in damage prevention costs.

The recreational boaters surveyed have experienced, in October 1995 dollars, about $23,000 in major damages to their boats and docks over the past 15 years. The average damage derived from the surveyed boaters of about $5,000 per boat was applied to those recreational boaters not surveyed. The damages for these boaters is approximately $220,000. The estimated total damages for all recreational boaters in the harbor is then $23,000 + $220,000 = $243,000. It is assumed that $243,000 is the typical amount of damages that recreational boaters suffer every 15 years. Over the 50-year study period, $243,000 in damages every 15 years is equivalent to about $28,000 in average annual damages.

The total average annual cost and damages to recreational boats attributable to the present conditions at Maalaea Harbor is the sum of the average annual costs and the estimated annualized damages. The total average annual cost and damages equals $145,000 + $28,000 = $173,000.

5.4.3 Commercial Fishing Vessels.

Commercial fishermen in the existing harbor are also impacted by the rough conditions that affect the commercial passenger operators and recreational boaters. Commercial fishermen also incur additional expenses to prevent damages to their vessels when large south swells hit Maalaea Harbor. Input from commercial fishing interests moored at Maalaea Harbor show an average yearly cost attributable to rough conditions within the harbor similar to that of recreational and commercial boaters ($3,000). Applying the $3,000 average to the commercial fishing fleet results in a total average annual cost of approximately $39,000

Like recreational boaters, damage to commercial fishing vessels average approximately $5,000 per boat once every 15 years. Applying this damage estimate to the present commercial fishing fleet over the 50-year life of the navigation improvements results in an average annual estimated damage total of $8,000.

The total average annual cost to commercial fishing vessels attributable to wave damage and prevention is $47,000 ($39,000 + $8,000).

5.4.4 With-Project Harbor Conditions.

The modifications to the facility planned in the six alternatives under consideration will alleviate the impacts of large south swells entering the harbor. Waves will no longer break in the entrance channel and the harbor will remain calm relative to present conditions. Boat owners will no longer need to add lines to secure their boats or stay on board to keep watch or evacuate the harbor. The costs associated with these activities will be eliminated as will the occasional damages to vessels and docks that have been attributed to south swell conditions in the past. Under with-project conditions, the estimated added costs and damages to commercial passenger, recreational, and commercial fishing vessels will be eliminated. The total savings of $98,000 + $173,000 + $47,000 = $318,000 is a benefit of improving Maalaea Harbor.

5.4.5 Backup Area Repair Reduction.

The constant pounding of the surf is also affecting some of the backup area surrounding the harbor basin. This is especially evident along the south breakwater where the wave action is undermining the structure. It has reached the point where the water is making its way under the breakwater and affecting the backup area behind it. The Boating and Ocean Recreation Division of the DLNR has requested that a survey be done to determine the magnitude of the undermining. The extent of the undermining problem threatening the backup area will not be known until that survey is completed.

Cavities and sink holes have appeared in the parking lot area as a result of the undermining. There were two repairs made to sink holes that appeared in 1993. The repairs included removing the loose blacktop, laying a geotextile filter fabric, covering it with various layers of fill, and replacing the blacktop. The cost of these repairs totaled about $12,000. In 1994, similar repairs were made to patch another cavity at a cost of about $3,000.

While these repairs took care of the visible damages, they did not address the cause. The undermining of the area behind the south breakwater will continue and further repairs will be needed to maintain the usability of that area. In the absence of any data on the degree of the undermining, it is assumed that repairs like those done in 1993 and 1994 will be required annually. The cost of these repairs is taken to be the average of the amounts spent in 1993 and 1994. These expenditures were converted to 1995 dollars using the estimated Consumer Price Index, the CPI-U, for Honolulu. The 1993 expenditure in 1995 dollars is $12,000 x 1.028 x 1.036 = $12,780. The 1994 expenditure of $3,000 in 1995 dollars is $3,000 x 1.036 = $3,108. The average annual cost for sink hole repair in 1995 dollars is then ($12,780 + $3,108)/2 = $7,944. It is assumed that $7,944 in sink hole repairs will be needed every year under without-project conditions.

In addition to causing chronic damages to the parking area, the undermining has been cited as the cause of recent damages to a water main. In early 1995, a three-inch water main supplying water to the building where the harbor master's offices are located was damaged. It will cost an estimated $65,000 to replace the broken water main. As part of the repair, the water main will be relocated from its current position along the southern edge of the breakwater to the northern edge. Relocating the pipe will remove it from the area currently undermined to a more stable part of the breakwater. It will not stop the undermining problem, however, and it is likely that the water main will be damaged again, at least once, during the study period. It took approximately 40 years for the undermining to damage the water main in its current location. It is anticipated that it will take another 40 years for the undermining to reach the new pipe and cause another $65,000 in damages. The average annual cost of a $65,000 repair in Year 40 at 7-3/4 percent is about $260. This cost will be incurred under without-project conditions.

As part of the new harbor construction, the undermining problem along the south breakwater will be fixed. Repairs to the parking area and the water main will no longer be needed over the 50-year life of the project. The savings in repair cost of $7,944 + $260 = $8,204 or about $8,000 a year is a benefit of the project.

5.5 Additional Vessel Berths.

The improved Maalaea Small Boat Harbor will have more slips than the existing harbor. Alternatives 1 through 5 will provide 125 more slips than there are now. Alternative 6 will create 33 more slips. These slips will go into areas now deemed unusable because of the agitation that large south swells produce in those parts of the harbor. The realigned entrance channel and modified breakwater will alleviate the impact of the south swells and open up those areas for development.

The vessels allowed into the new harbor will be chosen based on several factors. The size of the vessel will govern whether it will fit one of the available slips. Those that are too big or too small will not be considered. A vessel's position on the waiting list will dictate priority provided it is of the proper size. DLNR's Maui District Manager will take these as well as other factors into consideration in the process of assigning the new slips in the harbor.

For benefit computations, vessels were assigned to the new slips based on the following assumptions and criteria:

(a) There will be 36 25-foot slips, 48 30-foot slips, 33 35-foot slips, 74 40-foot slips, 28 50-foot slips, and 1 100-foot slip in the improved harbor under alternatives 1 through 5. The improved harbor under alternative 6 will have 29 30-foot slips, 21 35-foot slips, 55 40-foot slips, 22 50-foot slips and 1 100-foot slip.

(b) All vessels in the existing harbor will be accommodated in the improved harbor.

(c) New permits for the harbor are given out based on a vessel's size, then its position on the waiting list.

(d) Preference for the larger slips is given to commercial vessels.

(e) No consideration is given for a vessel's width or its method of propulsion.

Table 3 lists the number and types of boats that will occupy the new harbor based on these criteria.

TABLE 3.
VESSEL COUNT FOR MAALAEA HARBOR
BY ALTERNATIVE

	Number of Vessels by Alternative						
Vessel Type	Existing	1	2	3	4	5	6
Recreation	49	111	111	111	111	111	68
Commercial Fishing	13	52	52	52	52	52	22
Commercial Passenger	27	51	51	51	51.	51	32
Total	89	214	214	214	214	214	122

Only 214 vessels will go into the new 220-slip harbor for alternatives 1 through 5 because six vessels currently take up more than one slip in the harbor. It is assumed they will continue to do so in the improved harbor. Only 122 vessels will go into the expanded harbor under alternative 6 for the same reason. Benefits generated by the additional berthing areas in Maalaea Harbor are based on the vessel counts in Table 3.

5.5.1 Benefits for Vessels Moored Elsewhere.

There are two vessels currently moored along the coast that have permits to load and unload passengers at Maalaea Harbor. Both commercial passenger operations face additional costs because they do not have a slip in the harbor. With the additional slips in place, one of those vessels is expected to get a berth in the harbor. The expanded harbor will not be able to accommodate the unique design of the other vessel.

The operators of the vessel that is expected to get a slip will see a reduction in their cost of doing business. Due to the exposed location of their mooring, the operators presently spend about $17,000 a year to have a crew member stay aboard their vessel every night. The crew member is there to secure the boat at night, prepare it in the morning, and sail it to Maalaea Harbor to pick up passengers. A crew member will not need to secure the vessel overnight or bring it to the harbor in the morning with a slip in the expanded facility. The $17,000 annual expenditure will be eliminated.

In addition to that savings, the fuel cost associated with the trips from the mooring spot to the harbor and back will also be eliminated. This will save $3,000 a year according to the vessel operators.

This particular tour operation presently leases the permits necessary to operate a commercial passenger vessel out of Maalaea Harbor. The operators pay about $50,000 a year to rent the permits from another corporation. The fee is based on a percentage of the operators' gross income. Expanding Maalaea Harbor will give the operators an opportunity to obtain their own commercial permits and eliminate the present $50,000 annual fee. Eliminating that fee can be counted as a benefit of expanding the harbor.

The total savings for moving into Maalaea Harbor is then $17,000 + $3,000 + $50,000 = $70,000.

Mooring fees are a cost of operating a commercial vessel that will increase with the move into Maalaea Harbor. Vessels are charged $100 a month for mooring along the coast while those in the harbor are charged $7.00 per foot per month. The operator expected to move into the expanded harbor has a 65-foot vessel. Their mooring fees will increase from $1,200 a year to about $5,500 a year.

The total reduction in operating costs for this operator is then $70,000 + ($1,200 - $5,500) = $65,700 or about $66,000. This savings can be attributed as a benefit of expanding Maalaea Harbor.

5.5.2 Commercial Fishing Benefits

There are 13 commercial fishermen now operating out of Maalaea Harbor. There are 55 commercial fishermen on the waiting list. Of the 55 commercial fishermen on the waiting list, 39 will get slips in the improved harbor under alternatives 1 through 5. A review of the commercial fishing licenses issued on Maui and interviews with Maui fish wholesalers revealed that 29 of the 39 commercial fishermen have ongoing operations. The benefits for existing commercial fishermen are derived from reductions in the time and cost of their present operations and increases in the amount and value of their catch. The effects of having a slip in the new harbor on the operating costs of these fishermen are calculated in this section.

The commercial fishermen without slips in the harbor trailer their boats to Maalaea for launching. A majority of these fishermen live in Kahului about nine miles north of Maalaea Harbor. The speed limits along the roads leading to the harbor vary. The average traveling speed is about 45 miles per hour. Trucks pulling trailered boats, however, are expected to go at a slower speed of 40 miles per hour for safety reasons. At that speed, it takes approximately 14 minutes to reach the harbor. Once at the harbor, launching a boat at the ramp takes another 30 minutes to complete. This includes placing the boat in the water, preparing it for the trip, and securing the truck and trailer. The whole operation takes about 44 minutes.

Upon returning to the harbor, it takes another 15 minutes to retrieve the boat and one hour to wash the salt from the boat, truck, and trailer. The return trip home after selling the day's catch takes another 14 minutes. The total time for this portion of the fishing trip is 89 minutes.

The overall time for the round trip to and from the harbor under without-project conditions is 44 minutes + 89 minutes = 133 minutes.

With a slip in the improved harbor, this time will be greatly reduced. The fishermen leaving home will travel at the average speed of 45 miles per hour with no boat in tow. They will arrive at the small boat harbor in 12 minutes. Launching a boat that is already at a slip will take no more than 10 minutes. The total time for this part of the trip is 22 minutes. There is no retrieval time for a boat with a slip. Washing down the equipment will take 30 minutes. The return trip to Kahului will take another 12 minutes without a boat in tow. The total time for a round trip to and from the harbor will be 64 minutes.

Each commercial fisherman getting a slip in the improved harbor will save 133 minutes - 64 minutes = 69 minutes per trip.

The annual time saved per boat is based on the number of trips per year and fishermen per trip. According to the Maalaea Boat and Fishing Club, the number of trips taken per year varies. Full-time commercial fishermen go out approximately 200 times a year while part-time fishermen go out about 100 times a year. Usually, two fishermen go out per trip.

The value of the time saved is based on the Thomas and Thompson method discussed in the Corps research paper Value of Time Saved for Use in Corps Planning Studies A Review of the Literature and Recommendations. According to this method, the value of time saved is based on the hourly median family income of the area. This study slightly modifies that value because the participants involved are known. Instead of the general hourly median family income of the area, it is the hourly income of the fishermen using Maalaea Harbor that is applied in the analysis. According to the Maalaea Boat and Fishing Club, the income per trip averages about $200. The operating expenses per trip average about $50. The profit is then $150 per trip. The average crew consists of two fishermen and the average fishing trip lasts about 12 hours. The average hourly wage is then $150/12 hours = $12.50 per hour or $12.50 per hour/2 crew members = $6.25 per hour for each crew member.

The value of time saved is dependent on two other variables: the type of trip and the reduction in travel time. Commercial fishing trips are considered work related trips. Work trips are valued on a per person basis. The reduction in travel time, as calculated earlier in this section, is 69 minutes. Based on these parameters, the value of time saved is set at 53.8 percent of the hourly wage for fishermen.

The value of time saved per trip is, then, 2 fishermen x ($6.25/hour/fishermen x .538) x (69 minutes/60 minutes per hour) = $7.73 per trip.

The improved harbor in alternatives 1 through 5 will have enough slips to accommodate the 29 vessels that are currently engaged in commercial fishing. According to the Maalaea Boat and Fishing Club, both part-time and full-time fishermen use the launch ramp at Maalaea. Part-time fishermen make up about 66 percent of all the fishermen that use the launch ramp. It is assumed that this percentage applies to the fishermen on the waiting list. The 29 commercial fishing vessels, then, consist of 19 part-time and 10 full-time operations. These vessels take (19 part-timers x 100 trips/part-timer) + (10 full-timers x 200 trips/full-timer) = 3,900 trips a year.

The total value of time saved by providing these boaters with slips is the number of trips taken multiplied by the value of time saved per trip or 3,900 trips x $7.73 per trip = $30,147.

The vessels going into the improved harbor in alternative 6 will include three vessels that will begin commercial fishing operations and six that are already engaged in commercial fishing. Of the six ongoing commercial fishing operations, four are part-time and two are full-time. Savings for these fishermen are computed following the methodology used for computing the savings to the commercial fishermen affected in alternatives 1 through 5. The six fishermen moving into the expanded harbor in alternative 6 take an estimated (4 part-timers x 100 trips/part-timer) + (2 full-timers x 200 trips/full-timer) = 800 trips per year. The total savings they will experience by moving into the improved harbor is 800 trips x $7.73 per trip = $6,148 per year.

The trucks used to transport the boats are an integral part of the commercial operation. Having a slip in the new harbor will reduce the wear and tear on the vehicles transporting the boats to and from the harbor. Reductions in truck related expenses can be taken as benefits of improving the small boat harbor.

The strain of hauling a boat and the corrosiveness of salt water take their toll on the life span of a truck. The typical procedure is to buy a used truck, drive it until it cannot go any farther, then get another used truck. Commercial fishermen report replacing the trucks that haul their boats as often as every two years. The average length of time an automobile is held in Hawaii is six years. It is assumed that under without-project conditions commercial fishermen will replace their trucks every two years. Under with-project conditions, truck purchases will be reduced to the average of one every six years.

Without the need to tow a boat, not only will the number of truck purchases be reduced, but the size of the trucks purchased as well. According to the Maalaea Boat and Fishing Club, the sizes of the trucks hauling boats to the launch ramp depend on the size of the boats. For boats under 30 feet long, 3/4-ton and smaller trucks are common. For boats 30 feet and longer, one-ton trucks are typical.

Of the 29 existing commercial fishermen from the waiting list that are expected to move into the new harbor in alternatives 1 through 5, eight fishermen have boats shorter than 30 feet. It is assumed that these fishermen drive 3/4-ton or smaller trucks. The remaining 21 fishermen have vessels longer than 30 feet. It is assumed that they drive one-ton trucks when hauling their boats. The commercial fishermen with slips in the harbor typically have 3/4-ton or smaller trucks to haul their catch to market.

A survey was taken of the listings of used trucks in the Kelley Blue Book Auto Market Report. The prices for 1/2-ton, 3/4-ton, and one-ton truck models from 1988 to 1994 were gathered. The average price for one-ton trucks is $10,400. The average for the smaller trucks is $7,900.

The benefit for truck expenditure reductions is the difference between the average annual cost of purchases under without-project conditions and with-project conditions. Without a slip, the eight fishermen with boats less than 30 feet in length will continue to purchase smaller trucks every two years at $7,900 a truck. The average annual cost of those purchases over the 50-year study period at 7-3/4 percent is $3,800. Having a slip will reduce truck purchases to one $7,900-truck every six years. The average annual cost of these purchases over the 50-year study period at 7-3/4 percent is about $1,100. The average annual benefits are equal to $3,800 - $1,100 = $2,700 per commercial fisherman. Under alternatives 1 through 5, then, the eight commercial fishermen with small boats will save $2,700 per fisherman x 8 commercial fishermen = $21,600.

The savings for commercial fishermen with larger boats are calculated in a similar way. Without a slip, a larger truck will be purchased every two years at $10,400. The average annual cost for these purchases over the 50-year study period at 7-3/4 percent comes to about $5,000. Having a slip will reduce purchases to a smaller $7,900-truck every six years. The average annual cost for these purchases over the 50-year project life at 7-3/4 percent is about $1,100. The benefit is equal to $5,000 - $1,100 = $3,900 per commercial fisherman. The total benefit for reduced truck expenditures for the 21 commercial fishermen moving into the improved harbor under alternatives 1 through 5 is 21 commercial fishermen x $3,900 per fisherman = $81,900.

The total savings in truck purchases for the 29 commercial fishermen moving into the improved harbor under alternatives 1 through 5 equal $21,600 + $81,900 = $103,500.

Of the six commercial fishing boats moving into the improved harbor in alternative 6, two are under 30 feet and assumed to be towed by 3/4-ton and smaller trucks. Without a slip, the two fishermen would continue to purchase smaller trucks every two years at $7,900 a truck. The average annual cost of those purchases over the 50-year study period at 7-3/4 percent is $3,800. Having a slip will reduce the average annual costs of these truck purchases to $1,100. The benefit is equal to $3,800 - $1,100 = $2,700 per commercial fisherman. The two commercial fishermen with smaller boats will save $2,700 per commercial fisherman x 2 commercial fishermen = $5,400.

The remaining four commercial fishermen have boats that are longer than 30 feet. It is assumed that one-ton trucks are used to tow these boats to the harbor under without-project conditions. It is further assumed that these fishermen will purchase a used one-ton truck every two years at $10,400 per truck. The average annual cost per fisherman of purchasing a one-ton truck every two years over the 50-year study period will be about $5,000. Having a slip in the harbor will reduce the truck purchases of these fishermen to one 3/4-ton truck every six years. The average annual cost of purchasing a 3/4-ton truck every six years over the 50-year study period will be about $1,100. The benefit of moving into an improved Maalaea Harbor is $5,000 - $1,100 = $3,900 per commercial fisherman. The total benefits for the four commercial fishermen with longer boats moving into the harbor under alternative 6 is then $3,900 per commercial fisherman x 4 commercial fishermen = $15,600.

Alternative 6 will generate $5,400 + $15,600 = $21,000 in total truck purchase savings.

TABLE 6.
BENEFIT SUMMARY BY ALTERNATIVES AND PRIORITY
($000)

Benefit Categories	Alternatives											
	1		2		3		4		5		6	
	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low
General Navigation Benefits												
Commercial Passenger Craft	98	---	98	---	98	---	98	---	98	---	98	---
Recreational Craft	173	---	173	---	173	---	173	---	173	---	173	---
Commercial Fishing Craft	47	---	47	---	47	---	47	---	47	---	47	---
Backup Area Repair	8	---	8	---	8	---	8	---	8	---	8	---
Additional Berth Benefits												
Vessels Moored Elsewhere	66	---	66	---	66	---	66	---	66	---	66	---
Commercial Fishing	96	---	96	---	96	---	96	---	96	---	19	---
New Commercial Operations	---	1,919	---	1,919	---	1,919	---	1,919	---	1,919	---	332
Totals By Priority	488	1,919	488	1,919	488	1,919	488	1,919	488	1,919	411	332
TOTAL AVERAGE ANNUAL BENEFITS		2,407		2,407		2,407		2,407		2,407		743

Benefits for reductions in storm and wave damage costs to commercial passenger craft, recreational craft, and commercial fishing craft are considered high priority benefits. Reductions in backup area repairs and in existing commercial operation costs are also considered high priority benefits. They make up approximately 20 percent of the total benefits generated by alternatives 1 through 5 and 55 percent of the total benefits in alternative 6.

Benefits for new commercial vessels are considered recreational benefits and categorized as low priority. These benefits make up 80 percent of the total in alternatives 1 through 5 and 45 percent in alternative 6.

7.0 COST

Table 7 summarizes the costs of the proposed plans of improvement for the Maalaea Small Boat Harbor.

TABLE 7.
PROJECT COST SUMMARY
($000)

Cost Categories	Alternatives					
	1	2	3	4	5	6
Project First Cost	9,301	10,301	10,742	12,539	10,301	6,406
Interest During Construction	859	951	992	1,158	951	592
Associated Costs	890	890	890	890	890	518
Total Investment Cost	11,050	12,142	12,624	14,587	12,142	7,516
Amortization Cost	877	964	1,002	1,158	964	597
Operation & Maintenance	52	52	52	52	52	52
Total Average Annual Cost	929	1,016	1,054	1,210	1,016	649

The total first cost of modifying the Maalaea Harbor has been calculated at an October 1995 price level for the different alternatives. The Interest During Construction (IDC) for these projects were calculated assuming a 7-3/4 percent interest rate and a 28-month construction period. The Associated Costs of the projects add another $890,000 to the first costs for alternatives 1 through 5 and another $518,000 to the first cost for alternative 6. The Total Investment Cost is the sum of the Project First Cost, Interest During Construction, and the Associated Costs. The capital recovery factor for a project with a 50-year life at 7-3/4 percent, 0.07940, is then applied to the Total Investment Cost to get the Amortization Cost. Next, the Operation and Maintenance Cost of the project is added to the Amortization Cost to compute the Total Average Annual Cost.

8. BENEFIT-COST RATIO

Table 8 lists the average annual benefits, average annual costs, benefit-cost ratios, and net benefits associated with each alternative.

TABLE 8.
PROJECT ECONOMICS

	Alternatives					
	1	2	3	4	5	6
Benefits ($000)	2,407	2,407	2,407	2,407	2,407	743
Costs ($000)	929	1,016	1,054	1,210	1,016	649
Benefit-Cost Ratios	2.59	2.37	2.28	1.99	2.37	1.14
Net Benefits ($000)	1,478	1,391	1,353	1,197	1,391	94

According to the information in Table 8, the National Economic Development (NED) plan is alternative 1. Alternative 1 has a benefit-cost ratio greater than one and has the highest net benefits of all six alternatives. As such, it is the preferred alternative from a Federal government standpoint.

Alternatives 1 through 5 will generate $488,000 in high priority benefits. These high priority benefits make up approximately 53 percent of the $929,000 average annual cost for alternative 1, 48 percent of the $1,016,000 average annual costs for alternatives 2 and 5, 46 percent of the $1,054,000 average annual costs for alternative 3 and 40 percent of the average annual cost in alternative 4. Alternative six will produce $411,000 in high priority benefits that make up approximately 63 percent of its $649,000 average annual cost.

9. ADDENDUM

The cost of alternative 1 treating the Preconstruction Engineering and Design (PED) costs as sunk costs has also been calculated. There is precedent for making a project implementation decision based on the exclusion of such costs for a project that has already been authorized.

The PED cost for alternative 1 is $1,288,300. This figure was subtracted from the Project First Cost of $9,301,000 for a new Project First Cost of $8,012,700. Adding the Associated Cost of $890,000 for the slips and other improvements and the Interest During Construction of $740,000 gives a Total Investment Cost of $9,642,700. Multiplying the capital recovery factor to the Total Investment Cost gives the interest and amortization of the project of $9,642,700 x 0.0794 = $765,630 or about $766,000. The Operation and Maintenance Cost remains the same at $52,100 a year. The total average annual cost of the project is then $766,000 + $52,100 = $818,100.

The benefit-cost ratio, in this case, is $2,407,000/$818,100 = 2.9. The $488,000 in high priority benefits generated by the project make up about 60 percent of the total average annual cost. The remaining 40 percent is covered by a portion of the $1,919,000 in recreational benefits. The remaining recreational benefits bring the benefit cost ratio to 2.9.

There have been no expenditures on PED activities for the other alternatives.

APPENDIX B

SEDIMENT ANALYSIS

ASSOCIATED LABORATORIES
806 North Batavia - Orange, California 92868 - 714/771-6900
FAX 714/538-1209

CLIENT

Marine Research Consultants
Attn: Steve Dollar
4467 Sierra Dr.
Honolulu, Hi 96816

LAB NO. LL1455-01

REPORTED 10/23/96

SAMPLE Sediment

IDENTIFICATION M1-32
Ma'alaea Harbor

BASED ON SAMPLE Date Collected 10/01/96 @ None Given
As Submitted

RECEIVED 10/04/96

TCLP EXTRACTION - INORGANICS

	Limits (mg/l)	Method	Date/Analyst	Results (mg/l)
Arsenic	5.0	EPA 7060	10/15 MT	0.003
Barium	100.0	EPA 6010	10/15 MT	0.068
Cadmium	1.0	EPA 6010	10/15 MT	ND< 0.001
Chromium	5.0	EPA 6010	10/15 MT	ND< 0.003
Lead	5.0	EPA 7421	10/15 MT	0.019
Mercury	0.2	EPA 7470	10/15 NK	ND< 0.0004
Selenium	1.0	EPA 7740	10/15 MT	0.014
Silver	5.0	EPA 6010	10/15 MT	ND< 0.003

TCLP EXTRACTION - PESTICIDES

	Limits (mg/l)	Method	Date/Analyst	Results (mg/l)
Chlordane	0.03	EPA 8080	10/22 LN	ND< 0.01
Endrin	0.02	EPA 8080	10/22 LN	ND< 0.002
Heptachlor	0.008	EPA 8080	10/22 LN	ND< 0.001
Heptachlor Epoxide	0.008	EPA 8080	10/22 LN	ND< 0.001
Lindane	0.4	EPA 8080	10/22 LN	ND< 0.001
Methoxychlor	10.0	EPA 8080	10/22 LN	ND< 0.05
Toxaphene	0.5	EPA 8080	10/22 LN	ND< 0.01
PCB's	---	EPA 8080	10/22 LN	ND< 0.0001

Cont'd on Next page

Client: Marine Research Consultants
Lab No: LL1455-01

TCLP EXTRACTION - HERBICIDES

	Limits (mg/l)	Method	Date/Analyst	Results (mg/l)
2,4-D	10.0	EPA 8150	10/21 LN	ND< 0.05
2,4,5-TP (Silvex)	1.0	EPA 8150	10/21 LN	ND< 0.01

TCLP EXTRACTION - VOLATILES

	Limits (mg/l)	Method	Date/Analyst	Results (mg/l)
Benzene	0.5	EPA 8240	10/18 AS	ND< 0.01
Carbon Tetrachloride	0.5	EPA 8240	10/18 AS	ND< 0.01
Chlorobenzene	100.0	EPA 8240	10/18 AS	ND< 0.01
Chloroform	6.0	EPA 8240	10/18 AS	ND< 0.01
1,2-Dichloroethane	0.5	EPA 8240	10/18 AS	ND< 0.01
1,1-Dichloroethylene	0.7	EPA 8240	10/18 AS	ND< 0.01
Methyl-ethyl-ketone	200.0	EPA 8240	10/18 AS	ND< 0.01
Tetrachloroethylene	0.7	EPA 8240	10/18 AS	ND< 0.01
Trichloroethylene	0.5	EPA 8240	10/18 AS	ND< 0.01
Vinyl Chloride	0.25	EPA 8240	10/18 AS	ND< 0.06

TCLP EXTRACTION - SEMIVOLATILES

	Limits (mg/l)	Method	Date/Analyst	Results (mg/l)
o-Cresol	200.0	EPA 8270	10/21 CS	ND< 0.01
m-Cresol	200.0	EPA 8270	10/21 CS	ND< 0.01
p-Cresol	200.0	EPA 8270	10/21 CS	ND< 0.01
Cresol	200.0	EPA 8270	10/21 CS	ND< 0.01
1,4-Dichlorobenzene	7.5	EPA 8270	10/21 CS	ND< 0.01
2,4-Dinitrotoluene	0.13	EPA 8270	10/21 CS	ND< 0.05
Hexachlorobenzene	0.13	EPA 8270	10/21 CS	ND< 0.01
Hexachloro-1-3-butadiene	0.5	EPA 8270	10/21 CS	ND< 0.01
Hexachloroethane	3.0	EPA 8270	10/21 CS	ND< 0.01
Nitrobenzene	2.0	EPA 8270	10/21 CS	ND< 0.01
Pentachlorophenol	100.0	EPA 8270	10/21 CS	ND< 0.05
2,4,5-Trichlorophenol	400.0	EPA 8270	10/21 CS	ND< 0.05
2,4,6-Trichlorophenol	2.0	EPA 8270	10/21 CS	ND< 0.05
Pyridine	5.0	EPA 8270	10/21 CS	ND< 0.5

ASSOCIATED LABORATORIES, by:

Robert A. Webber
Vice President

RAW/gk

ASSOCIATED LABORATORIES
806 North Batavia - Orange, California 92868 - 714/771-6900
FAX 714/538-1209

CLIENT

Marine Research Consultants
Attn: Steve Dollar
4467 Sierra Dr.
Honolulu, Hi 96816

LAB NO LL1455-02

REPORTED 10/23/96

SAMPLE Sediment

IDENTIFICATION M3-4
Ma'alaea Harbor

BASED ON SAMPLE Date Collected 10/01/96 @ None Given
As Submitted

RECEIVED 10/04/96

TCLP EXTRACTION - INORGANICS

	Limits (mg/l)	Method	Date/Analyst	Results (mg/l)
Arsenic	5.0	EPA 7060	10/15 MT	0.002
Barium	100.0	EPA 6010	10/15 MT	0.050
Cadmium	1.0	EPA 6010	10/15 MT	ND< 0.001
Chromium	5.0	EPA 6010	10/15 MT	ND< 0.003
Lead	5.0	EPA 7421	10/15 MT	0.009
Mercury	0.2	EPA 7470	10/15 NK	ND< 0.0004
Selenium	1.0	EPA 7740	10/15 MT	0.014
Silver	5.0	EPA 6010	10/15 MT	ND< 0.003

TCLP EXTRACTION - PESTICIDES

	Limits (mg/l)	Method	Date/Analyst	Results (mg/l)
Chlordane	0.03	EPA 8080	10/22 LN	ND< 0.01
Endrin	0.02	EPA 8080	10/22 LN	ND< 0.002
Heptachlor	0.008	EPA 8080	10/22 LN	ND< 0.001
Heptachlor Epoxide	0.008	EPA 8080	10/22 LN	ND< 0.001
Lindane	0.4	EPA 8080	10/22 LN	ND< 0.001
Methoxychlor	10.0	EPA 8080	10/22 LN	ND< 0.05
Toxaphene	0.5	EPA 8080	10/22 LN	ND< 0.01
PCB's	---	EPA 8080	10/22 LN	ND< 0.0001

Cont'd on Next page

Client: Marine Research Consultants
Lab No: LL1455-02

TCLP EXTRACTION - HERBICIDES

	Limits (mg/l)	Method	Date/Analyst	Results (mg/l)
2,4-D	10.0	EPA 8150	10/21 LN	ND< 0.05
2,4,5-TP (Silvex)	1.0	EPA 8150	10/21 LN	ND< 0.01

TCLP EXTRACTION - VOLATILES

	Limits (mg/l)	Method	Date/Analyst	Results (mg/l)
Benzene	0.5	EPA 8240	10/18 AS	ND< 0.01
Carbon Tetrachloride	0.5	EPA 8240	10/18 AS	ND< 0.01
Chlorobenzene	100.0	EPA 8240	10/18 AS	ND< 0.01
Chloroform	6.0	EPA 8240	10/18 AS	ND< 0.01
1,2-Dichloroethane	0.5	EPA 8240	10/18 AS	ND< 0.01
1,1-Dichloroethylene	0.7	EPA 8240	10/18 AS	ND< 0.01
Methyl-ethyl-ketone	200.0	EPA 8240	10/18 AS	ND< 0.01
Tetrachloroethylene	0.7	EPA 8240	10/18 AS	ND< 0.01
Trichloroethylene	0.5	EPA 8240	10/18 AS	ND< 0.01
Vinyl Chloride	0.25	EPA 8240	10/18 AS	ND< 0.06

TCLP EXTRACTION - SEMIVOLATILES

	Limits (mg/l)	Method	Date/Analyst	Results (mg/l)
o-Cresol	200.0	EPA 8270	10/21 CS	ND< 0.01
m-Cresol	200.0	EPA 8270	10/21 CS	ND< 0.01
p-Cresol	200.0	EPA 8270	10/21 CS	ND< 0.01
Cresol	200.0	EPA 8270	10/21 CS	ND< 0.01
1,4-Dichlorobenzene	7.5	EPA 8270	10/21 CS	ND< 0.01
2,4-Dinitrotoluene	0.13	EPA 8270	10/21 CS	ND< 0.05
Hexachlorobenzene	0.13	EPA 8270	10/21 CS	ND< 0.01
Hexachloro-1-3-butadiene	0.5	EPA 8270	10/21 CS	ND< 0.01
Hexachloroethane	3.0	EPA 8270	10/21 CS	ND< 0.01
Nitrobenzene	2.0	EPA 8270	10/21 CS	ND< 0.01
Pentachlorophenol	100.0	EPA 8270	10/21 CS	ND< 0.05
2,4,5-Trichlorophenol	400.0	EPA 8270	10/21 CS	ND< 0.05
2,4,6-Trichlorophenol	2.0	EPA 8270	10/21 CS	ND< 0.05
Pyridine	5.0	EPA 8270	10/21 CS	ND< 0.5

ASSOCIATED LABORATORIES, by:

Robert A. Webber
Vice President

RAW/gk

APPENDIX C

COASTAL ZONE MANAGEMENT

CEPOD-ET-PP 21 May 1996

INFORMATION PAPER

SUBJECT: A Report on Alternative 6, Ma'alaea Harbor, Maui, Hawaii

1. BACKGROUND: A Report on Alternative 6, Ma'alaea Harbor, Maui, Hawaii. In response to public concerns for the conservation of surf sites, an interior mole concept, known as Alternative 6 and shown as figure 1, was formulated. It was first introduced in Section 8, Alternatives Considered for Impact Mitigation, of the report entitled , "Ma'alaea Harbor, Evaluation of Project Impacts on Surf Sites" prepared by Moffatt & Nichol, Engineers, dated August 1992. This report considered only the subject of impacts to surfing and not other parameters.

2. WAVE TYPES AND CONDITIONS:

a. Types affecting the Hawaiian Islands:

(1) NORTHEAST TRADE WAVES - These waves are generated by the northeasterly trade winds that prevail approximately 75% of the year. These waves are typically 4 to 12 feet with 6 to 10 second periods.

(2) NORTH PACIFIC SWELL - These long-period swells are generated from North Pacific extratropical cyclones. These large waves have heights in excess of 20 feet and periods of 10 to 20 seconds.

(3) KONA STORM WAVES - Kona storm waves generally approach the islands from the south or southwest. A Kona storm is a large, low-pressure system that forms to the south of the islands. The waves are typically 10 to 15 feet with periods of 8 to 10 seconds.

(4) SOUTHERN HEMISPHERE SWELL - These waves are generated in the Southern Hemisphere, most frequently during the Antarctic winter months between April and November. After these waves are generated, they travel thousands of miles across the ocean to the islands. Wave heights are generally 3 to 6 feet with periods of 14 to 22 seconds.

(5) TROPICAL STORMS AND HURRICANES - Tropical storms and hurricanes are another source of waves for the Hawaiian Islands. These storms are generally formed off the coast of Mexico and travel westward through the equatorial region and occasionally pass close to or through the island chain. Deepwater wave heights in excess of 40 feet can be generated by these storms.

b. Conditions Characteristic to Ma'alaea Harbor: Since the Ma'alaea project site is located on the south side of the island of Maui, it is only exposed to waves from the Kona storms, Southern Hemisphere and tropical storms and hurricanes. The site is exposed to waves generated from 160 degrees (south-southeast) to 185 degrees and also exposed to waves generated from between 213 degrees through 217 degrees. The gap in the exposure is due to island-sheltering effects from the island of Kaho'olawe. It is these conditions that cause the navigation hazards and damages to the vessels within the harbor.

3. PREVIOUS STUDIES:

a. CERC Wave Response Report: The U.S. Army Corps of Engineers' Coastal Engineering Research Center (CERC) of the Waterways Experiment Station (WES) in Vicksburg, Mississippi studied that use of an interior mole structure at Ma'alaea utilizing a wave response model. The results of this study were documented in Miscellaneous Paper, CERC-94-17, "Wave Response of Proposed Improvement Plan 6 to the Small Boat Harbor at Ma'alaea, Maui, Hawaii", dated September 1994. The steady state, numerical, hybrid element model focused on the oscillation conditions within the berthing area. The study concluded that Alternative 6 was satisfactory in providing the harbor (berthing area) with adequate wave protection but that navigation was potentially more dangerous during high wave conditions. It also concluded that Alternative 6 can potentially lead to a significant increase in the amplitude of harbor oscillations. These oscillations are can potentially cause mooring problems within the basin.

b. Environmental Documentation: The navigation safety deficiency associated with Alternative 6 was also addressed in the Draft and Final Supplemental Environmental Impact Statement

(SEIS). The SEIS recognized that this safety deficiency is focused on the control of the vessels while entering the entrance channel under a breaking stern sea condition. It is under these conditions that a vessel could experience broaching, engine failure, swamping and possible collision with the internal rock mole.

c. CERC Supplemental Memorandum: The U.S. Army WES, Hydraulics Laboratory, Navigation Division MFR, dated 9 April 1996 and entitled "Evaluation of Navigation Conditions at Ma'alaea Small Boat Harbor" (Encl 1) was completed at the Pacific Ocean Division's request. This summarized the analysis of the Alternative 6 configuration and concluded that it does not provide any protection to the harbor entrance from incoming waves. Furthermore since vessels within this area would be traveling at slow speeds a situation could develop where the vessel could be driven into the interior mole due to the following waves. Following waves are defined as waves that are traveling in the same direction as the vessel. If the wave speed exceeds the vessel speed, the wave will interact with the stern of the vessel first then proceed along the hull to the bow. The WES Report discusses the wave length in terms of Ls which is the length of vessel. Basically the report concludes that when the wave length exceeds 1/2Ls, in this case 20 feet, then the vessel will experience a loss of maneuverability. In almost all existing southerly wave conditions at the harbor site, the wave lengths exceed the 1/2Ls threshold and could cause a loss of vessel control.

4. COAST GUARD NAVIGATION GUIDANCE: The U.S. Coast Guard Commandant Instruction, dated 6 July 1985 and entitled "Boat Crew Seamanship Manual," sets forth standards for approved Coast Guard standards for conducting boat operations. This manual discusses the boat handling characteristics of the standard Coast Guard vessels including the handling characteristics of the 41 feet UBT Coast Guard vessel which is compatible in size to the design vessel for the Ma'alaea project. In this section there is a separate section that is entitled "Running before a Sea." This section reads as follows:

a. "Very careful handling is required when running in a following sea." The 41' UBT tends to slip down the back of seas and heel strongly. When stern seas exceed eight feet, the rudder is sluggish. If at all possible, avoid running directly before a swell. Make your heading at a 15 degree angle to the swells. The boat's small well deck makes swamping much less likely than in the earlier boats where the well deck includes the engine spaces, but the possibility is not eliminated.

b. In waves with a wide, regular pattern, ride on the back of the swell. Never let the boat ride on the front of the wave. The boat's tendency will be to dig in at the bow and "pitchpole" or come broadside to the sea and "broach." (See Figures 8-45 thru 8-48, Encl 2)

c. The average sea runs at 20-30 knots. Position the 41' UTB on the "back" of the wave. If you feel the boat being pulled back towards the following sea, open the throttles, it the boat continues being sucked back, be alert for "mushy" helm response and higher engine whine. As soon as either happens, BACK OFF the throttles, then apply FULL THROTTLES and try to kick out of the wave. If you are running with the sea and have "white water" gaining astern, you must either gain "sternway" before the water reaches the screws and rudder or get the bow into it with "headway."

d. Another section within this manual entitled "Running an Inlet" contains the following guidance: "Operation in a following sea, especially a breaking sea, involves the risk of having the stern lifted up and rammed forward by the onrushing swell or breaker. The result, surfing down the face of a wave, has always been recognized as an extremely dangerous situation, one which is nearly impossible to control, and quite often ends up forcing the boat to "broach" and roll over or to "pitchpole."

e. From the analysis of above guidance contained in the Coast Guard Seamanship Manual, it is clear that the navigation of a vessel in following seas can be hazardous within itself. The addition of a rock structure aligned parallel to the channel further increases the hazards by adding a possible collision with the rock structure by the vessel.

5. RELATED NAVIGATIONAL EXPERIENCES:

a. On 23 April 1996, a telephonic discussion was held with BM3 Stalhut, a member of the U.S Coast Guard stationed at Coast Guard Station, Maui, which is located within Ma'alaea Bay. Mr. Stalhut stated that he has lived on Maui for 8 years and has been stationed at Ma'alaea for the last 3 years and is very familiar with the varying navigational conditions at the harbor site. After explaining the concept of an interior mole, Mr. Stalhut was very emphatic that because of the reduced control a vessel operator experiences during following seas, the interior mole would be a hazard and recommended against this type of alternative. He further stated that he was familiar with and supported the recommended Federal plan for improving the Ma'alaea Harbor.

b. A number of years ago, a large sight seeing vessel lost control while entering Kewalo Basin during a large south swell. This vessel was turned 90 degrees (broached) in the channel by a wave, the engine lost power, passengers on board were injured because of broadside impacts of the waves. A surfer in the area lost his life during this incident. Many more lives could have been lost if the vessel had not been restarted but was driven into the rocks or capsized. This was a real life scenario of accidents that are likely to occur under Alternative 6 or any other interior mole proposal.

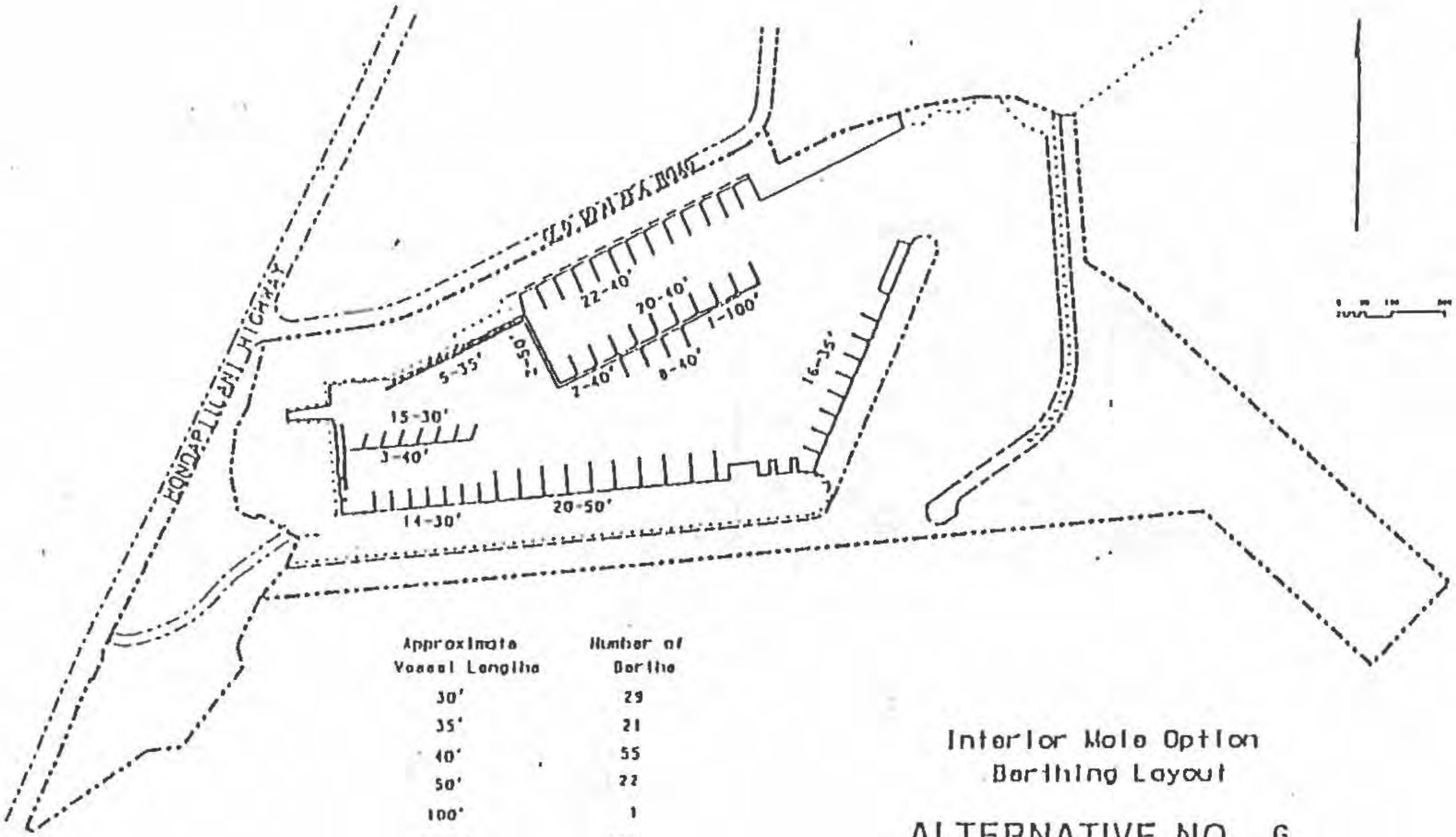
6. OTHER CONSIDERATIONS

a. Economic Feasibility: The Alternative 6 configuration precludes the maximum utilization of the interior harbor area. The State of Hawaii, Department of Transportation, Harbors Division in conjunction with representatives of the present harbor users estimated that the berthing capacity of this alternative would be approximately 93 to 128 berths as compared to 220 berths under the recommended alternative. This small increase in harbor capacity from the existing 87 berths would produce a low amount of general navigation benefits. Clearly with a reduction of the number of berths as compared to the recommended alternative, Alternative 6 would not to economically feasible. There would be no federal interest in a project not achieving appropriate net benefits.

b. Water Quality: The U.S. Army Corps of Engineers Miscellaneous Paper, CERC-95-8, dated September 1995 and entitled "Numerical Hydrodynamic Modeling and Flushing Study at Ma'alaea Harbor, Maui, Hawaii," reported on the harbor circulation numerical model that included Alternative 6 and the results showed that the flushing period of the harbor would increase from 2.9 days for the existing condition, 3.3 days for the recommended plan and 6.3 days for Alternative 6. The EPA's criteria for coastal marina flushing is five days. Implementation of Alternative 6 would result in a project exceeding the EPA circulation criteria.

7. CONCLUSION:

Based upon principally safety and economic considerations as discussed in detail above, the U.S. Army Corps of Engineers cannot recommend or support the implementation of Alternative 6.

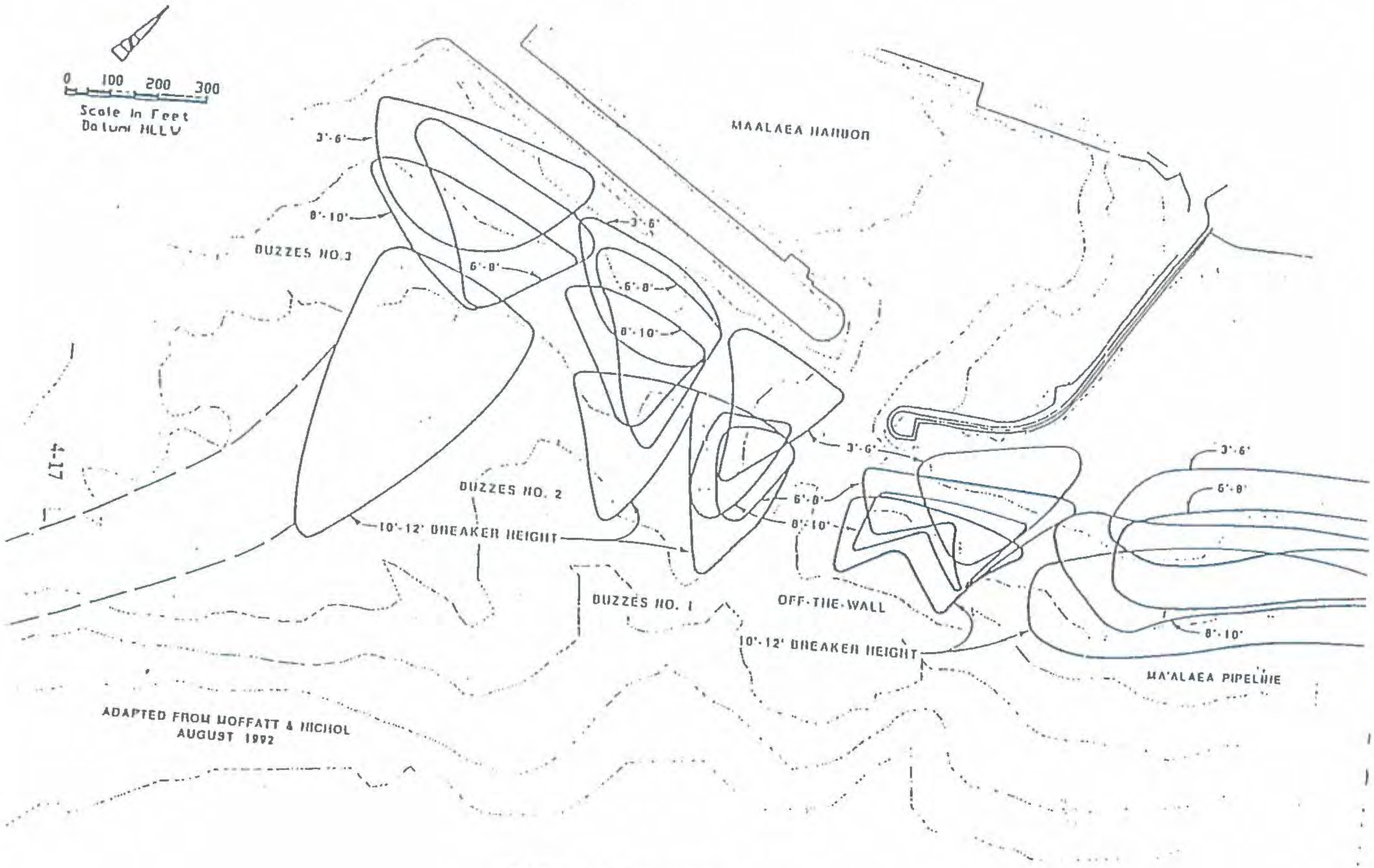


Approximate Vessel Lengths	Number of Berths
30'	29
35'	21
40'	55
50'	22
100'	1
Total	128

Interior Mole Option
Berthing Layout

ALTERNATIVE NO. 6
(Eliminated from Detailed Consideration)

Figure 1



SURF BREAK LOCATIONS

Figure 2

DEPARTMENT OF THE ARMY
WATERWAYS EXPERIMENT STATION, CORPS OF ENGINEERS
3909 HALLS FERRY ROAD
VICKSBURG, MISSISSIPPI 39180-6199

REPLY TO
ATTENTION OF

CEWES-HN-S (1110-2-1150a) 9 April 1996

MEMORANDUM FOR Commander, U.S. Army Engineer Division, Pacific Ocean, ATTN: CEPOD-ED-PH (Mr. Stan Boc), Building 230, Ft. Shafter, HI 96858-5440

SUBJECT: Evaluation of Navigation Conditions at Maalaea Small Boat Harbor

1. References.

a. CEPOD-ED-PH memorandum, 25 March 1996, subject: Maalaea Small Boat Harbor.

b. Telephone conversation on 27 March 1996 between Mr. Stan Boc of CEPOD-ED-PH and Mr. Ronald Wooley of this office.

2. The U.S. Army Engineer Waterways Experiment Station (WES) is conducting experiments to determine the response of small boats in various wave environments. Although this research effort is not complete, sufficient data have been collected to provide some guidance on the plans presented in reference 1a. Experiments have been conducted with the following conditions:

a. Vessel length, L_s = 40 ft.

b. Vessel draft, T= 5.24 ft.

c. Water depth (h/T) = 1.5 and 3.8.

d. Wave length, L_w = 1/2Ls, Ls, and 2Ls.

e. Vessel speed, V_s = 4, 6, and 8 knots.

f. Wave height, H_w = varied from 1-5 ft.

Experiments are being conducted with different length vessels; however, these data have not been processed and evaluated.

3. In the referenced telephone conversation, Mr. Boc stated that the waves generally come out of the south with a magnitude of 3-5 ft. During storms, the magnitude of the waves can be significantly higher; however, a wave height of 3-5 ft should be used for design of the harbor entrance. Mr. Boc also stated that the harbor entrance is a no wake zone; therefore, the vessels will be moving at a slow speed.

4. Alternative 6, which is an interior mole design, does not provide any protection to the harbor entrance from waves coming out of the south. Waves could move into the harbor entrance and continue along the

interior mole. This would create a following wave environment for vessels approaching and entering the harbor. Our research indicates a vessel's controllability ranged from marginal to none depending on the combination of wave length, wave height, and vessel speed. In following waves, wave height was not the most important parameter influencing the vessel's behavior. Vessel speed and wave length were the most influential parameters. No controllability problems were present at the highest speed (8 kts) or the shortest wave length ($1/2L_s$). When the speed of the vessel is less than 8 kts and the wave length is greater than $1/2L_s$ the vessel begins losing maneuverability. At vessel speeds of 4 kts or less, the vessel stops responding to the rudder. This could create a situation where the vessel would be pushed into the interior mole due to the following waves and the length of the entrance channel. There is also a possibility that the following waves could cause the vessel to broach.

5. The breakwater design shown in Figure 8 of reference 1a would provide some protection for a vessel approaching the entrance to the channel. A vessel should be able to approach the breakwater with sufficient speed to maintain rudder control and then, when it moves into the protection of the breakwater, reduce speed and enter the harbor at no-wake speed with full control for a wide range of wave conditions.

6. This evaluation is based on experiments conducted in an open water environment with no reflected waves. The geometry of the harbor entrance and the bathymetry of the channel approaching the harbor could have a significant influence on the behavior of the vessel. A site specific physical model study could be used to provide a more comprehensive evaluation of navigation conditions for vessels entering and leaving the harbor with the two designs. The model would reproduce the harbor entrance, the approach bathymetry, and the wave environment.

7. If you have questions regarding this evaluation, please contact Mr. Ronald Wooley at (601) 634-3340.

FOR THE DIRECTOR:

Richard A. Sager

RICHARD A. SAGER
Acting Director, Hydraulics Laboratory

C

Department of the Army
U.S. Army Engineer Division, Pacific Ocean
Ft. Shafter, Hawaii 96858-5440

PLANNING DIVISION
FACSIMILE COVER SHEET

FAX NUMBER: (808) 841-1581

DATE: March 25, 1996

SUBJECT: Maalaea Small Boat Harbor

TO: Derek Staha
(Name)

WES
(Agency)

601-634-2998
(Telephone Number)

601-634-3218
(FAX Number)

FROM: Stan Boc
(Name)

CEPOD-ED-PH
(Office Symbol)

(808) 438-1907
(Telephone Number)

MESSAGE:

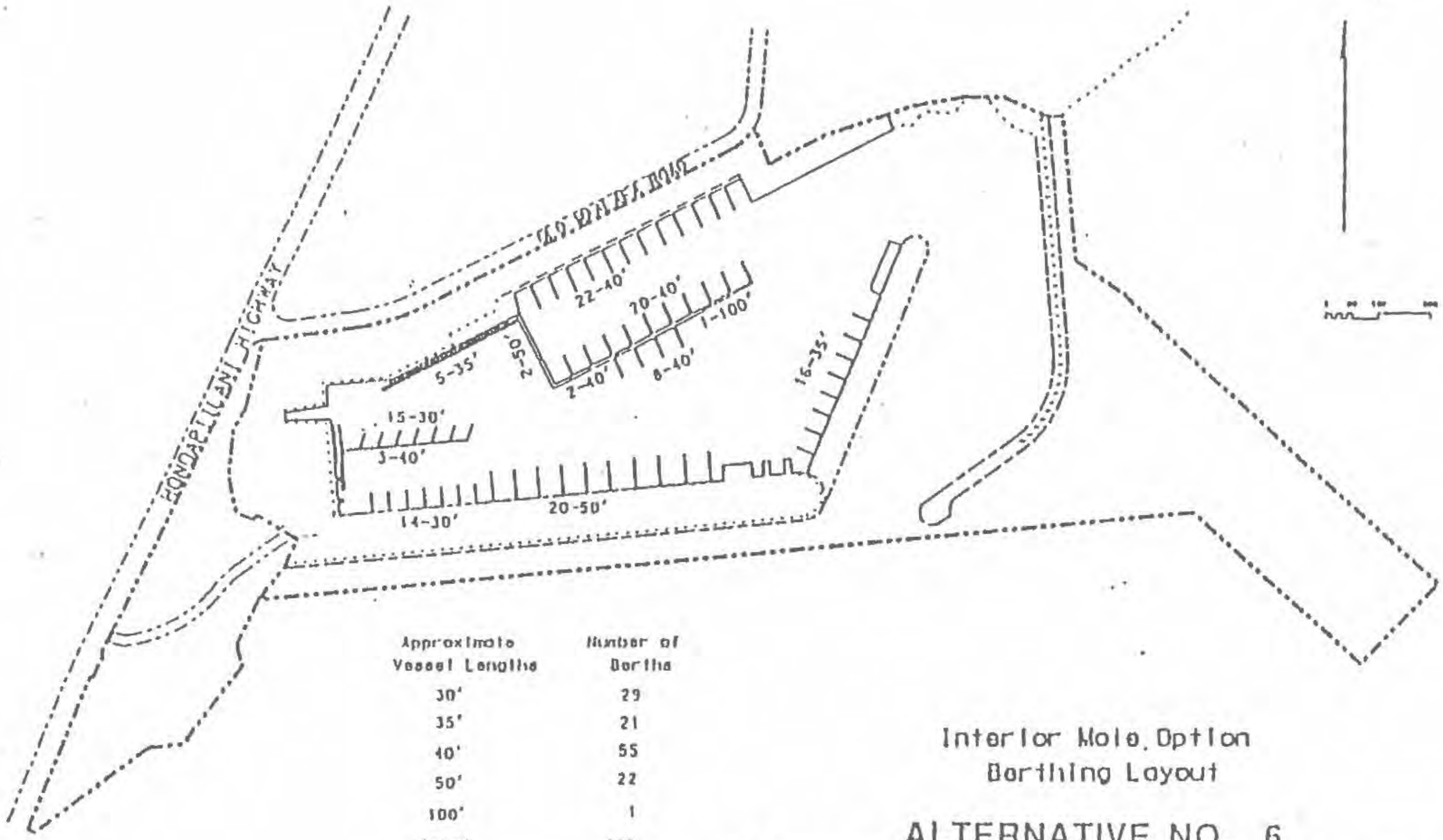
Attached is the info as we discussed. I appreciate any help that you can provide. Call me at 808-438-9526 or fax at 808-841-1581.

Thanks

Stan Boc

Number of pages transmitted (including cover sheet) 4

NOTE: If all pages of this transmittal were not received or if the pages are illegible, please notify the sending office.



Approximate Vessel Lengths	Number of Berths
30'	29
35'	21
40'	55
50'	22
100'	1
Total	128

Interior Mole Option
Berthing Layout

ALTERNATIVE NO. 6
(Eliminated from Detailed Consideration)

Figure 15

a:\maa4.dgn Aug. 4, 1993 07:16:09

for the south mole. The State's Plan would increase the harbor capacity to 220 vessels.

The State's planned improvements would require 33,200 cubic yards of coral fill and 20,680 tons of stone or concrete. Approximately 7,000 cubic yards would be dredged from the berthing areas.

If the State Department of Transportation's programmed highway widening project were delayed, intersection improvements would be made to Honoapiilani Highway and Ma'alaea Wharf Road. East mole improvements would include construction of berths, access to them, and landscaping. Construction of the east revetted mole would require construction of a storm drain to conduct rainwater through the mole. A comfort station would be constructed near the Coast Guard Station. Finally, parking and picnic areas would be developed at the west end of the harbor.

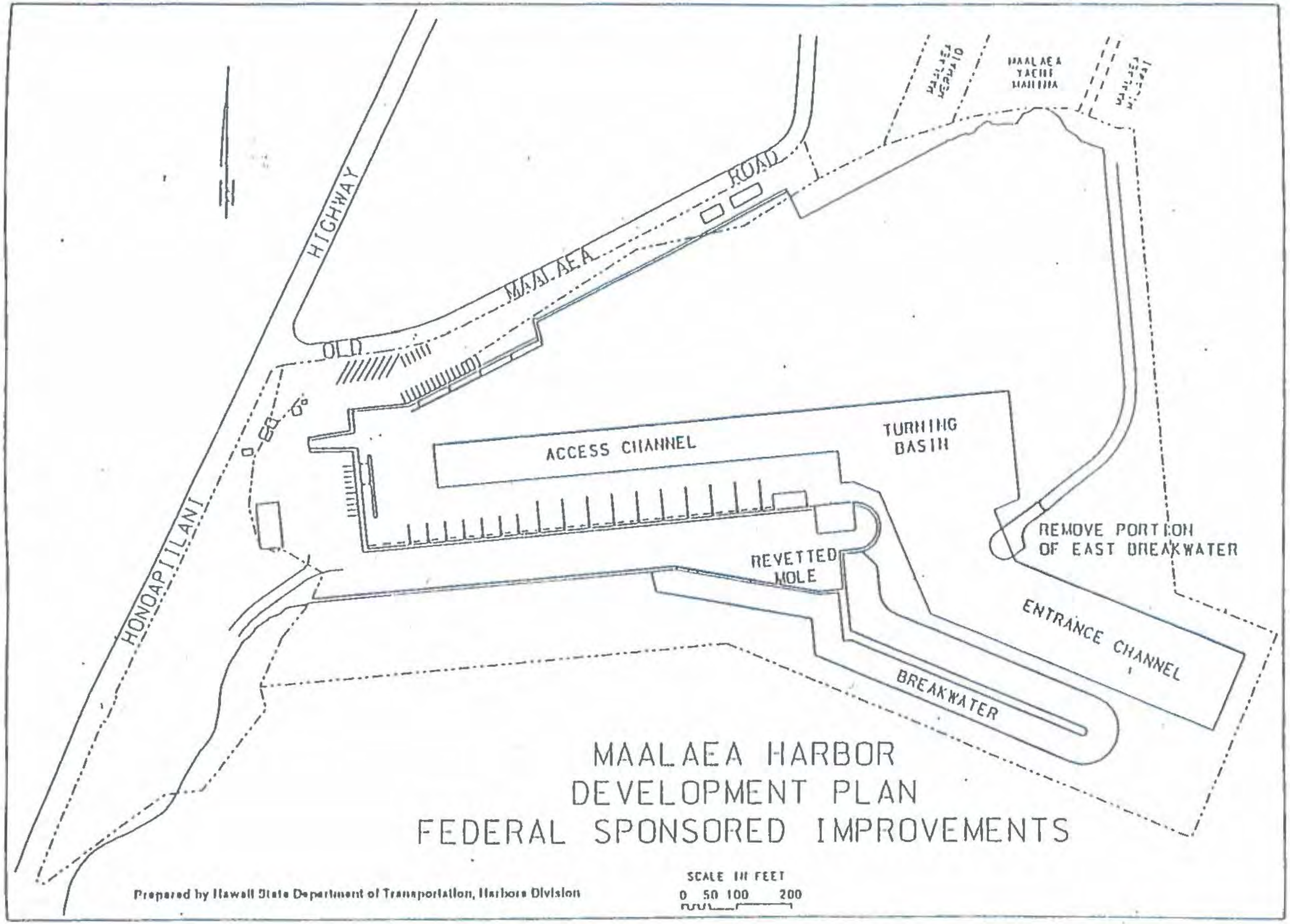
The completion of all improvements is scheduled to take about 10 years (Table 2). Initial funding has already been provided in the FY88-89 Biennium. The schedule for construction is dependent upon the completion of the Federal navigation improvements.

3.2.2 FEDERAL ALTERNATIVES CONSIDERED IN DETAIL

Alternative Plan 1. This alternative (Figure 8) is similar to the selected plan identified in the 1980 GDM/FEIS. This new plan would provide an extension to the existing south breakwater 620 feet long; an entrance channel 610 feet long, varying in width from 150 feet to 180 feet, and varying in depth from 12 to 15 feet; a 1.7-acre turning basin, 12 feet deep; a 720-foot-long, 80-foot-wide and 8-foot-deep main access channel; and the addition of a revetted mole 400 feet long on the seaward side of the existing south breakwater for a bus turn-around. The south breakwater revetted mole has been substantially reduced in area from the design in the 1980 selected plan.

About 80 feet of the existing east breakwater head would be removed, and about 27,000 cubic yards of material would be dredged from the harbor basin, including the turning basin, access channel, and new entrance channel. About 11,200 cubic yards of that amount would be used for construction of the breakwater extension and revetted mole. An additional 56,700 tons of stone would be placed in the construction of the revetted mole. Modification of the aids to navigation would also be included in the federal project. Construction is expected to take approximately 26 months. The construction costs are estimated to be $8.45 million. Non-Federal costs are estimated at $2.48 million, for a total of $10.9 million.

Primary construction materials would consist of dredged material, basalt stone, and concrete. Material dredged from the entrance channel and harbor would be used to the extent possible in the construction of the breakwater extension. The stone material can be obtained from three commercial quarries on Maui. In addition, 23,900 cubic yards of concrete would be required for construction of armor units on the main breakwater. Figures 9, 10, and 11 show typical sections.



a:\maafedl.dgn May. 5, 1994 10:09:53

Figure 8

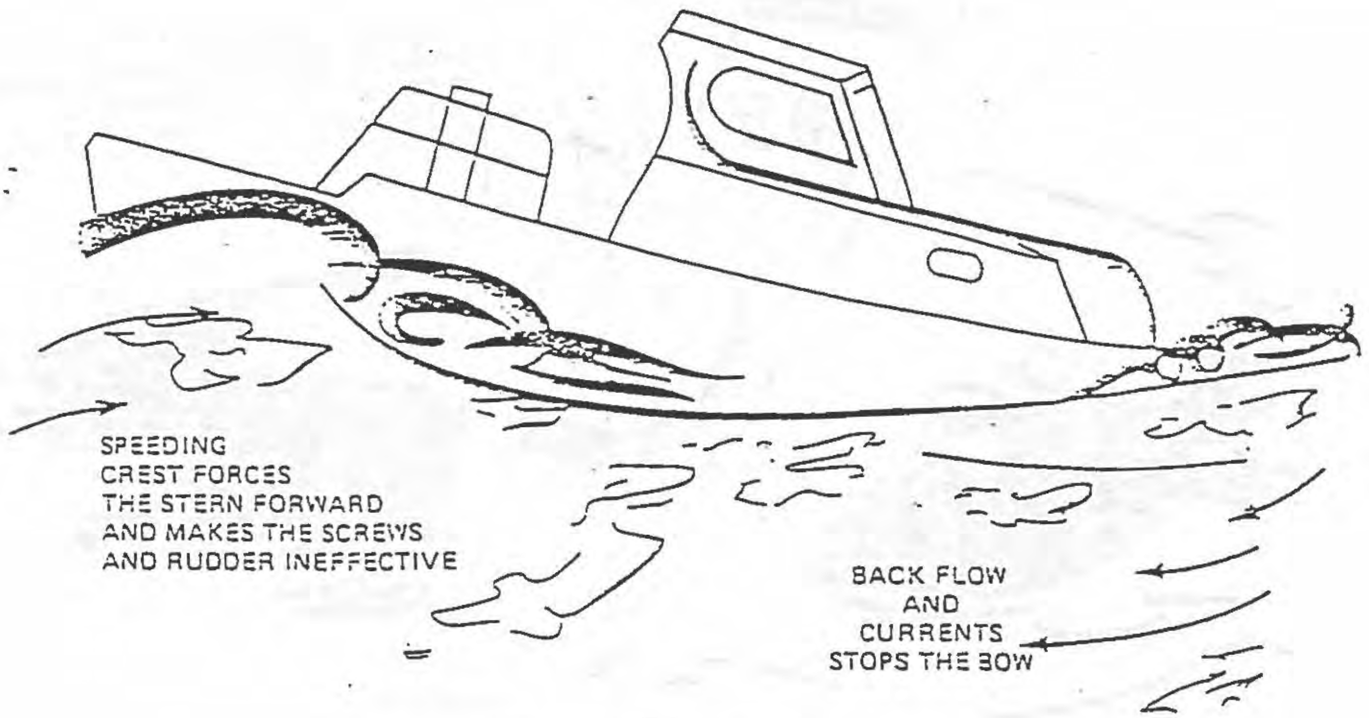


Figure [illegible]-25 Forces Creating a Movement (Turning Motion) Leading to Pitch Poling

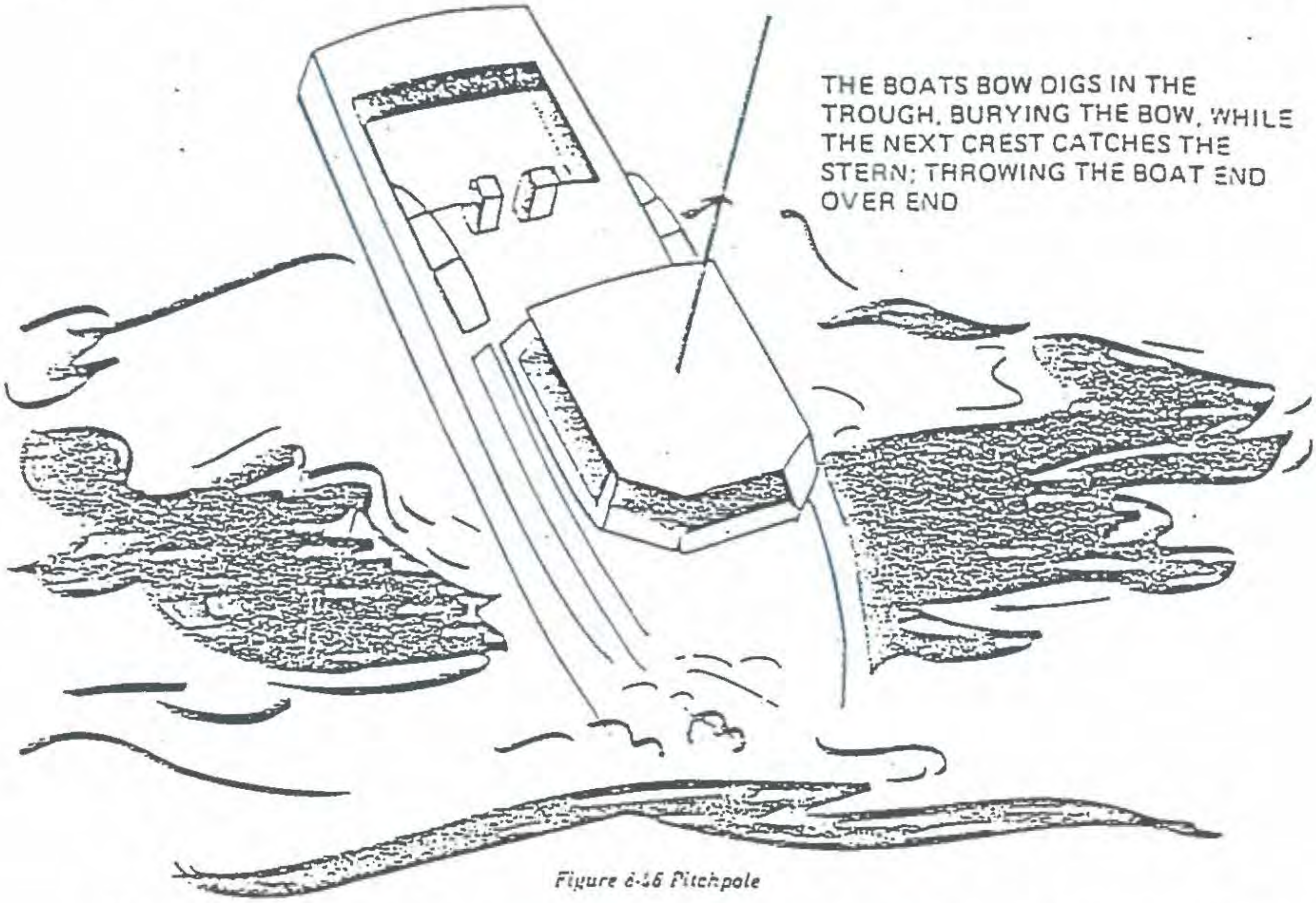


Figure 6-46 Pitchpole

e. If the sea shows a tendency to gather speed and accelerate to the point off breaking, keep the wave's crest ahead of you.

CAUTION

Keep ahead of breaking seas. Should you find that the sea is close to breaking astern, OPEN YOUR THROTTLES IMMEDIATELY. DO NOT WAIT until the wave overtakes you. At this point, you will have LOST CONTROL OF YOUR BOAT TO THE SEA.

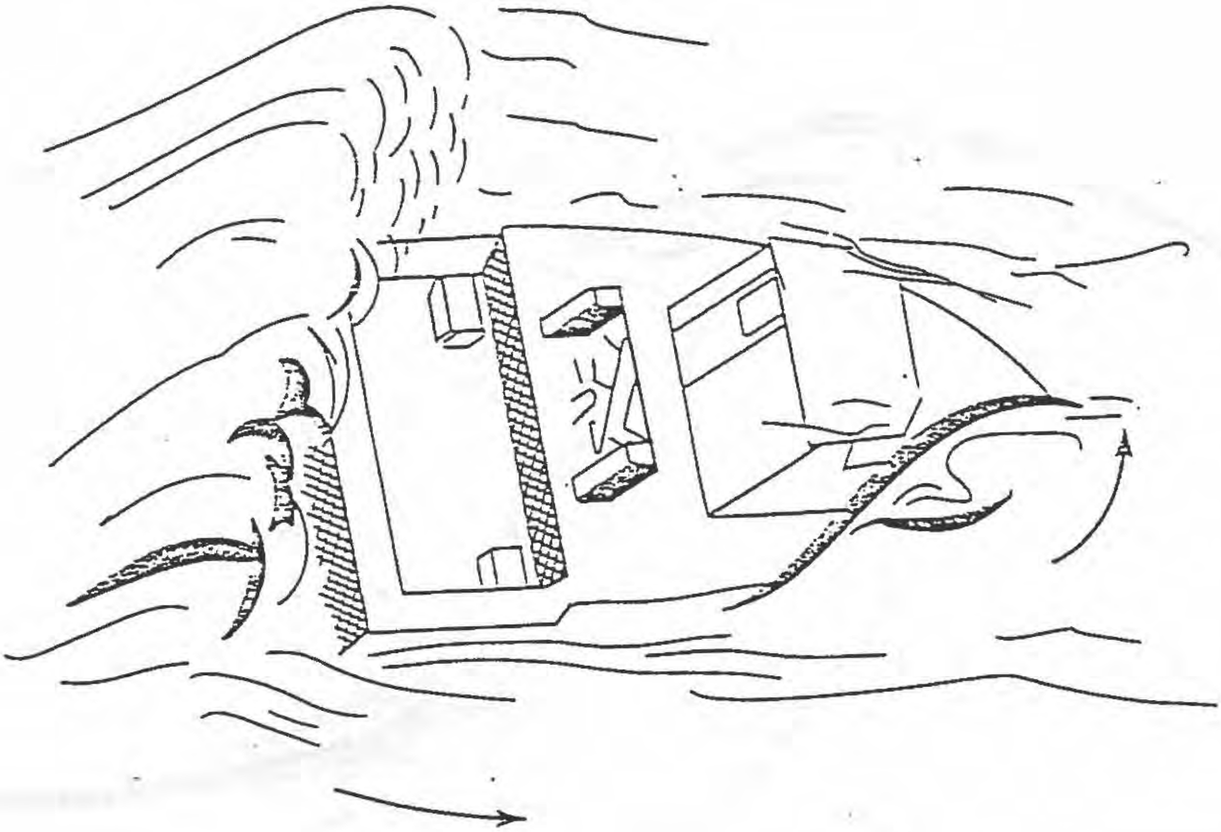


Figure 3-47 Forces Creating a Movement (Turning Motion) Leading to Broaching

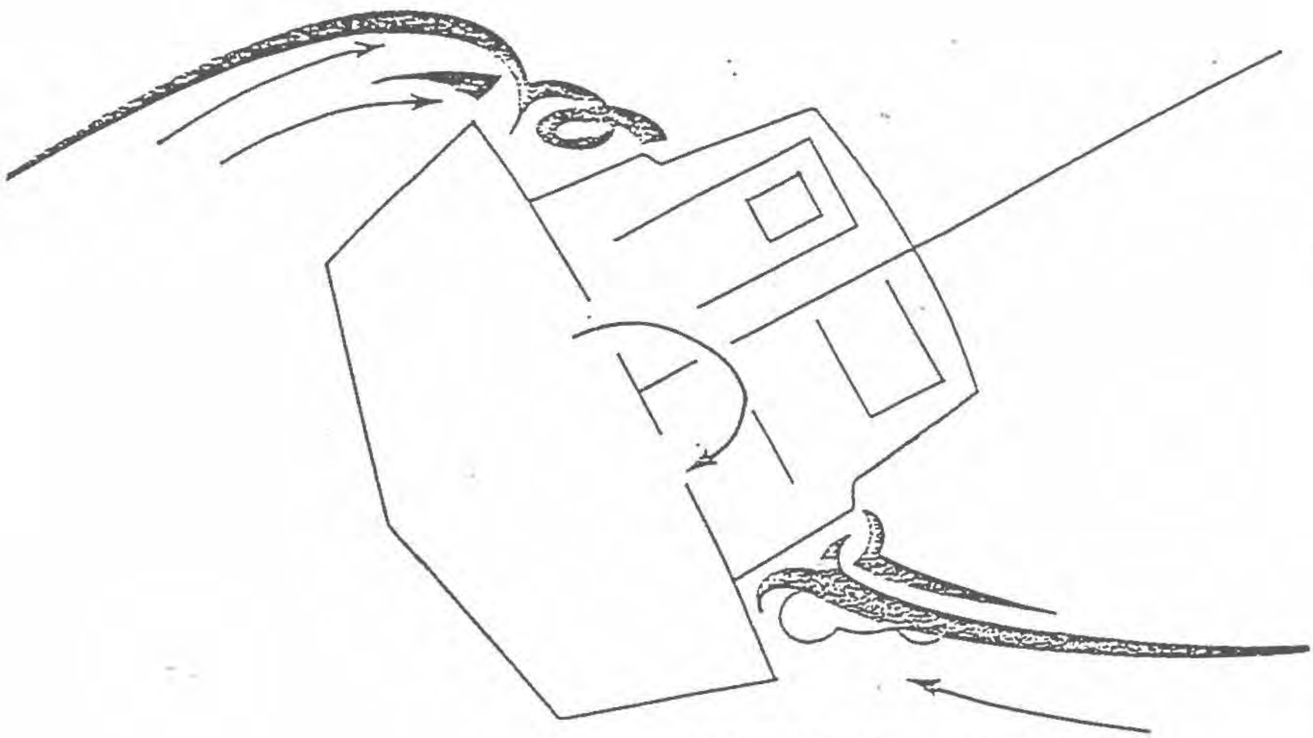


Figure 8-43 Broach

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

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

MICHAEL D. WILSON
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

DEPUTY DIRECTOR
GILBERT S. COLOMA-AGARAN

AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
CONSERVATION AND ENVIRONMENTAL AFFAIRS
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION PROGRAM
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

96-835

September 3, 1996

RECEIVED
16 SEP 1996
CEPOD-OC

Mr. Rick Egged, Administrator
Office of Planning
Department of Business, Economic
Development and Tourism
No. 1 Capitol District Building, 4th floor
250 South King Street
Honolulu, Hawaii 96813

Dear Mr. Egged:

Enclosed please find a draft mitigation plan developed to reduce environmental impacts to marine resources of the coastal ecosystem associated with the proposed expansion project for Maalaea Harbor, Maui. Environmental, recreational, and economic concerns that arose halted the Coastal Zone Management (CZM) consistency determination process. State and Federal agencies collaborated in developing this plan to address these concerns.

We are requesting that your Coastal Zone Management Program review this plan relative to possibly reconsidering an earlier finding of objection to a consistency determination (letter to Mr. Ray Jyo, Department of the Army, of October 14, 1994 from the former Office of State Planning).

Should your review find the mitigative measures favorable in terms of granting consistency, we request that the Army Corps of Engineers, Honolulu Engineering District and my office be so advised. Further, should no existing or additional measures require amendment, this draft document may be considered a final mitigation plan.

If there are any questions, please call Mr. Francis Oishi with the Division of Aquatic Resources at 587-0094.

Aloha,

Michael D. Wilson

Michael D. Wilson

Attachment

BENJAMIN J. CAYETANO
GOVERNOR
SEIJI F. NAYA
DIRECTOR
RICK EGGED
DIRECTOR OFFICE OF PLANNING

DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM

OFFICE OF PLANNING

No. 1 Capitol District Building, 250 South Hotel Street, 4th Floor, Honolulu, Hawaii 96813
Mailing Address: P.O. Box 3540, Honolulu, Hawaii 96811-3540

Telephone: (808) 587-2846
Fax: (808) 587-2848

Ref. No. P-6285

September 12, 1996

RECEIVED
18 SEP 1996
CEPOD-CO

Mr. Ray H. Jyo, P.E.
Director of Engineering
Department of the Army
U.S. Army Engineer District,. Honolulu
Building 230
Ft. Shafter, Hawaii 96858-5440

Dear Mr. Jyo:

Subject: Hawaii Coastal Zone Management (CZM) Program Federal Consistency for Improvements to the Maalaea Harbor, Maui

We have reviewed for Federal consistency your proposal to improve the Maalaea Harbor on Maui. We have also reviewed the draft mitigation plan prepared jointly by the State Department of Land and Natural Resources, the National Marine Fisheries Service and the U.S. Army Corps of Engineers. This plan was developed to reduce environmental impacts to marine resources of the coastal ecosystem associated with the project.

On the basis of the information included in the draft mitigation plan and its implementation, the project should satisfy our CZM concerns. We are, therefore, issuing our CZM consistency approval for this project. Because of the complex interrelationships of coastal environmental ecosystems and resources, we would appreciate your continued monitoring of the effectiveness of the mitigation plan during construction of the project and a progressive assessment of the measures. The latter would include an evaluation of the desirability of implementing additional mitigation measures, if needed.

This CZM consistency approval is not an endorsement of the project nor does it convey approval with any other regulations administered by any State or County agencies. Thank you for your cooperation in complying with Hawaii's CZM program. If you have any questions, please call Douglas Tom of the CZM Program at 587-2875.

Sincerely,

Rick Egged
Director
Office of Planning

cc: Michael D. Wilson

OFFICE	ACTION	INFO
Dir of Engrg	Tech	
Deputy		
Secretary		
Cont		
[illegible]		
[illegible]		
[illegible]		
[illegible]		
[illegible]		
[illegible]		

VEF · P Billington
CEPOD-OC

Mitigation Plan
for the
Maalaea Harbor for Light Draft Vessels
Maui, Hawaii
5 June, 1996

PREPARED FOR: State of Hawaii
Coastal Zone Management Program Division
Office of State Planning
Office of the Governor
P.O. Box 3540
Honolulu, Hawaii 96811-3540

PREPARED BY: State of Hawaii
Department of Land and Natural Resources
Division of Aquatic Resources
1151 Punchbowl Street
Room 330
Honolulu, Hawaii 96813

State of Hawaii
Department of Land and Natural Resources
Division of Boating and Ocean Recreation
333 Queen Street, Suite 300
Honolulu, Hawaii 96813

National Marine Fisheries Service
Pacific Area Office
2570 Dole Street
Honolulu, Hawaii 96822

U.S. Army Engineer District, Honolulu
Building 230
Ft. Shafter, Hawaii 96848-5440

ADVISED BY: State of Hawaii
Coastal Zone Management Program Division
Office of State Planning
Office of the Governor
P.O. Box 3540
Honolulu, Hawaii 96811-3540

Mitigation Plan
for the
Maalaea Harbor for Light Draft Vessels
Maui, Hawaii

On August 30, 1994, the U.S. Army Corps of Engineers, Honolulu Engineer District (HED), submitted to the Hawaii Coastal Zone Management (CZM) Program, Office of State Planning (OSP), its written determination that construction of the proposed Maalaea Harbor for Light Draft Vessels (the project or harbor improvements) was consistent to the maximum extent practicable with the State of Hawaii's CZM Program, and requested OSP's concurrence with that determination. The proposed federal harbor improvements project was specifically authorized by the U.S. Congress to be constructed by HED, and is locally-sponsored by the State of Hawaii Department of Land and Natural Resources (DLNR), Division of Boating and Ocean Recreation (DBOR).

By letters dated October 14 and November 4, 1994, OSP denied HED's request for concurrence in its consistency determination, and stated OSP's finding that construction of any of the four proposed alternative plans was not consistent to the maximum extent practicable with Hawaii CZM Program objectives and policies. OSP's two letters stated that as proposed, construction of the project conflicted with the CZM Program's Recreational Resources Objective and Policies, Coastal Ecosystem Objective and Policies, and its Economic Uses Objective and Policies. The OSP stated that it was available to assist in developing a proposal that complies with Hawaii's CZM Program (October 14, 1994 letter, pp. 2-3).

Because of the State's support for and sponsorship of the project, in December 1995 the Chair of DLNR, and the Director of the OSP and the Hawaii CZM Program, initiated an effort to develop additional mitigation for the proposed project's impacts. To that end, DLNR and OSP established a team with participants from DLNR's Division of Aquatic Resources (DAR), DBOR, and the CZM program. Also participating on the team were representatives from HED and the National Marine Fisheries Service (NMFS). The team's goal was to develop a draft plan to mitigate the proposed project's impacts on resources protected by the CZM Program's objectives and policies cited in OSP's denial of consistency. The team's draft mitigation plan is intended to provide enhancement and protection of coastal resources sufficient to provide a basis upon which the OSP can certify that the project is consistent with Hawaii's CZM Program. The draft mitigation plan is conceptual in nature and does not attempt to quantify in final form the proposed mitigation measures, nor to reanalyze previously documented alternatives performed through other studies. In fact, the impacted area, as illustrated by Figure 1, demonstrates the beneficial change from an initial concept to the current construction plans. The draft mitigation plan is set forth below. The plan

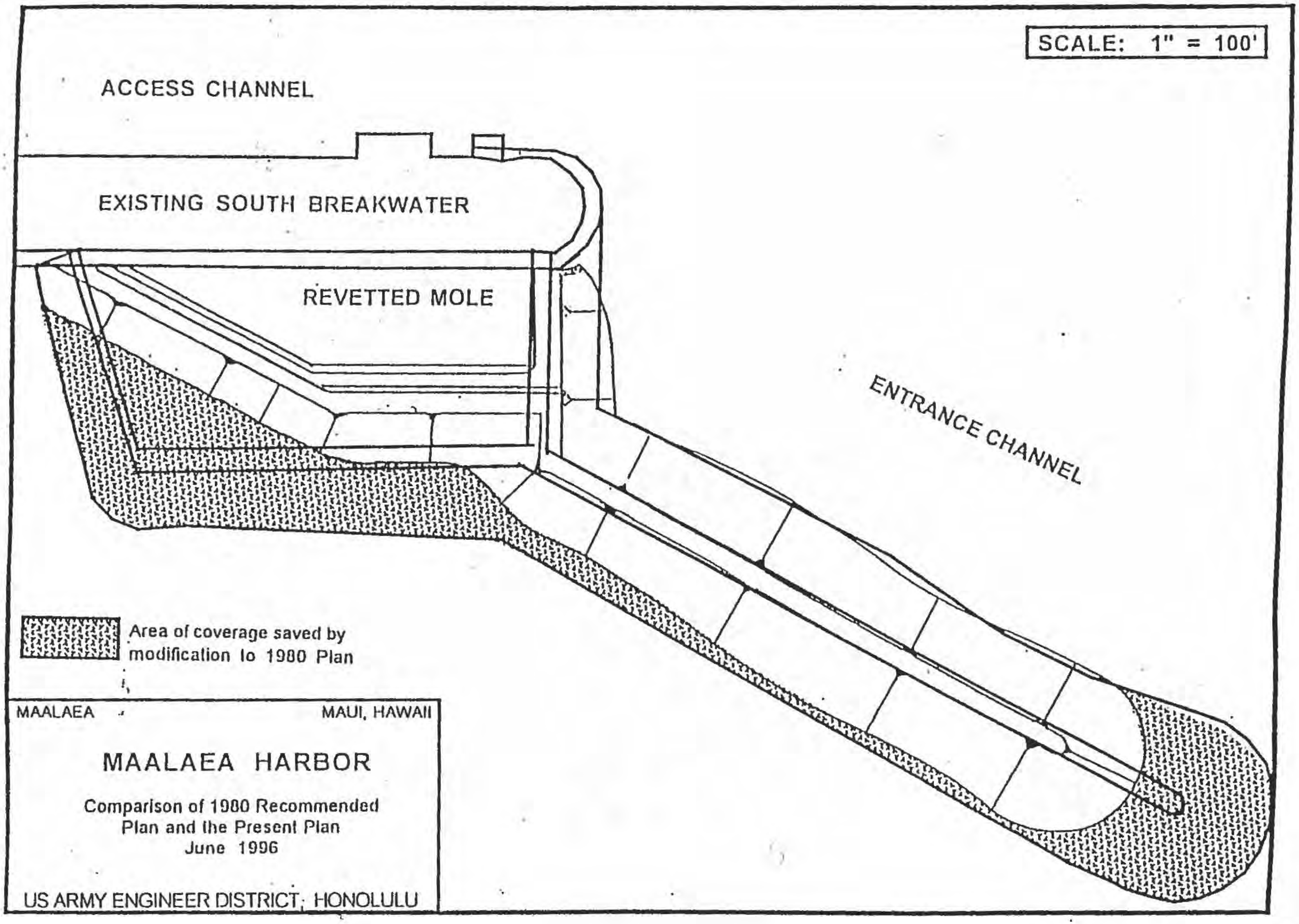

SCALE: 1" = 100'
ACCESS CHANNEL
EXISTING SOUTH BREAKWATER
REVETTED MOLE
ENTRANCE CHANNEL
Area of coverage saved by modification to 1980 Plan
MAALAEA
MAUI, HAWAII
MAALAEA HARBOR
Comparison of 1980 Recommended Plan and the Present Plan
June 1996
US ARMY ENGINEER DISTRICT, HONOLULU

FIGURE 1

describes the protected resources and the impacts expected, and proposes mitigation to compensate for those impacts. It is organized in accordance with the three CZM Program objectives and policies cited by OSP.

Finally, the team addresses the concern that an alternative harbor design (#6) that does not impact coral reefs or surf sites has not been considered fully. Attached is an information paper explaining why Alternative 6 (or other interior mole design) is not feasible (Enclosure 1).

1. Recreational Resources Objective and Policies.

The stated CZM program objective associated with recreational resources is to "(p)rovide recreational opportunities accessible to the public" (Hawaii CZM Program, July 1990, Objective 1., page B-1). Included in this resource category are surf sites and sandy beaches. Construction of the proposed project will destroy one surf site and alter a second surf site, and will destroy a small sandy beach within the existing harbor.

CZM policy protects these recreational resources by requiring "replacement of coastal resources having significant recreational value, including but not limited to surfing sites and sandy beaches, when such resources will be unavoidably damaged by development; or requiring reasonable monetary compensation to the State for recreation when replacement is not feasible or desirable," Hawaii CZM Program, July 1990, Recreational Resources Policy 1.(B)(ii), page B-1.

A. Surf Sites.

Wave breaking patterns at identified sites provide the opportunity for surfing, a recreational activity important to residents and visitors. Clark (1992) identified five named surf sites at Maalaea Harbor: Maalaea Pipeline, Off the Wall, and Buzz' 1, Buzz' 2, and Buzz' 3. According to the September 1992 Belt Collins report incorporating Clark's 1992 report, the density of use of these five surf sites is up to a maximum of 150+ persons total, with frequency of surfable conditions at a rough average of 50% of the time. The report defines surfable conditions as those which occur with a breaker height of greater than one foot, with waves that are plunging or spilling, and peel angles between 30 and 90 degrees. Table 1 shows the surf sites parameters from page 9 of the Belt-Collins report.

Implementation of the project will destroy Off the Walls and will slightly modify Buzz' 2. Maalaea Pipeline will not be affected, nor will Buzz' 1 and Buzz' 3. Replacement of the affected surf sites is not proposed.

SITES / PARAMETERS	Maalaea Pipeline	Off-the-Wall	Buzz's No. 1	Buzz's No. 2	Buzz's No. 3
quality of the waves	peel angle = 30-60 degrees breaker heights = 3 to 12 feet type = hollow plunging	peel angle = 30-80 degrees breaker heights = 3 to 12 feet type = hollow plunging	peel angle = 40-80 degrees breaker heights = 3 to 12 feet type = spilling/plunging	peel angle = 30-80 degrees breaker heights = 2 to 12 feet type = spilling	peel angle = 35-60 degrees breaker heights = 2 to 12 feet type = gently spilling
frequency of use	high	high	moderate	high	moderate
density of use	80	15	6	40	15
uniqueness	unique	unique	similar sites in the area	unique characteristics	similar sites in the area
ability level	beginners to experts	beginners to experts and bodyboarders	beginners to experts	beginners to intermediate and bodyboarders	beginners and bodyboarders
frequency of surfable conditions	55%	52%	21%	46%	53%

From Belt Collins & Associates
September 1992

Table 1
Site Parameters

The five surf breaks described above occur within the immediate vicinity of the harbor. Seven additional surf breaks occur in the area between McGregor Point and Kealia Pond (Clark (1992), Surfing Education Association (1971)). Clark described these as McGregor Point, Little Cape St. Francis, Haywood's Lot, Mudflats, Loading Zone, Hole-in-the-Wall, and Kealia. Clark estimated that these breaks could accommodate over eighty (80) surfers. The 1971 survey assessed the five harbor surf breaks as lower in value than the seven adjacent surf breaks listed above, (State Comprehensive Ocean Recreation Plan sub-area evaluation sheet). The 1971 survey identified 212 surf sites on Maui. The destruction of one surf site would diminish Maui's surf sites by 0.5%.

Mitigation.

As was reported in the FEIS (page 5-21), the impact to surf sites has been mitigated in part by downscaling the size of the seaward extension of the revetted mole at the base of the south breakwater extension. Prior to this design modification, the revetted mole extended seaward approximately 150 feet into Buzz' 2. The toe of the revetted mole is maintained within 100 feet of the existing structure. This modification limits development to an area out of the Buzz' 2 riding area. The revetted mole will be tapered from Station 0+00 to its full width at about Station 3+70, adding additional maneuvering area for surfers.

In addition, a recent materials change in the south breakwater extension will reduce previously forecast impacts to Buzz' 1 from slight to none. Instead of constructing the south breakwater extension with multiple layers of concrete armor units (dolos), a single layer of concrete armor units (core-loc) would be used. This change would narrow the breakwater footprint so that the area typically surfed at Buzz' 1 will not be impacted by construction of this feature (Figure 1).

The following additional mitigation will be implemented by HED and/or DBOR at the project site.

Amenities including easier access to the water via the east mole, as well as showers at the east and south moles will also be provided for surfers (DBOR).

Increased and diverse recreational opportunities for sport fishing, whale watching, diving, and snorkeling will also provide recreational mitigation for the loss of surfing opportunities near the project site.

Replacement of "Off the Wall" would be consistent with the CZM Program's Recreational Policy numbered 1.B.(ii). However, artificial replacement of surf sites requires modification of the sea bottom by methods including scraping/excavation, dredging, placement of fill or other artificial shoals in order to alter the bottom contours. The impact of these activities would be to smother or destroy additional marine habitat

Construction of the harbor as redesigned, with mitigation to reduce its impact on Buzz' 2, provides showers for surfers on both the east and south breakwaters, and provides better access to surf sites from both breakwaters, furthers the CZM Program's recreational resources objective and the following recreational policies. The harbor improvements with mitigation will help to "(p)rovide an adequate supply of shoreline parks and other recreational facilities suitable for public recreation" (1.(B)(iv), page B-1), and will "(e)ncourag(e) expanded public recreational use of county, state and federally owned or controlled shoreline lands having recreational value" (1.(B)(v), page B-1). CZM policy would be advanced by improving and expanding the existing harbor facility, since such improvement "(p)rotect(s) coastal resources uniquely suited for recreational activities that cannot be provided in other areas" (1(B)(i), page B-1). Harbor facilities are distinctly limited and not capable of being provided elsewhere, particularly on Maui. Project-related recreational opportunities include recreational boating, fishing, whale watching, and related recreational activities for which harbor facilities are required.

B. Sandy Beach

Hawaii's sand beaches are a highly regarded coastal resource for their aesthetic and recreational value. The 250 foot-long sand beach within the eastern end of Maalaea Harbor would be eliminated by construction of the proposed harbor improvements. This sand beach was removed from Hawaii's public beach inventory in the 1960s through acquisition and incorporation into Maalaea Harbor to provide access for construction and maintenance of the east breakwater. In-kind replacement of this beach was not then, and has not now been proposed.

According to the 1992 State of Hawaii Data Book, citing a 1962 survey, the island of Maui has 32.6 miles of sandy shoreline. 7.9 miles of this sandy shoreline is considered safe and suitable for swimming. If the sand beach within Maalaea Harbor is included in this latter category, its destruction would result in the elimination of 0.6% of the safe, suitable swimming beaches on Maui, although its location inside a harbor is neither a "safe" nor "suitable" place for swimming.

Mitigation.

The sand beach would be replaced with a revetted mole extending inside the existing east breakwater about 750 feet. This revetted mole is part of the State's plan for increasing berthing within the harbor. The revetted mole supports the project purpose and would also facilitate closer access to harbor waters for fishermen and to surf sites for surfers.

2. Coastal Ecosystems Objective and Policies.

The published CZM program objective associated with coastal ecosystems is to "(p)rotect valuable coastal ecosystems from disruption and minimize adverse impacts on all coastal ecosystems" (Hawaii CZM Program, July 1990, Objective 4., page B-2). Included in this resource category are corals and coral reefs, fishes, and algae, and federally protected species such as the humpback whale and the green sea turtle. Construction of the proposed project will destroy or adversely affect a total of about 12.9 acres of ocean substrate either within the existing harbor site, or immediately outside it. The total acreage of effects of 11.9 acres reported in the SEIS and the 18.5 acres in the final U.S. Fish and Wildlife Service (USFWS) Coordination Act report were based on the draft plans existing at the time of preparation of those reports. The present area of effect of 12.9 acres is based on the latest plans.

The Hawaii CZM Program includes the following policies to protect coastal ecosystems: "(i)mprove the technical basis for natural resource management" (4.(A), page B-2); "(p)reserve valuable coastal ecosystems of significant biological or economic importance" (4.(B), page B-2); "(m)inimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses, recognizing competing water needs" (4.(C), page B-2), and "(p)romote water quality and quality planning and management practices which reflect the tolerance of fresh water and marine ecosystems and prohibit land and water uses which violate state water quality standards" (4.(D), page B-2).

A. Coral Reef Ecosystem.

Corals, fishes, and algae are all important components of the marine ecosystem. Corals provide a structural function and add dimension to a reef's features. They also provide shelter to other marine animals and serve as a food source for fishes and marine invertebrates. Coral reefs provide protection, recreation, and commercial opportunities to the human population.

Within the marine ecosystem, reef fishes and algae are part of the food chain. Marine fishes provide food and recreation for humans. Marine algae also provides food for both humans and marine life.

Construction of the project would destroy coral reef habitat. Dredging the proposed entrance channel would displace reef fishes. Once completed, the entrance channel might alter the marine habitat sufficiently to change present fish population distributions. Standing crops of marine algae would be reduced during channel dredging and by construction of the proposed breakwater extension, and species distribution would be altered as a consequence of the proposed habitat modification.

According to the December 1994 Final 2(b) Report prepared by the USFWS in accordance with the Fish and Wildlife Coordination Act, (2(b) Report) the proposed harbor expansion would dredge 4.0 acres of substrate fronting the east breakwater to create the entrance channel (page 19). 2.0 of these 4.0 acres are coral reef (FEIS, July 1994, page 5-17). Of the remaining 2.0 acres, part is the existing entrance channel which is barren and sandy (2(b) Report), and part is the footprint of the portion of the existing east breakwater which will be removed.

In addition to the 4.0 acres impacted by construction of the entrance channel, the proposed breakwater extension would cover 3.4 acres of reef substrate. Of the 7.4 acres of marine habitat that would be affected by the combined construction of the entrance channel and the breakwater extension, USFWS estimates that 3.7 acres of live coral coverage would be eliminated (2(b) Report, page 20). Present plans indicate about 4.3 acres of marine habitat would be affected by the combined construction of the entrance channel and breakwater, with about 2.8 acres of live coral affected.

Reef fishes depend upon a coral reef's structure for shelter and, indirectly, for food. Areas of reef flat are also utilized by fishes for foraging and grazing. Consequently, any destruction of reef area, whether coral reef, reef flat, rubble, or sand, would adversely affect fishes.

In addition to the 7.4 acres described by USFWS, there remains approximately 11.1 acres of the total 18.5 acres of substrate which USFWS indicated would be affected by construction of the proposed project. These include 0.8 acres for the south mole and 10.3 acres which are within the existing harbor. Present plans would affect 1 acre for the south mole and 7.6 acres inside the harbor. Both these areas are considered degraded. Of greater importance to fishes is the coral reef habitat that would be destroyed or modified outside the existing harbor.

Most algae depend on coral reef substrate for attachment. Any destruction of reef area would initially impact seaweeds. Hard, solid substrate either dredged for the entrance channel or covered by the new breakwater extension would eliminate sites for the seaweeds to attach, although the new breakwater extension will provide other hard, solid surface for seaweed attachment.

The cumulative impact of construction of the proposed project can be considered in the following context. There are an estimated 50,903 acres of coral reef habitat around the island of Maui, (Hunter, 1995). According to USFWS, live coral habitat within the project area covers about 3.7 acres of substrate, or about 0.0073% of Maui's coral reef habitat. It is likely that Hunter's estimate includes reef areas not entirely occupied by live corals, such as reef flats. Since the area to be affected does include reef flat and rubble areas, it might be more appropriate to evaluate the impact based on the larger area to be affected outside the existing harbor, i.e., on 7.4 acres of adjacent substrate. This 7.4 acres constitutes about 0.014% of Maui's coral reef habitat. For the present plans, the 4.3 acres affected by the entrance channel and breakwater extension would constitute about 0.0084% of Maui's coral reef habitat.

The 4.3 acres of marine environment outside the existing harbor provides many functions for reef fishes. When disturbed, fishes will relocate, thus reducing fish populations in the area. Interstitial spaces in the new breakwater will provide some replacement value in terms of shelter to fishes. How much this function will mitigate for destruction of the reef habitat cannot be quantified at this time.

The marine environment outside the existing harbor that would be impacted by construction of the project is presently suitable habitat for marine algae. Disturbance of this area would temporarily remove any attached algae. Recruitment will not occur within the newly dredged entrance channel because what was once hard substrate will become sandy, aggregate substrate unsuitable for attachment by marine algae, and changes from existing to project depth may result in depths unsuitable for some algae to grow.

Mitigation.

A baseline assessment will be performed by HED to locate major coral colonies and potential sites for coral relocation, transplantation and long-term monitoring to measure success rates of transplantation. Lessons learned from the ongoing Kawaihae coral transplant project regarding how to conduct successful coral transplants will be applied toward this project. In order to mitigate the impacts of construction of the project, additions to the existing artificial reef at Keawekapu will be used to offset adverse impacts to fish. Shoreline cleanup of *Hypnea musciformis* in and adjacent to the harbor will be implemented.

Coral transplantation has the potential to save viable existing coral colonies, and the potential to rapidly restart corals in adjacent areas. Coral reefs and artificial reefs can provide shelter to fishes, and resting habitat for sea turtles. The physical removal of *Hypnea musciformis* may result in other native species of algae becoming established at sites identified as foraging habitat for green sea turtles. This is beneficial since native species constitute a larger percentage of normal forage items for turtles. Removal of Hypnea would also improve water quality since periodic blooms of the species wash ashore and rot, causing disagreeable sights and odors and would also improve harvesting potential for subsistence fishers and could result in a return to a more typical coast ecosystem.

In order to accomplish these mitigation proposals, the project proponents would carry out a coral transplantation program onsite, adjacent to the site, and possibly offsite at the State's Keawekapu reef. Participants in the effort could include HED, DBOR, DAR, USFWS, NMFS, and the University of Hawaii (UH). To offset the impacts of the project on fishes, the proponents would add modules at the existing artificial reef site to increase fish habitat diversity. To mitigate against project impacts on marine algae and seaweeds, the DBOR and DAR would organize a Hypnea beach cleanup effort utilizing private and public resources such as State and County resources, boaters, fishers, surfers, condominium owners, and area residents.

In addition, a field study will be designed to evaluate an earlier assertion of the Bay's uniqueness in terms of flora and fauna. Updating this study could assist and support management decisions regarding future coastal development.

Construction of the harbor improvement project including the coral transplant project described above would serve the CZM Program coastal ecosystems policies of "improv(ing) the technical basis for natural resource management" (4(A), page B-2), by developing data on the effective conduct of coral transplantation for this and future efforts, and would "preserve valuable coastal ecosystems of significant biological or economic importance" (4(B), page B-2) by physically moving coral out of the project area and into an area where it might grow and serve as habitat for other marine life.

Finally, as part of the construction project an increment to the existing artificial reef will be implemented. Adding to the existing artificial reef to increase fish habitat diversity would serve the CZM coastal ecosystems policy to "minimize disruption or degradation of coastal water ecosystems by effective regulation of ... land and water uses, recognizing competing water needs" (4.(C), page B-2), by replacing fishery habitat lost at the project site with fishery habitat at the State's artificial reef, and by accommodating the competing water use need for harbor improvements at Maalaea. The proposed Hypnea beach cleanup effort would support CZM Program coastal ecosystems policies to "preserve valuable coastal ecosystems..." (4.(B), page B-2), by providing water area where native seaweed species might flourish and support foraging by sea turtles and would "promote water quality and quality planning and management practices..." (4(D), page B-2) by improving off shore water quality at and near the project site.

B. Endangered and Threatened (Listed) Species.

Marine species such as the green sea turtle and the humpback whale are federally protected by the Endangered Species Act and the Marine Mammals Protection Act, in order to prevent their extinction and promote their recovery. These species are regarded as valuable for species diversity preservation. Both species have become popular and commercially important, serving as the focus of many diving and whale watching tours.

The aquatic environment proposed to be affected includes some resting and foraging habitat for green sea turtles. An increase or change in boating activity may affect distribution of humpback whales in an area often used by cow and calf pairs. The presence of humpback whales and sea turtles contributes to determining that this area is a valuable coastal ecosystem worthy of protection and preservation and mitigation.

Unpublished estimates of the humpback whale population vary. For example, estimates of the North Pacific population range from 1400 to 2000 and from 3000 to 4000, according to various research presentations at a National Oceanic & Atmospheric Administration (NOAA) sponsored workshop on Maui, in April 1995. Prior to Federal listing and protection, this population was estimated to be about 1000 individuals. All presenters indicated that the population is undergoing slow recovery.

The total mature nesting female population of green sea turtles at French Frigate Shoals (FFS), Northwest Hawaiian Islands, was estimated at 750 (1992 Interim Recovery Plan for Hawaiian Sea Turtles). In 1982 and 1983 the estimated number of nesting females at FFS was 300 (Proceedings of the Second Symposium on Resource Investigations in the Northwest Hawaiian Island, Vol. 1, May 25-27, 1983). These estimates are an index and do not represent an estimate of the total population of green sea turtles in Hawaii.

The proportion of the estimated populations of both species that use or are present in Malaga Bay is unknown. Consultation between HED and NMFS concluded that implementation of the proposed project would not jeopardize the continued existence of any species within NMFS' jurisdiction. However, potential impacts to individual whales and turtles include injury or death caused by construction activities or increased boating activity. Whales and turtles could also be impacted by affecting their normal patterns of resting and foraging. Although some adverse impacts are possible, measures to reduce or eliminate these impacts will be implemented.

Mitigation.

DBOR, in consultation with HED and NMFS, will review the State Boating plan for current and future harbor and boat ramp needs, as well as the locations and capacities of designated mooring areas with respect to their potential impact on listed species, and revise these plans to avoid adverse impacts to listed species.

All non-permitted moorings in Ma'alaea Bay will be removed or relocated to within a State designated mooring area, or within Ma'alaea Harbor, whichever is appropriate, as directed by DBOR.

DBOR, NMFS, and HED will consult with the U.S. Coast Guard to develop and implement ingress and egress corridors for the expanded small boat harbor at Maalaea. Vessel speed limits within the cow/calf area of Ma'alaea Bay as defined by 50 CFR 22.31 will be evaluated and implemented upon the recommendation of NMFS.

If blasting is required, the Contractor as directed by HED, will be required to prepare a blasting plan which will be developed in coordination with and approved by NMFS and the Contracting Officer. Blasting will be avoided to the maximum practicable extent between December and May. Necessary blasting at any time would be confined to small charges, and sound suppressing measures such as bubble curtains or heavy tamping will be employed, and other measures will be used to reduce the effect on marine mammals and sea turtles to the maximum extent practicable. If blasting is required, the Contractor will be required to conduct a survey for turtles and marine mammals in the vicinity. The survey methodology will be included in the blasting plan to be approved by NMFS and the Contracting Officer.

Construction of the artificial reef may mitigate for lost turtle resting habitat in the new entrance channel.

The foregoing mitigation measures were proposed by the NMFS in its July 23, 1990 Biological Opinion concluding consultation with HED under Section 7 of the Endangered Species Act for the harbor improvements project. In its transmittal letter of the same date, NMFS stated:

> "Based on the available information, we conclude that the proposed activities are not likely to jeopardize humpback whales or green turtles in Hawaiian waters. We believe that the project will help reduce the number of illegal moorings and consolidate vessel traffic so that adverse impacts to whales from vessel traffic will be reduced compared to impacts from expected increases in vessel traffic without the project."

CZM's consistency denial was based on the predicted increase in boating activities in Maalaea Bay, citing NMFS' stated concern that increased boating activities would adversely impact the whale population of the bay. The foregoing statement from NMFS clarifies their view that construction of the harbor improvements would have less adverse impact on whales and turtles than the continuation and proliferation of vessel activity without the harbor improvement project. Implementation of the harbor improvement project with the mitigation measures proposed by NMFS will promote rather than hinder the CZM Program's coastal ecosystems objective and policies.

C. Water Quality

The maintenance of high water quality standards is essential to the health and vitality of the associated marine ecosystem and its many aesthetic and economic uses. Superior water quality, in accordance with Class A State Department of Health Water Quality Standards, positively influences ecological, aesthetic, and economic attributes of the coastal environment, favors high diversity, abundance, and growth of renewable natural resources, and supports a wide variety of social and economic activities.

Water quality is viewed broadly to include transparency, as well as the distribution of dissolved and particulate sediments and nutrients, toxicants, and pollutants carried by coastal waters.

If the project is implemented, short term water quality impacts are predicted to occur within the confines of the existing east and south breakwaters, during excavation of the harbor entrance channel and construction of the proposed south breakwater extension.

Long term, chronic water quality impacts would result from increased vessel activity and activities associated with harbor functions. In addition, there is a potential for changes in longshore sediment transport to take place due to the changed configuration of the project breakwaters and entrance channel.

Mitigation.

Silt curtains and other means will be directed by HED for the contractor to confine suspended sediments during dredging of the entrance channel and construction of the project features. Short term mitigation using silt curtains will help to minimize construction impacts on water quality.

A better understanding of the mechanisms causing changes in water quality will be developed by implementing a study under DAR's ongoing Main Hawaiian Islands Marine Resources Investigation (MHI-MRI). A predictive, geographic model will be developed to forecast potential changes in sediment transport and water quality (point and non-point sources) in response to changes in coastal topography and various terrigenous imputs. The model will be designed to represent existing natural and human-made coastal features and a suitable range of variation in wind and ocean-driven waves and currents. This study will encompass the greater Maalaea-Kihei coast, including Maalaea Bay. It will contribute to any subsequent efforts to mitigate long-term impacts of the proposed project on water quality by providing a tool for predicting the outcome of any further modifications to the coastline. The HED will contribute to this effort by supplying historical and recent data on current regimes and water quality in the area.

Long term mitigative measures, such as the development of a longshore transport and water quality model, have the potential to help ensure more comprehensive and informed planning efforts for the Maalaea-Kihei region, in order to sustain coastal resources. This study, prepared under the auspices of the State-wide MHI-MRI, will be developed to evaluate the potential impacts to other areas of the West Maui coast caused by changes in the patterns of longshore transport of sediments, nutrients, organic and inorganic debris, and to allow for planning to prevent or mitigate such changes, if necessary.

This long term mitigation proposal will be implemented in the following manner. The model and associated field work will be developed by DAR. DAR will design, fund, and supervise all aspects of fieldwork and model development under the MHI-MRI. HED will supply detailed information on existing models and available data on currents at sites near the harbor, both before and after construction of the project. DAR MHI-MRI staff will work with HED to coordinate the use of HED assets including, but not limited to, data, drogues, and current meters, and may obtain HED assistance with other measures as appropriate.

The predictive sediment-water quality model will be designed for compatibility with and implementation on the State Geographic Information System (GIS). Based on known information regarding dynamic patterns of winds, tides, currents, and coastal hydrology, a flexible, menu-driven query system will be developed which will allow the user to select specific changes in coastal features (i.e., changes in the shape and boundaries of the breakwall surrounding the harbor), deepen or widen channels, increase or decrease inputs through groundwater, streams, surface flow, sediments and dissolved nutrients from land, in order to evaluate what differences in coastal currents, sediment transport, and coast water quality could be expected as a result. This system will combine theoretical information with interactive GIS capabilities, to produce a practical model which will be useful in making informed decisions with respect to the potential impacts of proposed changes in the coastline on, for example, the longterm viability of fisheries habitat along the West Maui coast.

The study and sediment-water quality model will be developed by a graduate student of the University of Hawaii, in partial fulfillment of requirements for a doctoral degree. Study research and implementation will be funded by DLNR (DAR, MHI-MRI project, under the LNR 401 Program). This work will be conducted in close collaboration with the University of Hawaii Institute of Geology and Geophysics, the U.S. Geological Survey, and HED, using the best available data and most modern technology to create a realistic, interactive oceanographic model.

Construction of the project with the foregoing mitigation would promote the CZM coastal ecosystems objective of "protect(ing) valuable coastal ecosystems from disruption and minimize adverse impacts on all coastal ecosystems" (Coastal Ecosystems Objective, Hawaii CZM Program 1990, page B-2), and its associated policies by providing a comprehensive long term model to evaluate the impacts of proposed future project and activities on the coastal ecosystem and water quality of West Maui. Utilization of this model will "improve the technical basis for natural resource management" (4.(A), page B-2), foster future project planning in order to "preserve valuable coastal ecosystems of significant biological or economic importance" (4.(B), page B-2), and "promote water quality and quality planning and management practices which reflect the tolerance of fresh water and marine ecosystems and prohibit land and water uses which violate state water quality standards" (4.(D) page B-2).

3. **Economic Uses Objective and Policies.**

OSP's November 4, 1994 letter stated that the proposed project conflicted with the State's CZM Program's economic uses objective and policies because of social impacts including the loss of the following resources: surf sites, the sandy beach, limu gathering opportunities, and other marine resources. The letter further cited potential adverse environmental impacts previously discussed in the coastal ecosystem section as constituting a conflict with the Program's economic uses objective and policies.

The mitigation described above addressing CZM Program objective and policy sections regarding recreational resources and coastal ecosystems also serve to mitigate potential adverse impacts to the Program's economic uses objective and policies. Although the losses cited by the two 1994 CZM letters will occur and to the extent possible be mitigated, these losses should be balanced against the proposed project's benefits which support the Program's economic uses objective and associated policies. With mitigation, the proposed project would serve the State Program's economic uses objective, which is to "(p)rovide public or private facilities and improvements important to the State's economy in suitable locations" (Hawaii CZM Program, 1990, page B-3). The harbor improvement project would serve the CZM Program's associated economic uses policies by "concentrat(ing) in appropriate areas the location of coastal dependent development necessary to the State's economy" (5.(A), page B-3); by "insur(ing) that coastal dependent development such as harbors and ports, ... are designed and constructed to minimize adverse social, visual and environmental impacts in the coastal zone management area; and ... direct(ing) the location and expansion of coastal dependent development to areas presently designated and used for such development and permit reasonable long-term growth at such areas, ..." (5.(B)and (C), page B-3).

APPENDIX D

CORAL STUDY

currents at sites near the harbor, both before and after construction of the project. DAR MHI-MRI staff will work with HED to coordinate the use of HED assets including, but not limited to, data, drogues, and current meters, and may obtain HED assistance with other measures as appropriate.

The predictive sediment-water quality model will be designed for compatibility with and implementation on the State Geographic Information System (GIS). Based on known information regarding dynamic patterns of winds, tides, currents, and coastal hydrology, a flexible, menu-driven query system will be developed which will allow the user to select specific changes in coastal features (i.e., changes in the shape and boundaries of the breakwall surrounding the harbor), deepen or widen channels, increase or decrease inputs through groundwater, streams, surface flow, sediments and dissolved nutrients from land, in order to evaluate what differences in coastal currents, sediment transport, and coast water quality could be expected as a result. This system will combine theoretical information with interactive GIS capabilities, to produce a practical model which will be useful in making informed decisions with respect to the potential impacts of proposed changes in the coastline on, for example, the longterm viability of fisheries habitat along the West Maui coast.

The study and sediment-water quality model will be developed by a graduate student of the University of Hawaii, in partial fulfillment of requirements for a doctoral degree. Study research and implementation will be funded by DLNR (DAR, MHI-MRI project, under the LNR 401 Program). This work will be conducted in close collaboration with the University of Hawaii Institute of Geology and Geophysics, the U.S. Geological Survey, and HED, using the best available data and most modern technology to create a realistic, interactive oceanographic model.

Construction of the project with the foregoing mitigation would promote the CZM coastal ecosystems objective of "protect(ing) valuable coastal ecosystems from disruption and minimize adverse impacts on all coastal ecosystems" (Coastal Ecosystems Objective, Hawaii CZM Program 1990, page B-2), and its associated policies by providing a comprehensive long term model to evaluate the impacts of proposed future project and activities on the coastal ecosystem and water quality of West Maui. Utilization of this model will "improve the technical basis for natural resource management" (4.(A), page B-2), foster future project planning in order to "preserve valuable coastal ecosystems of significant biological or economic importance" (4.(B), page B-2), and "promote water quality and quality planning and management practices which reflect the tolerance of fresh water and marine ecosystems and prohibit land and water uses which violate state water quality standards" (4.(D) page B-2).

3. Economic Uses Objective and Policies.

OSP's November 4, 1994 letter stated that the proposed project conflicted with the State's CZM Program's economic uses objective and policies because of social impacts including the loss of the following resources: surf sites, the sandy beach, limu gathering opportunities, and other marine resources. The letter further cited potential adverse environmental impacts previously discussed in the coastal ecosystem section as constituting a conflict with the Program's economic uses objective and policies.

The mitigation described above addressing CZM Program objective and policy sections regarding recreational resources and coastal ecosystems also serve to mitigate potential adverse impacts to the Program's economic uses objective and policies. Although the losses cited by the two 1994 CZM letters will occur and to the extent possible be mitigated, these losses should be balanced against the proposed project's benefits which support the Program's economic uses objective and associated policies. With mitigation, the proposed project would serve the State Program's economic uses objective, which is to "(p)rovide public or private facilities and improvements important to the State's economy in suitable locations" (Hawaii CZM Program, 1990, page B-3). The harbor improvement project would serve the CZM Program's associated economic uses policies by "concentrat(ing) in appropriate areas the location of coastal dependent development necessary to the State's economy" (5.(A), page B-3); by "insur(ing) that coastal dependent development such as harbors and ports, ... are designed and constructed to minimize adverse social, visual and environmental impacts in the coastal zone management area; and ... direct(ing) the location and expansion of coastal dependent development to areas presently designated and used for such development and permit reasonable long-term growth at such areas, ..." (5.(B)and (C), page B-3).

APPENDIX D

CORAL STUDY

Coral Baseline Survey of Ma'alaea Harbor for Light-Draft Vessels, Island of Maui.

Paul L. Jokiel Ph.D. and Eric K. Brown M.S.
Hawai'i Institute of Marine Biology
P.O. Box 1346
Kaneohe, HI 96744-1346

Draft final report for DACW83-96-P-0216

submitted March 13, 1998
to the
U.S. Army Engineer District, Honolulu
Environmental Resources Branch, Attn: Bill Lennan
Fort Shafter, Hawai'i 96858-5440

Introduction:

Ma'alaea small boat harbor on the south central coast of Maui is a multi-use facility for recreational and commercial boaters (Figure 1). Originally constructed in 1952 with a single breakwater facing the south and a 12 foot deep entrance channel, it was further enclosed by the east breakwater in 1958 (AECOS, 1994). It is one of only 2 berthing areas for light-draft vessels on Maui. The harbor entrance opens to the south and is subjected to strong southerly swells that enter the bay. Modification of the harbor is proposed to reduce swell activity responsible for boat damage.

Prior to construction, this area consisted of reef flats divided by a shallow channel leading to the approximate area of the present day Ma'alaea General Store (Figure 2). Data from cores taken in 1980 during the preparation of the General Design Memorandum and Final Environmental Impact Statement provide information relevant to the geological history of the reef flat (USACE, 1980). A crust of limestone breccia approximately 1' in thickness, overlies unconsolidated clastic marine sediments of coral sands, gravels and rubble (USACE, 1980). The 2 cores taken within the harbor showed a 10'-12' layer of reef material overlying a reddish-brown clay. The south breakwater and east mole were constructed on top of these reef platforms. The central channel, which in the late 1800's was less than 6' deep, was dredged along with portions of the harbor interior to its present depth of 8'-12'.

In 1968 the United States Congress approved funding for renovations to the existing harbor. Subsequently, a General Design Memorandum and Final Environmental Impact Statement (EIS) was prepared in 1980 for the U.S. Army Corps of Engineers (USACE, 1980). The project, however, did not receive funding until 1989 (Forestell and Brown, 1991). A supplemental EIS was prepared in 1994 which included additional data on algae and endangered humpback whales. This document also included the renovation plans from the 1980 EIS for enhancing existing harbor facilities, increasing the number of berths and construction of an additional breakwater fronting the harbor to reduce swell within the harbor.

This proposed modification and expansion of the harbor raised concerns about the negative impact on coral reefs in and around the harbor as well as the impact on recreational surfing sites and nearby coastline developments. Biological impacts include siltation on nearby reefs from dredging operations and physical destruction of the reef habitat during construction of the breakwater and channel entrance. All parties involved were interested in evaluating possible mitigation measures. In order to assess habitat loss and potential damage to the adjacent coral reef ecosystem it was necessary to determine the extent and structure of the coral habitat through a series of underwater surveys. This information in turn will be used to recommend type and extent of mitigation activity.

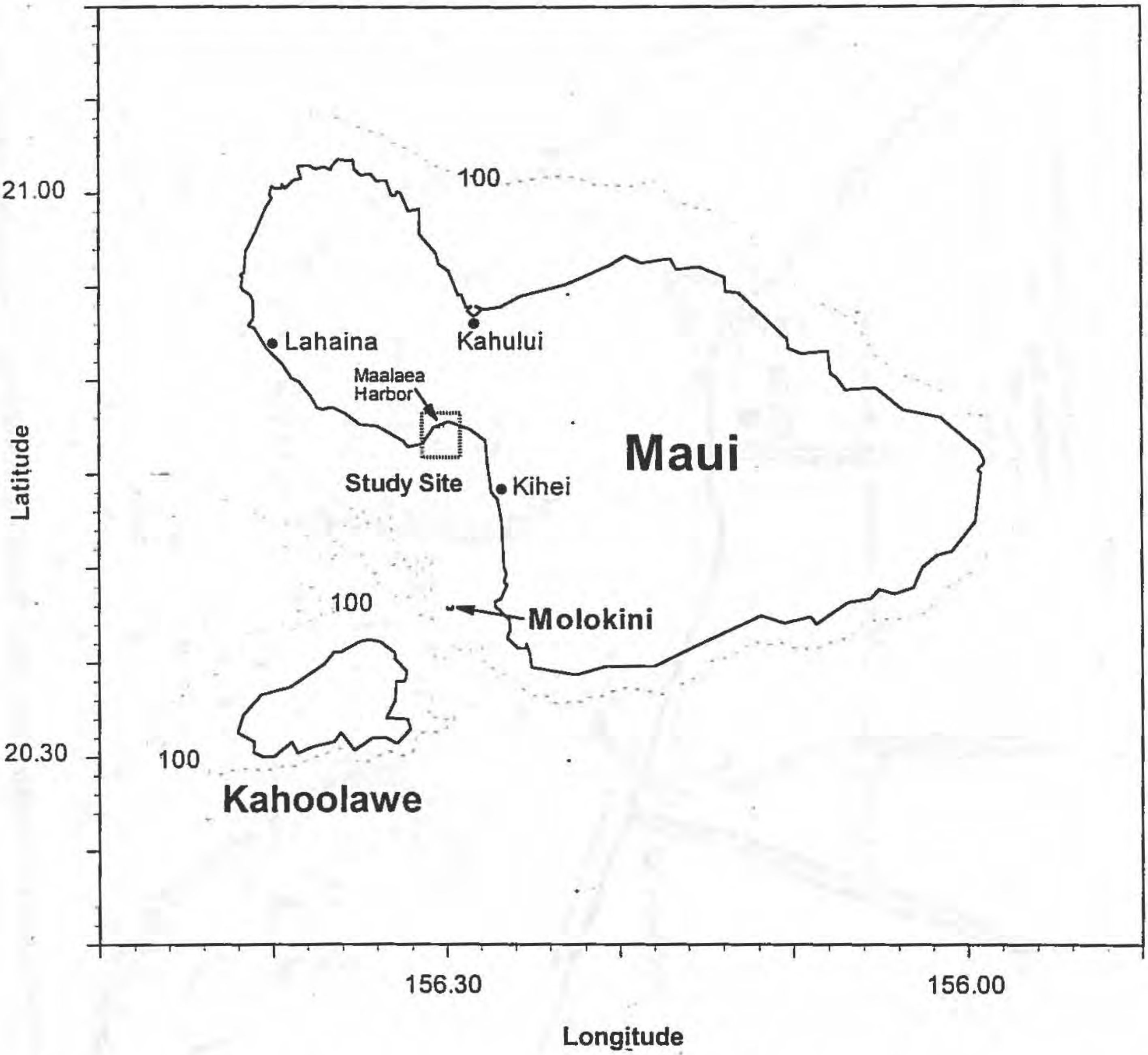


Figure 1: Study site showing location of Mā'alaea Harbor on the island of Maui (Depths in Fathoms).

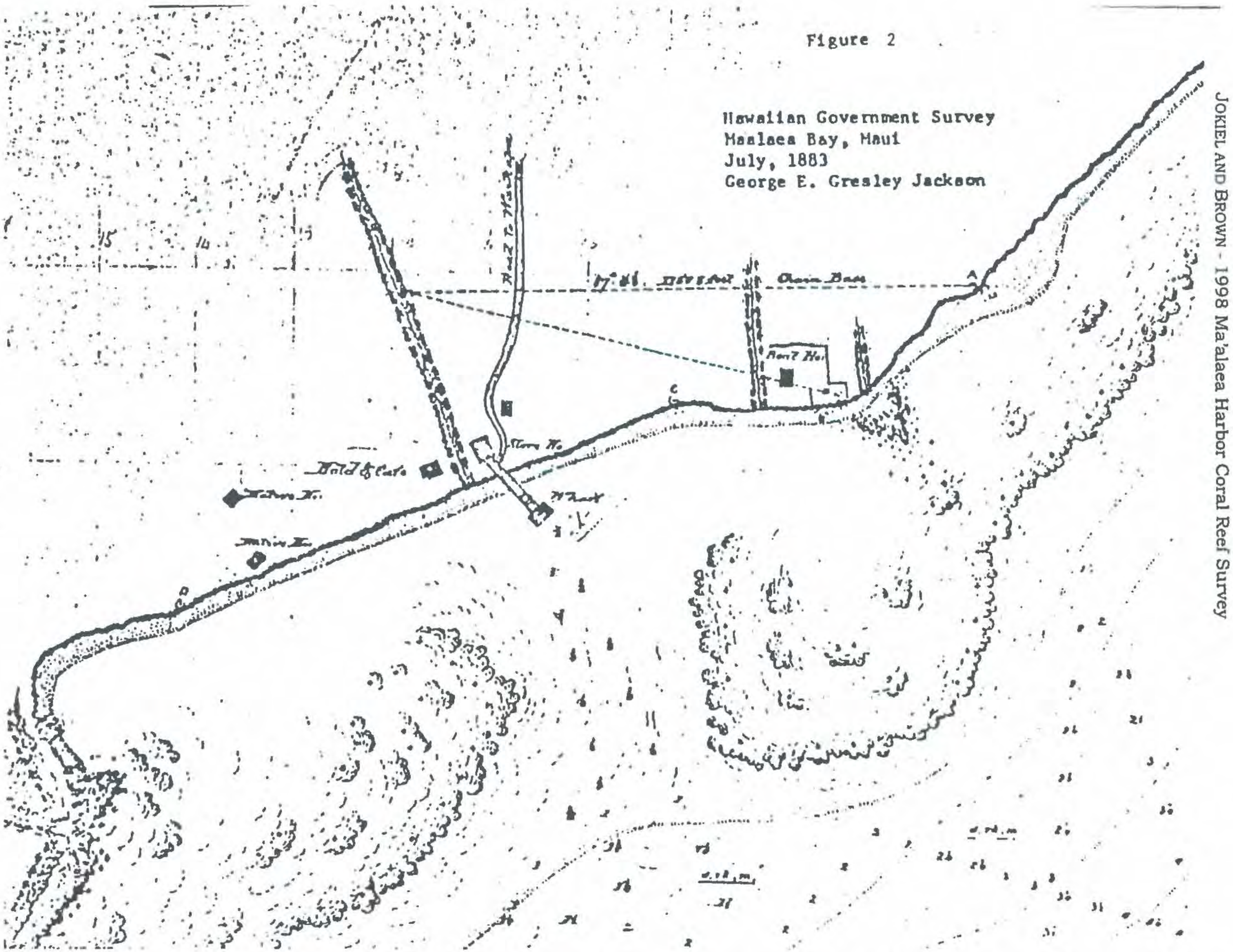


Figure 2: 1883 Hawaiian Government Survey of Maalaea Bay, Maui. Soundings in Fathoms. (Map located at the Archives of Hawaii

Scope of the Present Report:

The scope of work for the report was to:

1. Define and map the extent of various benthic habitats in and around Ma'alaea harbor. These data quantify the amount of coral that would be affected by the proposed harbor expansion.

2. Conduct detailed quantitative transects. Data taken include substrate types, coral cover, coral diversity, fish density and fish diversity. Fish community structure was also characterized in relation to coral coverage and fish trophic groups to examine the effect of harbor modification and expansion on fish populations.

3. Based on these data and prior experience with coral transplantation at other sites, develop recommendations for mitigation measures before, during and after harbor expansion. These recommendations include the identification of potential transplant sites, the quantity of coral species appropriate for transplantation and suggestions for various transplant techniques that might be used in this effort.

4. Include observations on threatened and endangered species habitat within the Ma'alaea area. One request was to identify the location and extent of the area known as "Turtle reefs" in relation to the harbor.

Methods:

Study Site

Ma'alaea Bay is located on the south central coast of Maui (Figure 1). The harbor area is protected by the south breakwater (Figure 3) and the eastern mole, creating a shallow basin approximately 8 - 12' (2.4 - 3.7m) in depth (Figure 4). The harbor bottom consists primarily of soft sediments with remnants of the former reef flat still present within the central and eastern portion of the basin. Live coral reefs have developed along the east and west slopes of the dredged channel and turning basin.

The area outside of the harbor fronting the south breakwater is the pre-existing limestone platform with a thin veneer of sand that is transient over the substrate. This area is characterized by very low coral cover. Near the dredged channel entrance, coral coverage approaches 50-75% (USFWS, 1994). East of the harbor there is a band of high coral cover along the reef face from 3' to 20' (1m-6m) in depth. A more complete qualitative description of the overall marine environment inside and outside of the harbor is given in the USFWS report

(1994), the EIS for the Maui Ocean Center (AECOS, 1994), and by William A. Brewer and Associates (1987).

Mapping of the coral community

Habitat types and coral coverage within the study area were mapped. A series of surveys were conducted on December 15, 1997, January 13, 15, and 16, 1998 using a 4 person team consisting of an observer with a lookbox, data recorder, navigator and vessel operator. The 17.4' (5.3m) vessel traversed transects that followed latitude coordinates established by a Differential Global Positioning System (DGPS) receiver. Approximately every .01 of a degree in Longitude the following parameters were measured; % sand, % coral rubble, % hard substrate, % coral, and % algae. In addition, the locations of major habitat boundaries were outlined as the vessel moved across the area. At each Latitude/Longitude location, supplemental data was collected on depth (from the depth sounder located on the boat), noteworthy plant and animal species and bottom topography. These data were used to produce a series of contour maps that delineate boundaries for the various types of substrates and identify major concentrations of coral coverage.

Quantitative assessment of coral coverage and fish density

The second phase involved a detailed assessment of coral coverage and fish density patterns using SCUBA along selected transects in and around the harbor. Two 25 meter lines were laid out in a parallel arrangement, separated by a 5 meter interval which created a sample area of $125m^2$(1,345.5ft^2). A rope was used to tether the two divers in order to maintain the 5 meter width for the transect area. Each transect was marked with flagging tape at both ends so that DGPS coordinates could be obtained. After the lines were positioned, the researchers returned to the start of the transect and allowed 5 minutes for the fish to habituate. The first diver proceeded down the transect corridor and recorded the number of every species of fish seen within the transect boundaries. The second diver followed behind and used a $1m^2$ quadrat to measure coral coverage at the 5, 10, 15 and 20 meter mark.

Coral diversity and percent coverage were measured using the point-intercept quadrat method described by Reed (1980). This method has been used quite extensively in the literature to assess benthic community composition and detect gross changes in the reef flat community structure (Dahl, 1981; Coyer and Whitman, 1990). The quadrat was $1m^2$ in area and consisted of 1"(2.54cm) PVC tubing fitted with nylon line spaced 10 centimeters apart to form a grid with 81 intersections. The quadrat was placed on the substrate at 5 meter intervals and different species of coral/substrate types found underneath each intersection were recorded on underwater slates. Coral species were identified using *Reef and Shore Fauna of Hawai'i, Section 1: Protozoa Through Ctenophora* by Maragos (1977).

Fish population density and species richness were censused using a modified Brock transect method (Brock, 1954). It is generally recognized that conducting visual transects using SCUBA is one of the most effective ways to assess fish populations over nearshore, rocky intertidal or shallow reef habitats (Dewees, 1981; Bortone and Kimmel, 1991). Visual census techniques are advantageous because they do not disturb the habitat and are minimally disruptive to the organisms. The most severe limitation of visual estimates is underestimation of actual abundance and diversity. This is due in part to the cryptic habit of certain reef fish and the structural complexity of the reef ecosystem (Bortone and Kimmel, 1991). Data were tabulated on an underwater slate using scientific names. All fish identifications were standardized using the *Guide to Hawai'ian Reef Fishes* by Randall (1985) and *Shore Fishes of Hawai'i* by Randall (1996). Three to four transects were surveyed during each morning and afternoon dive. After each dive, the data were transcribed from the underwater slates into a notebook for later computer entry.

A total of 50 transects in and around the harbor were sampled across 11 days between December 1997 to January 1998 (Figure 3). Actual sampling dates with the raw data are noted in Appendix A(Coral) and B(Fish). This data was then integrated into the contour maps by recording Longitude and Latitude data for the beginning and end of each transect and incorporating the mean percent coral cover for that transect. Surveys were conducted concurrently with the mapping effort.

Fish diversity (H') was calculated for each transect using the Shannon and Weaver diversity index formula

$$H' = -\sum_{i=1}^{s} p_i \log p_i$$

where p_i is the proportion of the *i*th species in the population (Pielou, 1966). General comparisons of fish communities could then be made across different regions within the harbor and outside in close proximity. The relationship between coral coverage and the overlying fish community was also examined using regression techniques. A distinction was made between transects inside of the harbor and outside to explore any possible differences associated with altered habitats. Finally fish community structure was analyzed using trophic categories outlined by DeMartini, *et. al.* (1994) and supplemented by Randall (1996) (Table 1). Each transect was broken down into the trophic guilds by grouping the various fish species into their appropriate feeding categories.

Table 1: Trophic categories of Hawai'ian reef fishes

Database Code	Trophic Guild
C	Coralivore
D	Detritivore
H	Herbivore
MI	Mobile Invertebrates
P	Piscivore
SI	Sessile Invertebrates
Z	Planktivore

The charts and contour maps of the study area, habitat boundaries, coral coverage were produced using DeltaGraph 4.0 for the PC. Statistical analyses were carried out on the transect data using Minitab and Statistica for the PC.

Potential sites for transplantation, coral species suitable for transplantation and transplant techniques.

Reconnaissance surveys were conducted on January 15th and 29th, 1998 to examine potential sites for transplantation of corals. Using the 17.4' vessel, a 4 person team consisting of an observer with a lookbox, data recorder, navigator and vessel operator traversed the coastline in an easterly (1/15/98) and westerly (1/29/98) direction. Sites between a depth of 5' to 40' (1.5m-12m) were explored. Extremely calm conditions (Beaufort Sea State 0-1) coupled with high water transparency (Visibility >45'/15m) occurred during these surveys. The fortuitous conditions enabled us to conduct an extensive survey of the reef areas within approximately 3.1 miles (5km) of the harbor.

Results

Mapping of the coral community

The greatest concentration of coral inside the harbor occurs along the dredged channel entrance near the southern tip of the east mole (Figure 5). The area of high coral cover extends into a reef face heading northward with a steep slope that separates the sand channel from the old reef flat on the inside section of the east mole. Coral coverage near the entrance is approximately 30-40%. The coral community is dominated by *Montipora verrucosa, Porites compressa, Porites lobata* and *Montipora patula.* Some uncommon species of coral were observed such as *Psammocora stellata* and *Pavona pollicata.* Another

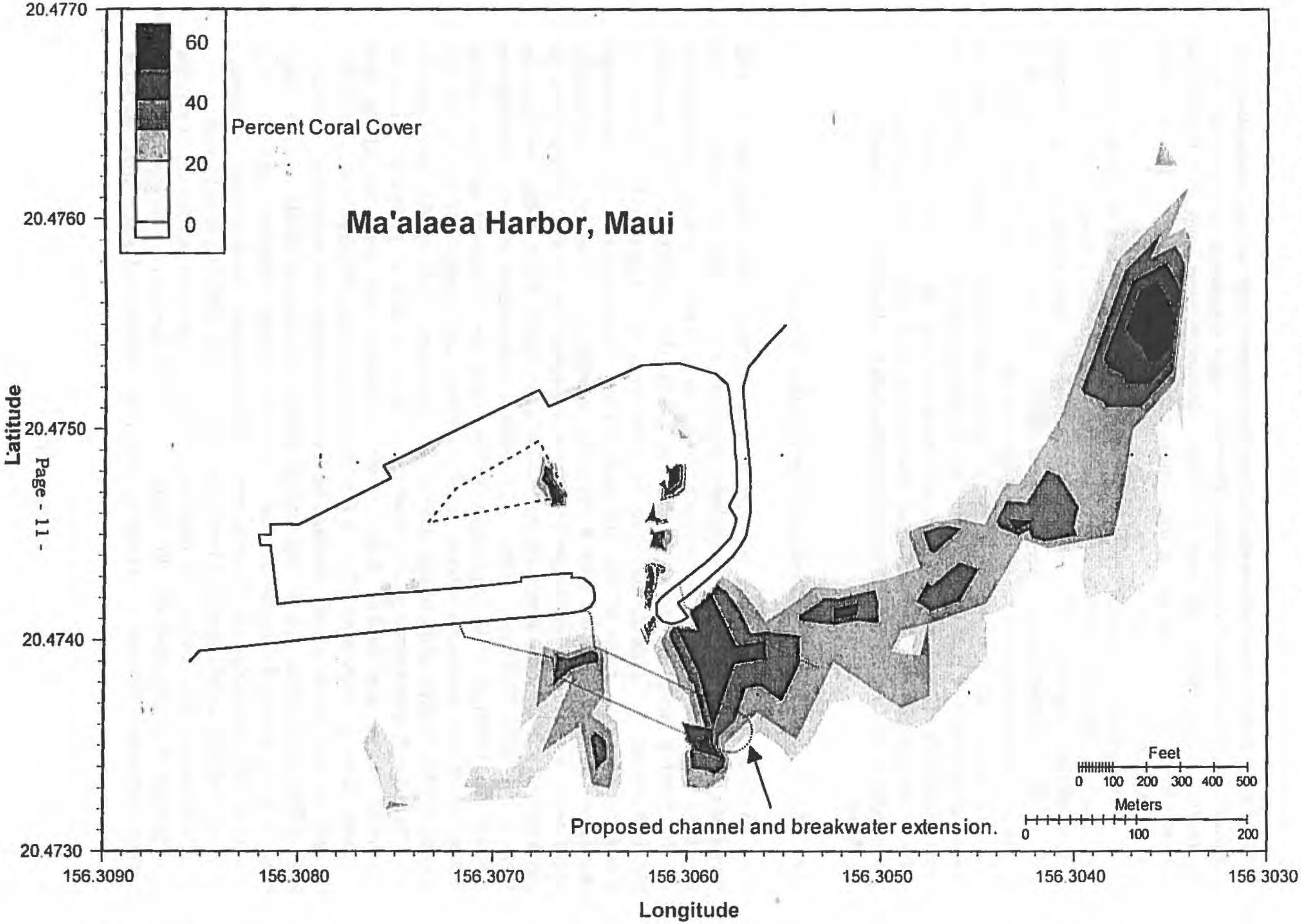


Figure 5: Location of coral reefs in and around Ma'alaea Harbor. Shaded contour values represent coral cover in percent.

area of high coral coverage existed along the eastern edge of the triangular reef remnant in the center of the harbor. The dominant species at this reef site were *M. verrucosa, P. compressa,* and *P. lobata. Montipora verrucosa* and *Pocillopora damicornis* also occurred along the inside slopes of the south breakwater and northern face of the wharf.

Outside of the harbor the highest coral cover occurred on either side of the channel entrance and extends eastward along a zone from 3' to 20' (1m-6m) in depth (Figure 5). The area with the highest coral cover on the western side of the channel occurs as a narrow band along a north-south axis and gradually dissipates with increasing depth to 23' (7m). On the eastern side of the channel, coral coverage was even higher and formed a rather extensive community over the reef flat. Clearly, this is the richest area of coral within the area surveyed. The dominant species included; *Montipora verrucosa, Porites lobata, Montipora patula, Pocillopora meandrina* and *Montipora flabellata.* The dominant coral species on the reef flat immediately adjacent to the east mole is *M. flabellata.*

Quantitative assessment of coral coverage and fish density

A total of 18 species of scleractinian corals were observed in 202 quadrats on the 50 transects sampled (Appendix A). The highest coral coverage inside of the harbor was estimated at 50.9% on transect #3 near the entrance of the harbor with *Montipora verrucosa* being the dominant coral species (48.1%) (Figure 5, Table 2, Appendix A). Another area of high coral cover exists along the eastern edge of the triangular reef remnant with coral coverage reaching 39.8% on transect #33. At this site *M. verrucosa* is again the dominant coral with an average coverage of 28.1% followed by *Porites lobata* with a coverage of 5.2%. Some areas off the south breakwater have coral coverage as high as 17.6% (Transect #40) with *Porites compressa* (8.3%), *Pocillopora damicornis* (4.0%), and *M. verrucosa* (4.0%) being the dominant species. Along the slope of the northern wharf, coral coverage was measured as 30.2% on transect #43. In this area of the harbor *M. verrucosa* (13.3%), *Montipora patula* (11.7%), and *P. damicornis* (5.2%) were the only coral species recorded. Close to the boat ramp and storm drains coral coverage was minimal along the breakwater slope (Transect #39 - 0.6%) and wharf edge (Transect #42 - 2.8%). On the eastern mole, coral coverage is highest around the entrance (Transect #36, 8.3%) and decreases as one moves closer to shore in shallow water less than 3' (1m) in depth (Transect #38, 1.2%). The most common corals in this region are *M. verrucosa* and *P. damicornis.* The majority of the harbor, however, is dominated by sand channel areas and coral rubble with 0% coral cover.

Outside of the harbor the highest coral coverage was estimated at 47.5% on transect #15 situated on the eastern edge of the sand channel near the harbor entrance (Figure 5, Table 2). At the harbor entrance and moving eastward around the mole, *Porites lobata* becomes the major species with estimates as high as 39.8% coral cover (Transect #18). In fact, coral coverage throughout this region was very uniform at a depth of 9'- 16' (3m-5m) on the reef flat (See Table 2 for Transects 11-13, 18-20 and 24-26). Along the western edge of the channel, coral coverage reached 39.2% on transect #9. Closer to the sand channel *Montipora verrucosa* is the dominant coral species approaching 28.1% coverage (Transect #12) of the substrate.

Slope was calculated for each of the transects as rise over run from bathymetric data provided in the original site maps and construction plans (Table 2). Average depth was also recorded for each transect. The slope ran perpendicular to the transect which followed the depth contours. The steepest slopes had values approaching 1 and were found inside of the harbor along the channel edges.

The relationship between coral cover, depth and slope is illustrated in Figure 6. At shallow depths (<2m) within the harbor, corals thrive due to the high light, steep slope, moderate water motion and lack of destructive waves. Coral cover diminishes with depth due to the light attenuation from the high turbidity found in the harbor. The coral species and growth forms found in the harbor are typical of quiescent waters. These include finely branched *Pocillopora damicornis,* foliaceous *Montipora verrucosa* and branched *Porites compressa.*

Outside of the harbor, areas of high coral cover are not found shallower than 3' (1m) due to extreme wave impact, sand scouring and movement of sand and rubble across the reef flat. High coral coverage is found between 6.5' and 16.4' (2-5m). This zone is characterized by high light penetration and hard substrate. Seasonal wave action is high but not sufficient to dislodge the corals. Coral species and growth forms found in this area are typical of high wave energy environments. They include encrusting *Montipora spp.,* lobate and encrusting *Porites spp.,* and thickly branched *Pocillopora spp.*. Below 5 meters the substrate consists of unstable sand and rubble which is not suitable for coral colonization.

The above observations are supported by our statistical analysis. Multiple regression analysis indicated that a steep slope coincided with areas of high coral coverage but only inside (R^2=.5758, $F(2,15)$=10.182, p<.0016) of the harbor compared with outside (R^2=.0305, $F(2,29)$=.4563, p<.6381) of the harbor (Table 3). Slope appears to be a determining factor in the distribution of coral within an altered habitat such as a harbor. This study indicates that only areas of high vertical relief in low water motion habitats can support good coral coverage. Perhaps this is due to the fact that suspended sediments would otherwise bury the existing reef structure unless a slope is present to facilitate removal. The only steep slope outside of the harbor is along the breakwater face which does not support good coral reef cover in comparison to the adjacent habitat (e.g. Transect #16 - 7.1% vs. Transect #17 - 42.6%). At this location, however, wave energy is extremely high compared to the protected water within the harbor.

Table 2: Slope value, average depth and percent coral cover for each transect inside and outside of the harbor.

Inside	Slope	Depth (m)	Coral %	Outside	Slope	Depth (m)	Coral %
1	.333	.8	20.7	4	.333	.2	0.3
2	.467	1.1	37.0	5	.018	1.0	1.8
3	.400	1.2	50.9	6	.333	.2	3.4
30	.133	2.7	27.5	7	.018	1.0	1.5
31	.014	.8	0.0	8	.086	1.9	23.1
32	.015	.6	0.3	9	.086	2.3	39.2
33	.667	1.5	39.8	10	.057	2.3	29.0
34	.133	1.2	17.9	11	.063	4.9	33.3
35	.133	.5	0.0	12	.027	4.7	43.2
36	.333	.5	8.3	13	.067	4.5	44.1
37	.025	.5	1.8	14	.333	.4	15.4
38	.100	.4	1.2	15	.067	1.6	47.5
39	.171	1.5	0.6	16	.200	.3	7.1
40	.229	1.5	17.6	17	.040	1.2	42.6
41	.229	1.4	6.2	18	.114	2.9	44.4
42	.400	1.3	2.8	19	.114	2.8	40.1
43	.400	1.4	30.2	20	.024	3.1	33.9
44	.400	1.5	20.7	21	.027	3.0	3.4
				22	.027	2.8	19.1
				23	.057	2.5	21.9
				24	.057	2.9	36.4
				25	.057	2.9	36.1
				26	.044	3.1	23.5
				27	.025	6.3	0.3
				28	.025	6.7	0.0
				29	.025	7.3	0.0
				45	.045	7.9	0.0
				46	.045	8.6	7.1
				47	.027	4.1	41.0
				48	.048	4.8	35.5
				49	.004	.8	0.9
				50	.004	1.1	2.8

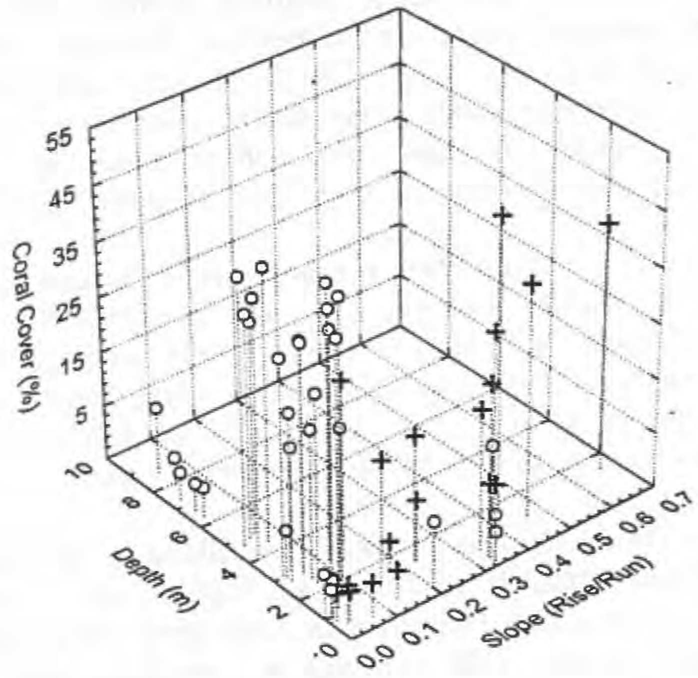


Figure 6: Relationship between coral coverage, slope and depth inside (+) and outside (o) of the harbor.

Table 3: Multiple Regression Summary for Dependent Variable: CORAL_CV Inside (A) and Outside (B) of the Harbor.

A. Inside of the Harbor

	BETA	SE of BETA	B	SE of B	t(15)	p-level
Intercept			-7.3338	6.4813	-1.1315	.2756
Depth	.2752	.1752	7.9572	5.0657	1.5708	.1371
Slope	.6342	.1752	55.8625	15.4309	3.6202	**.0025**

B. Outside of the Harbor

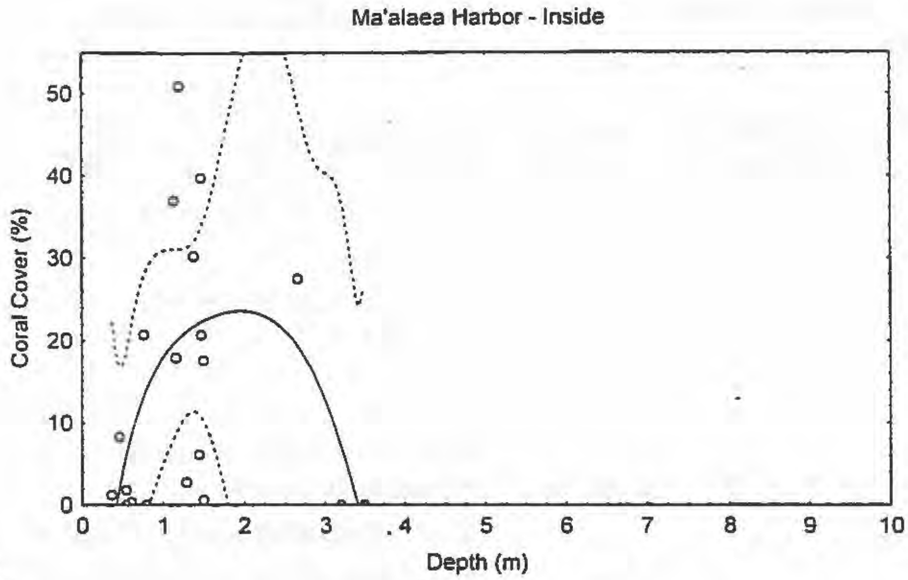
	BETA	of BETA	B	of B	t(29)	p-level
Intercept			27.2401	7.5182	3.6232	.0011
Depth	-.1370	.2049	-1.0416	1.5571	-.6690	.5088
Slope	-.1865	.2049	-35.7428	39.2618	-.9104	.3701

Typically, the steep reef slope fronting healthy reefs have the highest number of coral species, cover and diversity (Rodgers, 1977; Dollar, 1982; Sheppard, 1982; Jokiel and Tyler, 1992). Human altered habitats such as dredged surfaces, however, have been rarely quantified with respect to slope and coral cover. Harbor studies more often focus on water quality and degradation of the reef habitat (Dodge and Vaisnys, 1977; Maragos, 1993; AECOS, 1994).

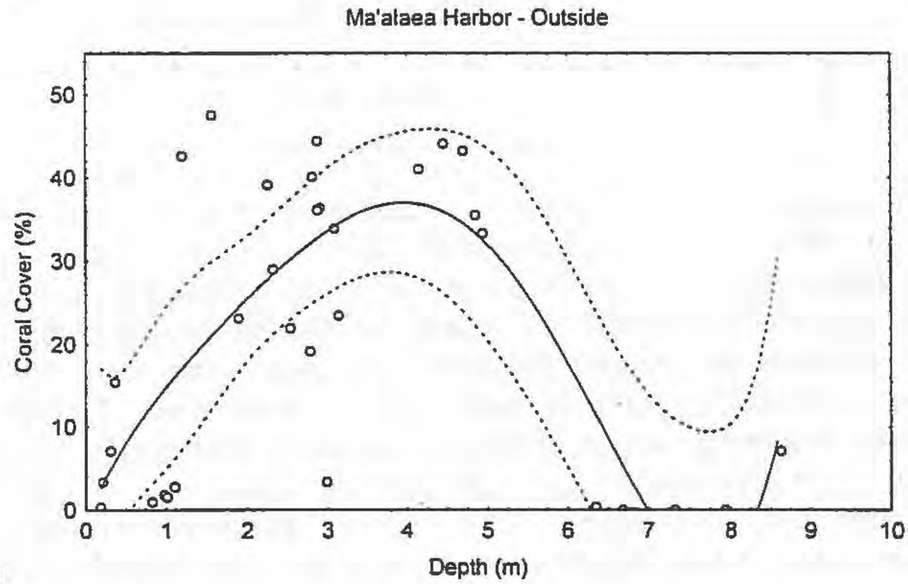
Depth did not account for a significant amount of variation in the multiple regression analysis yet was still very important in the distribution of corals. This is because coral cover is a non-linear function of depth (Figure 7). This is clearly evident outside of the harbor where coral coverage drops off dramatically below 16' (5m). This relationship is also apparent inside of the harbor where coral coverage is <1% on the harbor channel bottom at depths of 8' - 12' (2.4m-3.7m).

As seen in Figure 5, the proposed breakwater extension and channel relocation would cut through some of the highest concentration of coral in close proximity to the harbor. Using small scale geometric shapes, the area (ft^2) occupied by living coral reef with coverage greater than 10% was calculated for the region that would be directly impacted by the dredging and filling during construction (Table 4). Inside of the harbor it is estimated that 45,926 ft^2 (4,267m^2) of coral reef would be altered by construction. This includes filling of the center mole and dredging of the reef flat along the east mole. A much larger expanse (164,050ft^2/15,241m^2) of coral reef outside of the harbor would be filled for the new breakwater and dredged for the channel entrance. A total of approximately 209,976ft^2 (19,507m^2) or 4.8 acres (1.9ha) of coral reef habitat would be dredged or filled with the present construction plan.

Habitat loss would be partially offset by the creation of about 84,591ft^2 (7,859m^2) or 1.9 acres (.8ha) of new or altered habitat due to the addition of the new breakwater, dredged channel slope and interior harbor slope. Data from the present study indicate, however, that only the protected areas inside the breakwater would support coral cover greater than 5% on the breakwater itself. Therefore, the new substrate that would actually be suitable coral habitat is approximately 66,438ft^2 (6,172m^2) or 1.5 acres (.6ha). This breaks down to approximately 34,198ft^2 (3,177m^2) inside of the harbor along the center mole and east mole slope face. About 32,240ft^2 (2,995m^2) would be available for coral colonization outside of the existing harbor along the inside edge of the new breakwater and slope face of the channel entrance. Ultimately, this construction would directly result in a net loss of approximately 143,538ft^2 (13,335m^2) or 3.3 acres (1.3ha) of coral habitat. Information on habitat loss for the alternative plans (USACE, 1994) is contained in Appendix C. We do not anticipate adverse sediment damage to adjacent reefs so long as best management practices are employed. Any sediments that are carried out of the harbor would be kept in suspension by wave action and transported offshore.



A



B

Figure 7: Relationship between depth and coral cover inside (**A**) and outside (**B**) of the harbor.

On the 50 transects conducted in and around the harbor a total of 101 species of fish were observed (Appendix B). Even though fish species richness was greater outside of the harbor (79 species versus 62) than inside, this is confounded by the fact that nearly twice as many transects were surveyed outside. Both areas may have more equitable species richness with similar effort.

Table 4: Extent of habitat alteration on existing coral reefs inside and outside of Ma'alaea harbor.

LOCATION	EXISTING HABITAT	ALTERATION	AREA (ft^2)
Inside	Triangular reef flat	Filled and dredged	-13,051
		Center mole new surface area	+10,860
	East reef face & flat	Dredged	-32,875
		East mole new surface area	+23,338
		Net gain (-loss) inside	(-11,728)
Outside	Western reef slope	Filled	-29,150
		New west channel surface area	+5,683
	Eastern reef slope	Filled and dredged	-134,900
		New breakwater area (usable)	+13,925
		New east channel surface area	+12,632
		Net gain (-loss) outside	(-131,810)
		Total net gain (-loss)	(-143,538)

The highest fish densities recorded were inside of the harbor with 344 fish/125m² recorded at transect #37. The dominant species were Yellowfin Goatfish (*Mulloides vanicolensis*) and Hawai'ian Flagtails (*Kuhlia sandvicensis*). These 2 species comprised as much as 63.4% of the total fish numbers observed around the harbor entrance and along the east mole. The harbor serves as a refuge for many juvenile species of wrasses, *Stethojulis balteata* & *Thalassoma duperrey,* surgeonfish *Acanthurus triostegus* & *Acanthurus blochii,* parrotfish *Scarus psittacus,* and butterflyfish, *Chaetodon sp.* Several species of fish not recorded on transect but noted as abundant in some areas of the harbor included mullet, *Mugil cephalus,* and anchovy, *Encrasicholina purpurea.*

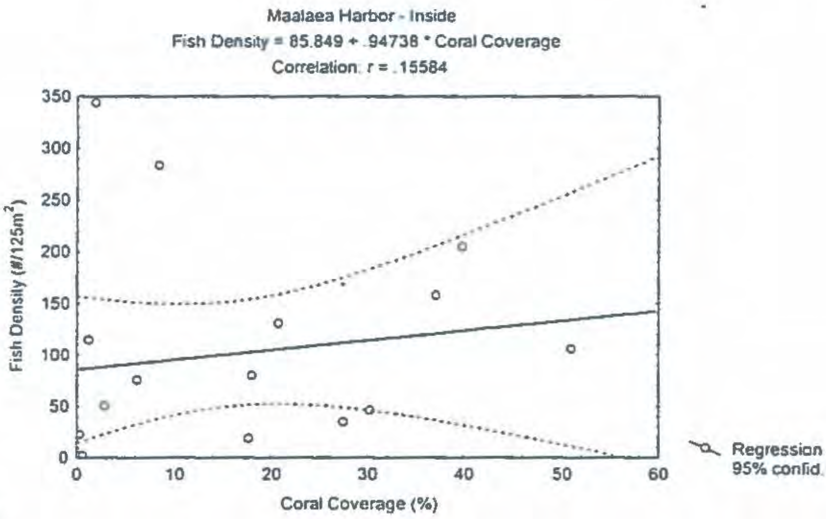
Outside of the harbor fish densities were highest (176/125m²) on transect #12. The fish populations in this region were quite uniform and dominated by parrotfish *Scarus psittacus,* tobies *Canthigaster jactator,* surgeonfish *Acanthurus triostegus,* wrasses *Stethojulis balteata* & *Thalassoma duperrey,* and damselfish *Abudefduf abdominalis* & *Stegastes fasciolatus* (Appendix B). the highest densities of any particular species of fish occurred around the harbor entrance or along the sand channel. In deeper water over the sandy flats, fish density dropped off dramatically at transects #27, 28, and 29 (5/125m², 2/125m², 50/125m²).

Fish diversity patterns in and around the harbor were analyzed using the Shannon-Weaver diversity index for each transect (Table 5). There was no significant difference between fish diversity inside of the harbor and outside using a one-way ANOVA (df=49,F=.1221,p=.7283). This is primarily due to the extreme variability of the fish populations encountered across a wide variety of habitats in both areas. Therefore, the relative proportion of each species to the overall sample was quite similar.

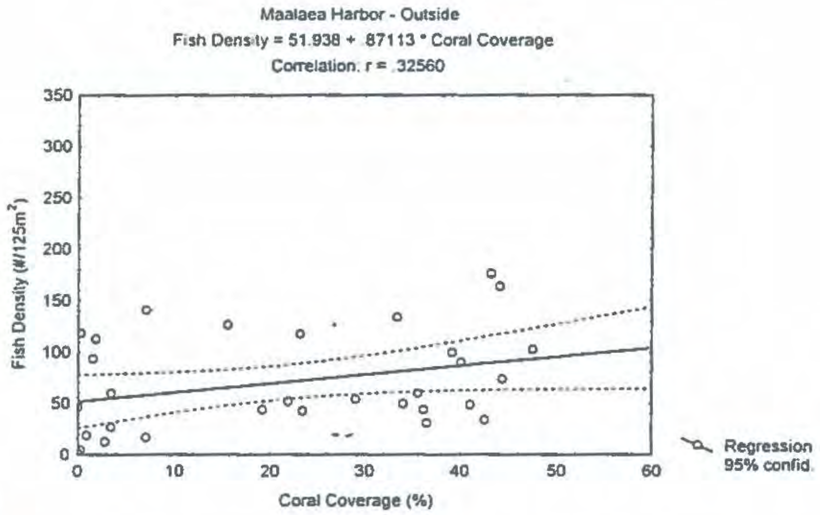
Table 5: Shannon-Weaver diversity indexes (H') for transects inside and outside of Ma'alaea harbor.

Inside Transect	H'	Outside Transects	H'
1	0.8718	4	0.8669
2	0.9842	5	0.9705
3	1.0242	6	0.7398
30	1.0914	7	0.7815
31	0.3768	8	1.0260
32	0.8334	9	0.6990
33	1.3019	10	0.6898
34	0.9245	11	1.0357
35	0.3010	12	0.9277
36	0.9017	13	0.9009
37	0.9301	14	1.2208
38	0.7002	15	1.1993
39	0.3010	16	0.9736
40	0.8174	17	0.6986
41	0.5511	18	0.9796
42	0.7253	19	0.9263
43	0.9136	20	0.9115
44	0.8474	21	0.6004
		22	0.9018
		23	1.1005
		24	0.7692
		25	0.8255
		26	0.9824
		27	0.6990
		28	0.3010
		29	0.0000
		45	0.9803
		46	0.5308
		47	0.8475
		48	1.0836
		49	0.4342
		50	0.8474

The relationship between coral cover and fish density was weak (R^2=.0243, $F(1,16)$=.3982, p<.5369) inside of the harbor due to the large numbers of fish in areas of relatively low coral cover (Figure 8). In this altered habitat, fish are attracted to human-made structures and/or low visibility which provides shelter from predation. The presence of many juveniles supports the hypothesis of predator avoidance. Another possibility is the abundance of food resources within the harbor such as algae, plankton and benthic invertebrates in the soft substrate. Outside of the harbor there was a stronger positive correlation between coral cover and fish density but it still was not statistically significant at α<.05 (R^2=.1060, $F(1,30)$=3.5575, p<.0690).



A



B

Figure 8: Relationship between coral cover and fish density inside (**A**) and outside (**B**) of Ma'alaea harbor.

Examining the trophic composition of the fish community inside of the harbor versus outside yielded only 76.2% similarity (Table 6). This is primarily due to the higher percentage of planktivorous fish inside of the harbor versus the greater percent of mobile invertebrate feeders outside of the breakwater. The higher percentage of coralivores outside of the harbor were positively correlated with the greater amount of coral in this habitat. Sessile invertebrate feeders contributed substantially more to the inside fish population than outside. The threefold increase is probably attributed to the abundance of soft bottom communities within the harbor.

Table 6: Trophic composition (%) of the fish community inside and outside of Ma'alaea harbor.

Trophic Group	Inside %	Outside %	Minimum
Coralivore	0.94	2.26	0.94
Detritivore	1.49	0.89	0.89
Herbivore	33.63	36.84	33.63
Mobile Invertebrates	25.96	44.83	25.96
Piscivore	2.54	2.93	2.54
Sessile Invertebrates	6.95	2.00	2.00
Planktivore	28.50	10.25	10.25
Percent similarity			76.21

Observations on threatened and endangered species focused on the Green Sea Turtle (*Chelonia mydas*) and the Humpback Whale (*Megaptera nouvengliae*). One turtle (highly diseased with fibropapilloma) was observed inside of the harbor along the eastern side. Large numbers of turtles were noted in shallow water east of the harbor and adjacent to the south mole. A large group (30-50 animals) of turtles were counted at "turtle reef". This reef provides resting habitat and is located in deeper water (30' at crest, 45' at base) approximately .5 miles (.8km) seaward from the harbor entrance in a southeasterly direction. We suspect that a much larger population of sea turtles utilize these reefs due to number of turtles observed in nearshore waters during daylight hours. A majority of the animals were large adults of considerable size (>1m carapace length).

Humpback whales were observed in close proximity 100 yards (~100m) to the transect areas but never in water depths less than 20' (6m). Pod compositions were primarily mother-calf pods in these nearshore areas. A detailed description of humpback whale distribution and behavior patterns is provided by Forestell and Brown (1991).

Recreational fishing

As an aside, we noted that recreational fishing activities occurred around the piers and along the inside edges of the harbor. At any given time we observed lines in the water. This is not surprising since our data show that fish are as abundant inside of the harbor as outside. Immediately outside of the harbor spear fishing and shore casting are frequent activities. Pole fisherman were observed on the east and south breakwater throughout the study period.

Mitigation Activities - Transplantation vs. Artificial Reef

Suitable species for transplantation

Ma'alaea harbor contains appropriate species in sufficient quantity for transplantation to other sites. These are common species found throughout Hawai'ian waters and include *Montipora verrucosa, Pocillopora meandrina, Porites compressa* and *P. lobata.* Outside of the harbor the coral community structure is fairly typical of other coastline areas subjected to strong seasonal wave action.

There are several problems, however, with growth forms and colony size. The first issue is that coral colonies inside of the harbor are adapted to low water motion environments and as a consequence have growth forms that are more delicate and foliaceous. Many of these colonies would not survive the relocation to higher water motion regimes outside of the harbor especially during strong, seasonal southerly swells. Attachment of the colonies to the substrate would also be required.

The second point is that coral colonies on the outside of the harbor are either too large (e.g. large *Porites sp.*) or encrusting (e.g. *Montipora sp.*) to be easily transplanted. The future location of the breakwater and channel entrance will cut through vast areas of reef flat that cannot be readily fragmented into smaller movable pieces. From past experience only coral colonies of a certain size and shape can be easily moved for transplantation. There are not enough of these colony types at Ma'alaea to make this a feasible option when one considers the net area of coral habitat that will be lost.

Receiving sites for transplantation

East of the harbor, coral cover was extensive (30-60%) but tapers off at the end of the shoreline development near the park at Kanaio. Potential sites for transplantation would have to be in deeper (>20'/6m) sections of this reef area because shallow areas free of coral have sand channels that facilitate sediment removal from the existing reef. These channels are a necessary part of the reef framework and unsuitable for coral colonization. At these deeper sites, coral colonies would have to be attached to the hard substrate to prevent movement and subsequent death during high water motion events. Unfortunately, the available hard substrate has very little relief with a shallow slope gradient and is surrounded by sand so it is continually subjected to burial from the shifting sediment.

Moving eastward and further offshore the hard substrate gives way to a sandy bottom interspersed with patches of coral rubble (Maciolek, 1971). Most of this sandy substrate from Palalaū (north central Ma'alaea bay) has less than 5% coral cover indicating that suitable substrate for coral recruitment and survival does not exist. In addition, the turbidity in this area is impacted by silty water discharge from Kealia Pond and large southerly swells that resuspend bottom sediments (Maciolek, 1971).

To the west of the harbor, the hard substrate of the reef flat increases in topographic relief with an increase in depth. Coral cover increases dramatically moving southwest towards McGregor point and the Scenic lookout. Several possible sites were surveyed but suitable substrate was scarce. At some sites such as Wash Rock, a popular fishing and dive site, coral cover approached 80%. This exceeded our criteria because supplementing an area already rich in coral and apparently in equilibrium, would not benefit the ecosystem. Other sites had a hard substrate that were depauperate of coral (<10%) indicating high water motion from seasonal south swells. Therefore, any transplantation efforts would have to be cemented to the substrate increasing labor and costs. Past experience with transplantation at Kawaihae harbor, Hawai'i, identifies similar factors (e.g. existing coral cover, water motion and sedimentation) influencing reefs that are important considerations in selecting a site (Jokiel, *et.al.*, 1997).

Economic feasibility of transplantation

The economic aspect of transplantation is not a viable option. Any transplantation efforts at Ma'alaea would have to be conducted by commercial divers adhering to OSHA guidelines. The expense of commercial dive operations is very high compared with research projects or volunteer programs. Additional equipment, logistical support and personnel would have to be employed making commercial diving cost prohibitive. In this scenario, it is believed that artificial reef structures would be a better option by producing new habitat.

Alternatives

At present there are no areas within close proximity of Ma'alaea harbor that are under consideration for transplantation or artificial reef placement. The closest area currently designated as an artificial reef site is Keawakapu which is approximately 7miles (11.3km) from Ma'alaea harbor. Artificial reef structures already present at this site include concrete slabs, concrete filled tires and a sunken ship. Transporting extensive areas of living reef this distance, however, would be a costly undertaking. The most cost effective alternative is placement of new artificial reef structures of suitable size and material. The nearest approved site at Keawakapu is too deep (>50') for lush development of shallow coral reefs to replace the existing harbor community. Possibly a new artificial reef site east of "Turtle Reefs" could be created in depths of 40'-50'. Using concrete or boulders to create a mound on the sand of sufficient height (15'-20') would produce a reef similar to the "Turtle Reefs". These reefs exhibit high coral coverage (80%) and resting habitat for sea turtles. Corals, fish and sea turtles would recruit naturally to the new structures if placed in comparable depths.

Executive Summary

A detailed quantitative survey of corals and fishes leads to the following conclusions:

1.) The greatest concentration of coral inside the harbor is located near the dredged channel entrance along the east mole and along the eastern face of the triangular reef remnant located in the harbor. Prior to the construction of Ma'alaea Harbor, these areas were shallow (1-3 ft) reef flats with undoubtedly little if any living coral. Areas of high slope (>.4 Rise/Run) within the harbor show coral coverage as high as 50.9%. This coral community is dominated by the common species *Montipora verrucosa* and *Porites compressa* which thrive in low water motion environments.

2.) Outside of the harbor, coral coverage is extensive (30-40%) on both sides of the ship channel and extending eastward along the reef face at depths between 3' to 20' (1-6m). At these sites, slope of the reef face was low (.03-.06). This high correlation between good coral coverage and depth is attributed to suitable light conditions and moderate water motion with minimal destructive impact from waves. Little coral can be found at depths shallower than 1 m due to extreme wave action and exposure at minus tides. Substratum below 6 m consists of shifting sand/gravel that is unsuitable for coral colonization. The dominant species in the coral community outside of the harbor is *Porites lobata.*

3.) The areal extent of coral reef that would be dredged or filled is approximately 209,976ft^2 (19,507m^2) or 4.8 acres (1.9 ha), using the present construction plan sponsored by the State of Hawai'i and the Federal Government. This would be partially offset by the creation of about 66,438ft^2 (6,172m^2) or 1.5 acres (.6ha) of new, altered habitat due to the addition of the breakwater, dredged channel slope and interior harbor slope. Overall, there will be a net loss of approximately 143,538ft^2 (13,335m^2) or 3.3 acres (1.3ha) of coral habitat as a result of the proposed harbor construction. These values are merely estimates because we are uncertain at this time whether the construction will result in more extensive or less extensive coral cover on the new breakwater and slope faces.

4.) There were no significant differences between the fish species diversity inside of the harbor and outside. Even though fish density patterns were much more variable inside of the harbor, the proportion of each fish species within the sampled population was relatively uniform between the 2 areas.

5.) The positive correlation between coral coverage and the abundance of fish is stronger outside of the harbor. The relationship weakens inside the harbor due to the large numbers of schooling juvenile fish even within areas of low coral cover. In fact, the highest fish densities recorded in this survey (344/125m^2) were located inside of the harbor along the eastern mole in water depths less than 3' (1m). The harbor serves as a valuable nursery ground for juvenile fish such as mullet, *Mugil cephalus,* Hawai'ian flagtail, *Kuhlia sandwichensis,* anchovy, *Encrasicholina purpurea,* butterflyfish, *Chaetodon sp.,* and wrasses, *Stethojulis balteata* & *Thalassoma duperrey.* Coral and fish species seldom seen in Hawai'i (e.g. the coral *Psammocora stellata* and the stripey, *Microcanthus strigatus*) were also observed in the harbor.

6.) Even though fish species diversity was relatively uniform in and around the harbor, the trophic composition of the community was not. The similarity index indicated that the correspondence between the two areas was only 76.2%. This is due primarily to the large proportion of planktivores within the harbor and the high numbers of mobile invertebrate feeders outside. The proportion of coralivores outside of the harbor was twice as high as inside which correlated well with the higher overall coral cover. In turn there was a threefold percentage increase of sessile invertebrate feeders inside of the harbor which can be explained by the abundance of soft bottom communities.

7.) We conclude that the proposed expansion of the harbor will not impact green sea turtle (*Chelonia mydas*) populations. During the entire survey we observed only one turtle (highly diseased with fibropapilloma) inside the harbor (near the eastern mole). Large numbers of healthy turtles were noted in shallow water east of the harbor and off the south mole. A large group (30-50) of turtles were observed on "turtle reef". This reef serves as a resting habitat and is located in deeper water (30' at crest, 45' at base) approximately 0.5 miles (0.8km) seaward from the harbor entrance. This area will be outside of any conceivable impact due to harbor construction.

8.) Humpback whales were also observed near the harbor entrance during the study period but never entered water depths shallower than 20'. The deepest penetration of the proposed breakwater is approximately 16' so we conclude that impacts would be minimal once construction is completed. See Forestell and Brown (1991) for further details on construction impacts to humpback whales.

Recommendations

• Transplantation of corals to new locations is not an option at Ma'alaea due to lack of suitable colony sizes, growth forms and transplant sites along the coast. Either sites have extensive coral cover (>70%) in which case transplanted corals would not supplement the existing habitat over a 10 year period, or regions were relatively barren indicating harsh environmental conditions that would not support transplanted colonies of coral.

• Mitigation of habitat loss by construction of artificial reefs is the most attractive and cost effective option. In order to compensate for loss of critical reef habitat and associated fauna we estimate that an artificial reef equivalent to 143,500ft^2 (13,335m^2) or 3.3 acres (1.3ha) would be required. This takes into account new habitat that would be created from the construction of moles and dredging of channels through consolidated reef material. The artificial reef could be of the concrete type currently utilized by the State of Hawai'i Division of Aquatic Resources (DAR) or the sinking of derelict ship hulls in designated artificial reef zones. Overall habitat loss will be partially offset by these structures which are suitable for coral settlement. We advocate the creation of habitat at a new site near "Turtle Reefs" in similar water depths.

• During construction, efforts should be made to reduce sediment loads when dredging or filling portions of the harbor. Suspended sediments can be detrimental to coral recruitment and survival in low water motion environments with little vertical relief as is the case in protected harbor habitats. In the high water motion environment outside of the harbor, sediments are transported away to deeper depths.

• Establish a monitoring program to document indirect sediment impacts on coral coverage inside and outside of the harbor that result from construction activities. This program could help develop construction protocols for future harbor projects to mitigate reef impact from suspended sediments and the resulting loss in water clarity.

References

AECOS, Inc., 1994. Ma'alaea triangle and Maui Ocean Center. Draft environmental assessment for a sea water system and drainage improvements. Prep. for Maui Ocean Center and Ma'alaea Triangle Partnership. AECOS No. 780: 86p.

Bortone, S.A. and J.J. Kimmel, 1991. Environmental assessment and monitoring of artificial habitats. In: Artificial Habitats For Marine and Freshwater Fisheries. Ed. W. Seaman, Jr. and L.M. Sprague. Academic Press, Inc. 177-236.

Brock, V.E., 1954. A preliminary report on a method for estimating reef fish populations. Journ. Wild. Management. 18 (3): 297-308.

Coyer, J. and J. Witman, 1990. The Underwater Catalog. A Guide to Methods in Underwater Research. Shoals Marine Laboratory.

DeMartini, E.E., F.A. Parrish and J.D. Parrish, 1994. Temporal comparisons of reef fish populations at Midway Atoll, Northwestern Hawai'ian Islands. Southwest Fisheries Science Center. Administrative Report H-94-05. 56p.

Dahl, A. L., 1981. Monitoring Coral Reefs for Urban Impact, Bulletin of Marine Science, 31(3):544-551.

Dewees, C.M., (Ed) 1981. Guidelines for Marine Ecological Surveys: Nekton. Sea Grant California, Marine Advisory Publication.

Dodge, R.E. and J.R. Vaisnys, 1977. Coral Populations and Growth Patterns: Responses to Sedimentation and Turbidity Associated with Dredging. Journ. of Mar. Res. 35(4):715-730.

Dollar, S.J., 1982. Wave Stress and Coral Community Structure in Hawai'i. Coral Reefs 1:71-81.

Forestell, P.H. and E.K. Brown, 1991. Description of Humpback Whale Use of Ma'alaea Bay, Maui, Hawai'i. Prep. for U. S. Army Corps of Engineers, Honolulu Engineer District, Environmental Resources Branch. 44p.

Jokiel, P.L. and W.A. Tyler III, 1992. Distribution of Stony Corals in Johnston Atoll Lagoon. Proceedings of the Seventh International Coral Reef Symposium, Guam 2:683-692.

Jokiel, P.L., E.F. Cox, F.T. Te and D. Irons, 1997. Mitigation of Reef Damage at Kawaihae Harbor Through Transplantation of Reef Corals. Interim Report prep. for U.S. Fish and Wildlife Service, Pacific Islands Ecoregion. 35p.

Maciolek, J., 1971. Aquatic Ecosystems of Kealia Floodplain and Ma'alaea Bay, Maui. Hawai'i Institute of Marine Biology. Technical Report No. 27.

Maragos, J.E., 1977. Order Scleractinia, stony corals. In:Reef and Shore Fauna of Hawai'i, Section 1: Protozoa Through Ctenophora. B.P. Bishop Museum Spec. Pub. 64 (1):158-241.

Pielou, E.C., 1966. The Measurement of Diversity in Different Types of Biological Collections. Journ. Theoret. Biology, 13:131-144.

Randall, J.R., 1985. Guide to Hawai'ian Reef Fishes. Harrowood Books, Newton Square, PA.

Randall, J.R., 1996. Shore Fishes of Hawai'i. Natural World Press, Vida, OR.

Reed, A.S., 1980. Sampling and Transecting Techniques on Tropical Reef Substrates. pp. 71-89. In: Environmental survey techniques for coastal water assessment. Conference Proceedings. University of Hawai'i Sea Grant College program. Cooperative Report UNIHI-SEAGRANT-CR-80-01.

Sheppard, C.R.C., 1982. Coral Populations on Reef Slopes and Their Major Controls. Mar. Ecol. Prog. Series 7:83-115.

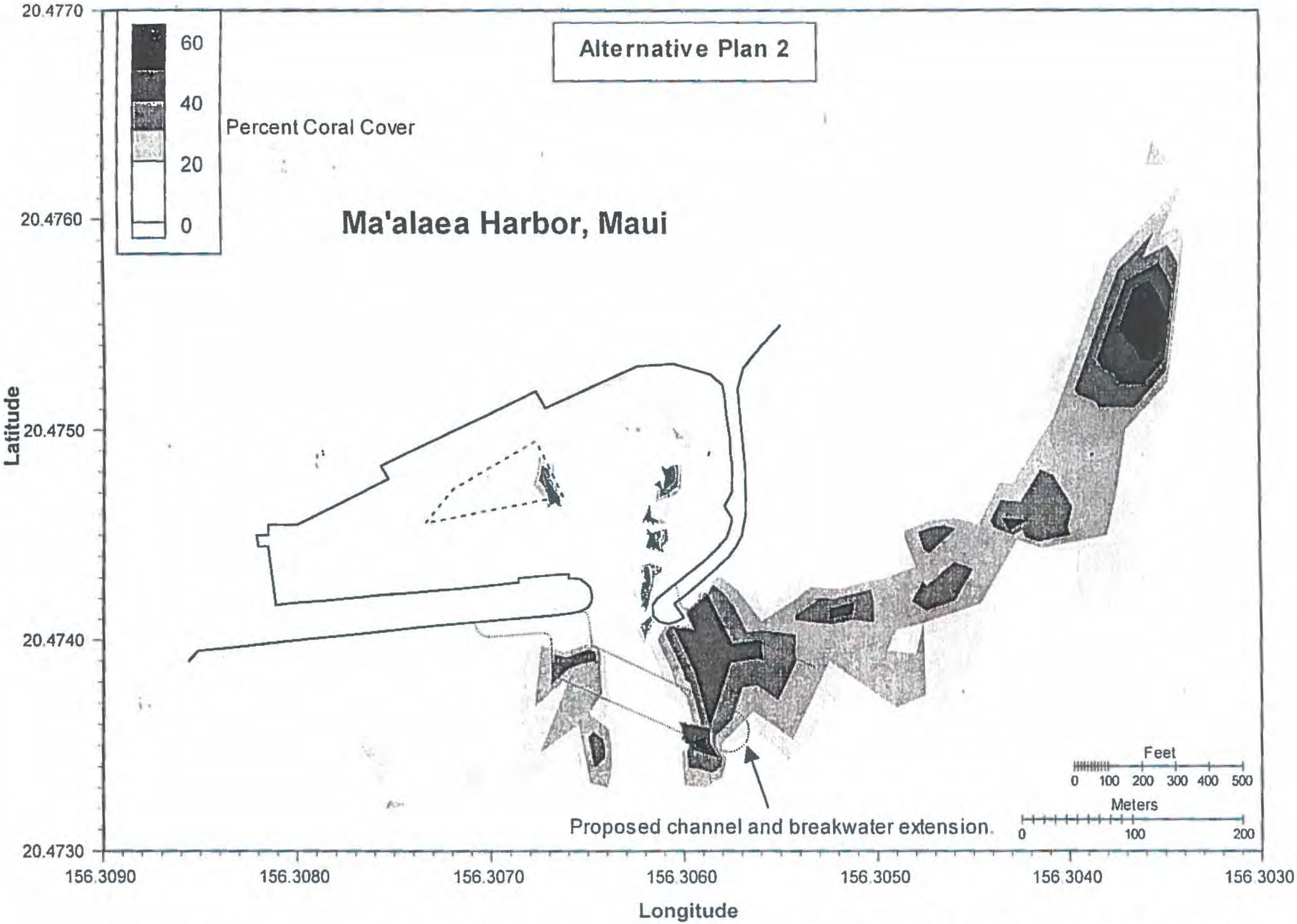
USACE. 1980. Ma'alaea Harbor for light-draft vessels, Maui, Hawai'i, general design memorandum and final environmental impact statement. U.S. Army Corps of Engineers, Honolulu District.

USFWS. 1994. Final Fish and Wildlife Coordination Act Report, Ma'alaea Harbor for Light-draft Vessels, Ma'alaea, Maui, Hawai'i. Prep. for U.S. Army Corps of Engineers, Pacific Ocean Division. U.S. Dept. of the Interior, Fish and Wildlife Service, Pacific Islands Office, Honolulu, Hawai'i. 44p.

William A. Brewer and Assoc. 1987. Baseline marine environmental surveys, Ma'alaea Harbor, Maui, Hawai'i. Prep. for Ma'alaea Triangle Partnership. 28p.

Extent of habitat alteration on existing coral reefs inside and outside of Ma'alaea harbor for Alternative Plan 2.

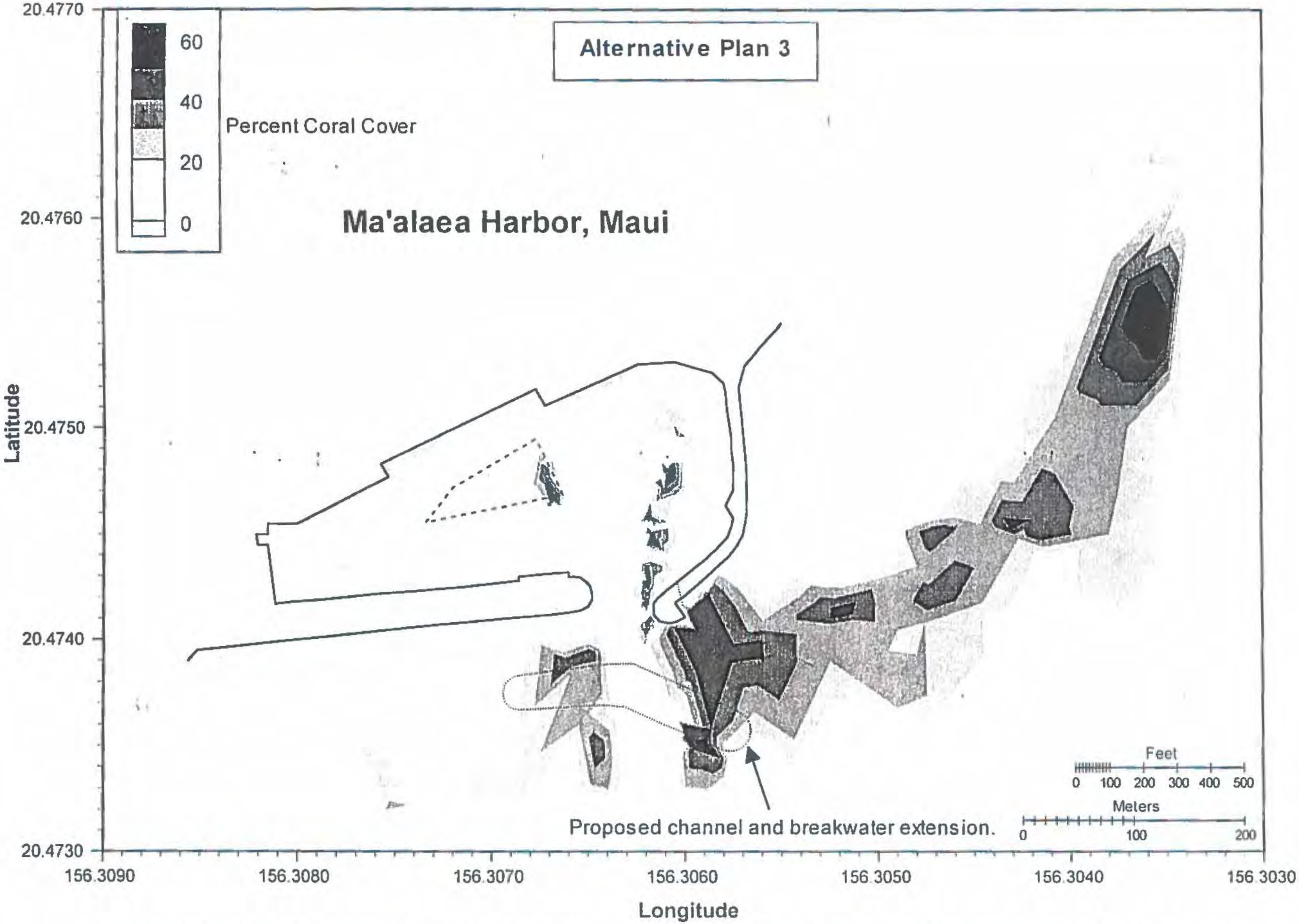
LOCATION	EXISTING HABITAT	ALTERATION	AREA (ft^2)
Inside	Triangular reef flat	Filled and dredged	-13,051
		Center mole new surface area	+10,860
	East reef face & flat	Dredged	-32,875
		East mole new surface area	+23,338
		Net gain (-loss) inside	(-11,728)
Outside	Western reef slope	Filled	-25,700
		New west channel surface area	+5,683
	Eastern reef slope	Filled and dredged	-134,900
		New breakwater area (usable)	+13,925
		New east channel surface area	+12,632
		Net gain (-loss) outside	(-128,360)
		Total net gain (-loss)	(-140,088)



Location of coral reefs in and around Ma'alaea Harbor with Alternative Plan 2 displayed. Shaded contour values represent coral cover in percent.

Extent of habitat alteration on existing coral reefs inside and outside of Ma'alaea harbor for Alternative Plan 3.

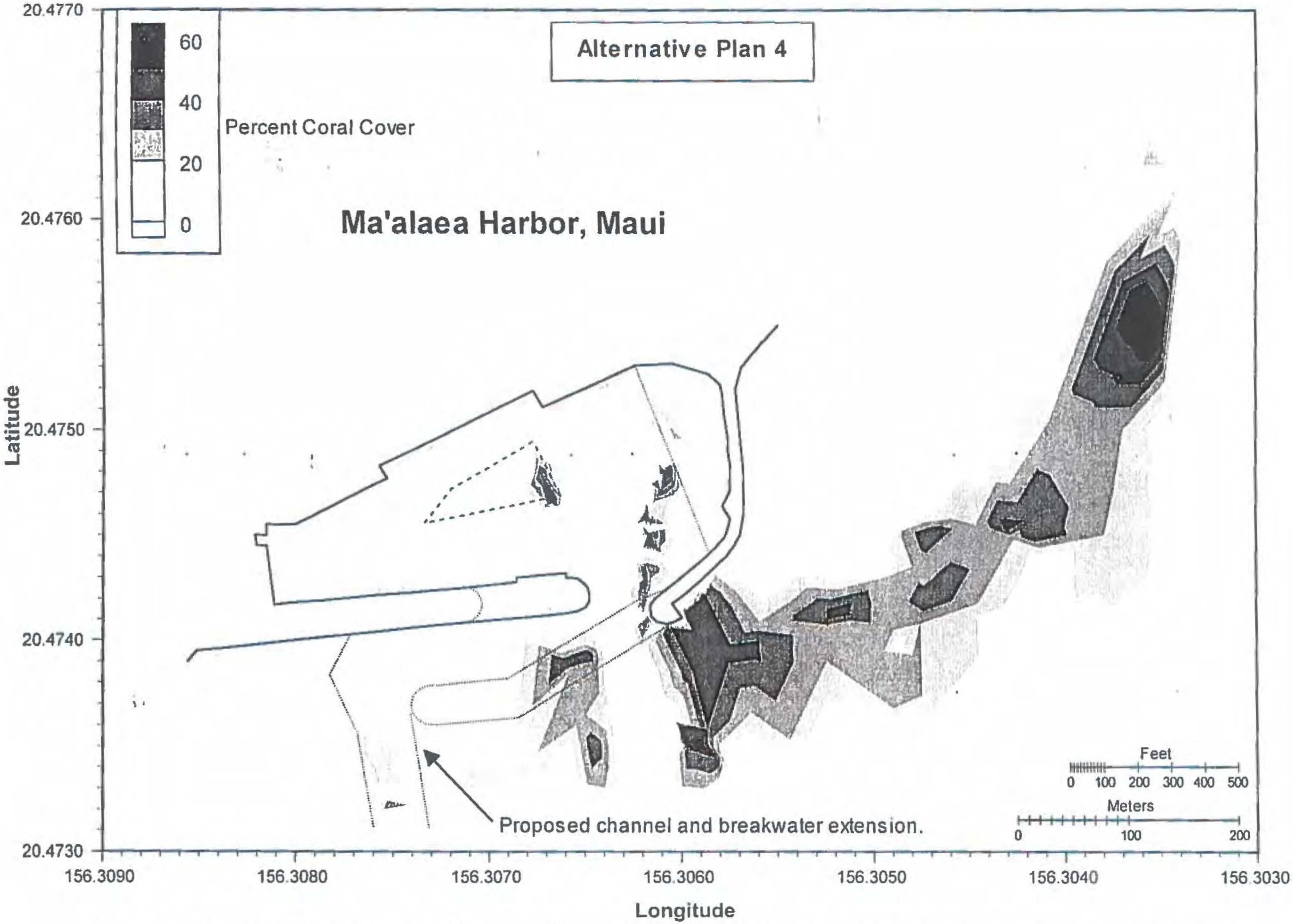
LOCATION	EXISTING HABITAT	ALTERATION	AREA (ft^2)
Inside	Triangular reef flat	Filled and dredged	-13,051
		Center mole new surface area	+10,860
	East reef face & flat	Dredged	-32,875
		East mole new surface area	+23,338
		Net gain (-loss) inside	(-11,728)
Outside	Western reef slope	Filled	-25,725
		New west channel surface area	+5,683
	Eastern reef slope	Filled and dredged	-134,900
		New breakwater area (usable)	+17,149
		New east channel surface area	+12,632
		South breakwater (now usable)	+3,868
		Net gain (-loss) outside	-121,293
		Total net gain (-loss)	(-133,021)



Location of coral reefs in and around Ma'alaea Harbor with Alternative Plan 3 displayed. Shaded contour values represent coral cover in percent.

Extent of habitat alteration on existing coral reefs inside and outside of Ma'alaea harbor for Alternative Plan 4.

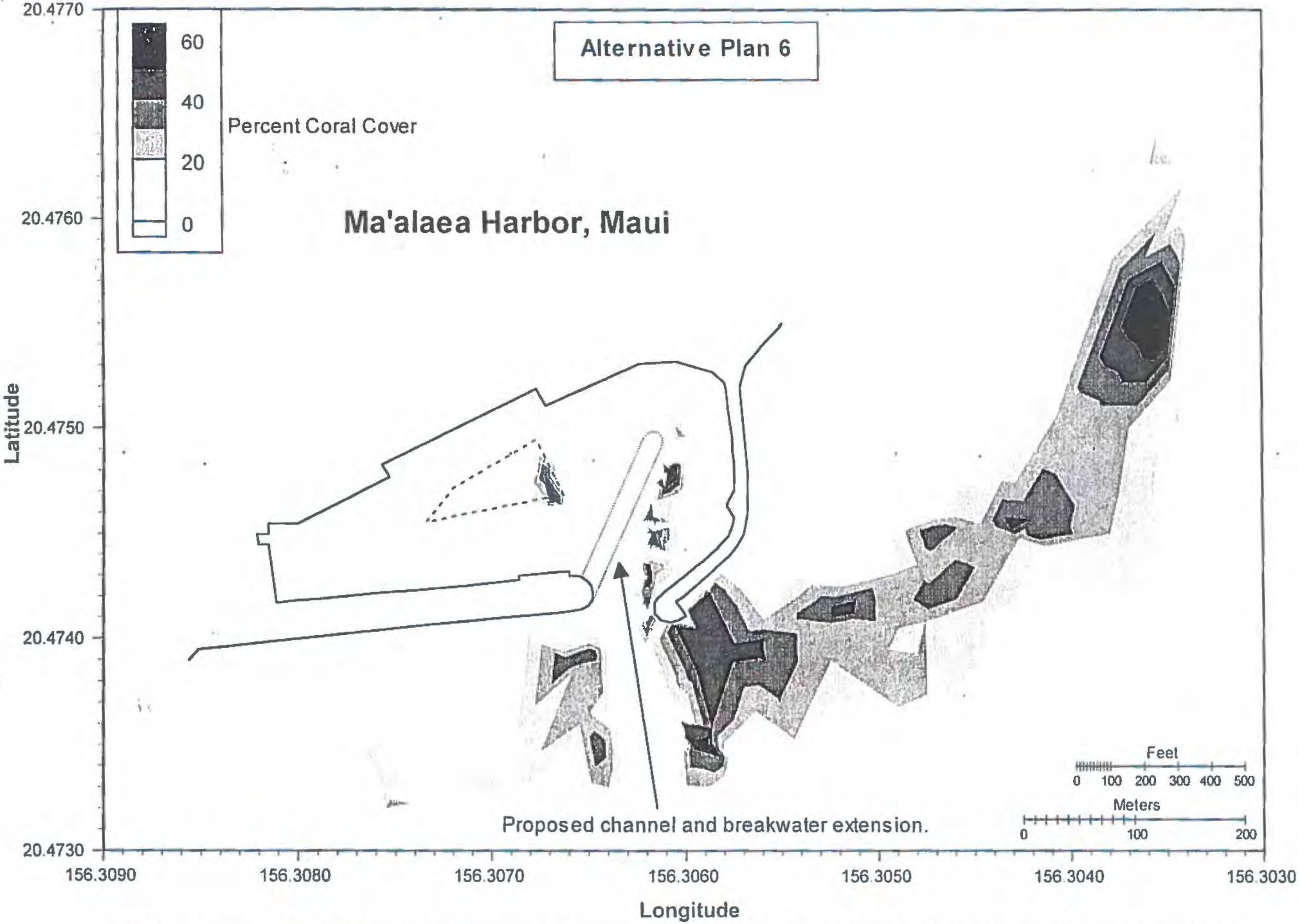
LOCATION	EXISTING HABITAT	ALTERATION	AREA (ft^2)
Inside	Triangular reef flat	Filled and dredged	-13,051
		Center mole new surface area	+10,860
	East reef face & flat	Dredged	-32,875
		East mole new surface area	+30,249
		Net gain (-loss) inside	(-4,817)
Outside	Western reef slope	Filled	-32,300
		Dredged	-23,863
	Eastern reef slope	New channel surface area	+24,285
		New breakwater area (usable)	+20,124
		South breakwater (now usable)	+11,371
		Net gain (-loss) outside	(-383)
		Total net gain (-loss)	(-5,200)



Location of coral reefs in and around Ma'alaea Harbor with Alternative Plan 4 displayed. Shaded contour values represent coral cover in percent.

Extent of habitat alteration on existing coral reefs inside and outside of Ma'alaea harbor for Alternative Plan 6.

LOCATION	EXISTING HABITAT	ALTERATION	AREA (ft^2)
Inside	Triangular reef flat	Dredged	-13,051
	East reef face & flat	Dredged	-32,875
		New breakwater area (usable)	+39,844
		East mole new surface area	+38,327
		Total net gain (-loss)	+32,245



Location of coral reefs in and around Ma'alaea Harbor with Alternative Plan 6 displayed. Shaded contour values represent coral cover in percent.

APPENDIX E

FISH AND WILDLIFE COORDINATION ACT REPORT

DEPARTMENT OF THE ARMY
U. S. ARMY ENGINEER DISTRICT, HONOLULU
FORT SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF

July 18, 1997

Planning and Operations Division

Mr. Brooks Harper
Field Supervisor, Pacific Island Office
U.S. Fish and Wildlife Service
P.O. Box 50167
Honolulu, Hawaii 96850

Dear Mr. Harper:

The U.S. Army Corps of Engineers is preparing a draft joint second Supplemental Environmental Impact Statement (SEIS) for Ma'alaea Harbor for Light-Draft Vessels, Maui, Hawaii in coordination with our local sponsor, the Department of Land and Natural Resources (DLNR). The new SEIS will document acceptance of the mitigation plan (copy enclosed) developed by the DLNR, Office of Coastal Zone Management (CZM), Office of the State Attorney General, National Marine Fisheries Service and the Corps, and receipt of the CZM Consistency Determination. In addition it will include minor changes in the project design and new information obtained since the final project SEIS was distributed in 1994.

Please advise if you wish to make additional comments at this time under the Fish and Wildlife Coordination Act for inclusion in this second draft SEIS. Should you have any further questions, please call Mr. Bill Lennan of my Planning and Operations Division staff at 438-2264.

Sincerely,

Ray H. Jyo, P.E.
Director of Engineering
and Technical Services

Enclosure

United States Department of the Interior

OFFICE OF THE SECRETARY
Washington, D.C. 20240

NOV 15 1994

ER 92/1122

Lieutenant Colonel M. Bruce Elliott
District Engineer
U.S. Army Corps of Engineers District, Honolulu
Attn: CEPOD-ED-6D-PV/Lennan
Building 230
Fort Shafter, Hawaii 96858-5440

Dear Lieutenant Colonel Elliott:

The U.S. Department of the Interior (Department) has reviewed the July 1994 Final Supplemental Environmental Impact Statement (FSEIS) for Ma'alaea Harbor for Light-Draft Vessels, Maui, Hawaii. The following comments are provided for your consideration when preparing the Supplemental Record of Decision (SROD).

GENERAL COMMENTS

The preferred alternative plan presented in the FSEIS differs from the one contained in the Draft Supplemental Environmental Impact Statement (DSEIS). The principal differences are: (a) the widening of the existing south revetted mole has been "substantially reduced", (b) the amount of dredged material has been reduced from 44,000 cubic yards (yds^3) to 27,000 yds^3, and (c) the destruction of coral-reef habitat off the end of the east breakwater has been reduced from 2.6 acres (ac) to 2 ac. However, we are unable to evaluate the revised alternative plan because pertinent information on the areas and amounts of the proposed project-related dredging and filling is missing, inconsistent, and conflicting.

In addition, the FSEIS was issued before submission of the Fish and Wildlife Service's (FWS) Final Fish and Wildlife Coordination Act (FWCA) report. The Department, Environmental Protection Agency, and our FWS all recommended the Final FWCA report be included. In the Draft FWCA report; our FWS identified Alternative 6 as the least damaging alternative plan to Federal trust species. Implementing Alternative 6 would involve construction of an internal mole, which would result in restricting direct dredge and fill impacts to within existing harbor boundaries. Alternative 6 conveys a concept rather than a specific detailed plan. As a result, FWS requested the Corps of Engineers (Corps) develop a workable project design based on the concept underlying Alternative 6 and provide the design to the FWS for evaluation prior to preparation and submission of a Final FWCA report. Instead, the Corps further analyzed Alternative 6 as presented in the DSEIS, and included the test results in the FSEIS. Our FWS should have been given an opportunity to complete the Final FWCA report prior to Corps' issuance of the FSEIS. Thus, the issue of avoidance of adverse project-related impacts to coral-reef habitat at Ma'alaea Harbor remains unsettled.

SPECIFIC COMMENTS

Page 1-2. Chapter 1. Summary. 1.3. Issues Yet To Be Resolved The FSEIS incorrectly states that the Corps has responded to a request from FWS for "additional consideration of an alternative which would restrict all improvements within the existing harbor boundaries to avoid any impacts to the marine environment outside the harbor." The Corps responded by conducting "further study of Alternative 6." The FWS did not request further study of Alternative 6 in the July 1993 Draft FWCA report. They requested "that the Corps refine a workable design based on the concept underlying Alternative 6." Thus, our request remains unfulfilled. A response to FWS's request should be made the final documents.

The FSEIS states "Alternative 6 would not meet the purposes of the proposed action" as listed on page 2-1. However, Appendix G contains a report entitled "Wave Response of Proposed Improvement Plan 6 to the Small Boat Harbor at Ma'alaea, Maui, Hawaii" (Plan 6 Report), which states that "Plan 6 satisfies the [Corps'] criteria for providing adequate protection in the channel and berthing areas...from incident wind wave and swell climate." Also, the conceptual harbor configuration shown in Figure 15 on page 3-18 indicates that at a minimum Alternative 6 would provide for a 30 percent increase in the number of existing berths. An even greater increase in the number of berths could be achieved by refinement of a design based on the concept underlying Alternative 6. Therefore, the information contained in the FSEIS supports the conclusion that Alternative 6 would meet the purposes of the proposed action. Because the interior mole concept would accomplish the stated project purposes while restricting direct project-related impacts from an area used by Federal trust species, this alternative should continue to be considered.

The FSEIS further states Alternative 6 "would actually worsen existing navigation and safety conditions." This statement is not supported by the test results. Test results presented in the Plan 6 Report indicate that wave heights in the entrance channel would be greater than 2 feet (ft) only 7.5 percent of the time per year and that wave heights in the berthing area would be greater than 1 foot only 1.9 percent of the time per year. These results are below the Corps' limiting criteria for the proposed harbor design improvements (Appendix G report entitled "Wave Response of Proposed Improvements to the Small Boat Harbor at Ma'alaea, Maui, Hawaii"). Refinement of a design based on the concept underlying Alternative 6 could achieve even better navigation and safety. Therefore, test results indicate the potential for a refined design based on the interior mole concept to improve navigation and berthing while preventing direct project-related impacts in an area currently used by Federal trust species.

Page 3-7. Chapter 3. Alternatives. 3.2.2. Federal Alternatives Considered in Detail The FSEIS states the preferred alternative "is similar to the selected plan identified in the 1980 GDM/FEIS." The dimensions of the south breakwater extension, entrance channel, turning basin, and access channel presented in the FSEIS are identical to those presented in the DSEIS. However, the FSEIS states that the south revetted mole "has been substantially reduced in area from the design in the 1980 selected plan," which was presented as the

United States Department of the Interior

OFFICE OF THE SECRETARY
Washington, D.C. 20240

NOV 15 1994

ER 92/1122

Lieutenant Colonel M. Bruce Elliott
District Engineer
U.S. Army Corps of Engineers District, Honolulu
Attn: CEPOD-ED-6D-PV/Lennan
Building 230
Fort Shafter, Hawaii 96858-5440

Dear Lieutenant Colonel Elliott:

The U.S. Department of the Interior (Department) has reviewed the July 1994 Final Supplemental Environmental Impact Statement (FSEIS) for Ma'alaea Harbor for Light-Draft Vessels, Maui, Hawaii. The following comments are provided for your consideration when preparing the Supplemental Record of Decision (SROD).

GENERAL COMMENTS

The preferred alternative plan presented in the FSEIS differs from the one contained in the Draft Supplemental Environmental Impact Statement (DSEIS). The principal differences are: (a) the widening of the existing south revetted mole has been "substantially reduced", (b) the amount of dredged material has been reduced from 44,000 cubic yards (yds^3) to 27,000 yds^3, and (c) the destruction of coral-reef habitat off the end of the east breakwater has been reduced from 2.6 acres (ac) to 2 ac. However, we are unable to evaluate the revised alternative plan because pertinent information on the areas and amounts of the proposed project-related dredging and filling is missing, inconsistent, and conflicting.

In addition, the FSEIS was issued before submission of the Fish and Wildlife Service's (FWS) Final Fish and Wildlife Coordination Act (FWCA) report. The Department, Environmental Protection Agency, and our FWS all recommended the Final FWCA report be included. In the Draft FWCA report, our FWS identified Alternative 6 as the least damaging alternative plan to Federal trust species. Implementing Alternative 6 would involve construction of an internal mole, which would result in restricting direct dredge and fill impacts to within existing harbor boundaries. Alternative 6 conveys a concept rather than a specific detailed plan. As a result, FWS requested the Corps of Engineers (Corps) develop a workable project design based on the concept underlying Alternative 6 and provide the design to the FWS for evaluation prior to preparation and submission of a Final FWCA report. Instead, the Corps further analyzed Alternative 6 as presented in the DSEIS, and included the test results in the FSEIS. Our FWS should have been given an opportunity to complete the Final FWCA report prior to Corps' issuance of the FSEIS. Thus, the issue of avoidance of adverse project-related impacts to coral-reef habitat at Ma'alaea Harbor remains unsettled.

SPECIFIC COMMENTS

Page 1-2. Chapter 1. Summary. 1.3. Issues Yet To Be Resolved The FSEIS incorrectly states that the Corps has responded to a request from FWS for "additional consideration of an alternative which would restrict all improvements within the existing harbor boundaries to avoid any impacts to the marine environment outside the harbor." The Corps responded by conducting "further study of Alternative 6." The FWS did not request further study of Alternative 6 in the July 1993 Draft FWCA report. They requested "that the Corps refine a workable design based on the concept underlying Alternative 6." Thus, our request remains unfulfilled. A response to FWS's request should be made the final documents.

The FSEIS states "Alternative 6 would not meet the purposes of the proposed action" as listed on page 2-1. However, Appendix G contains a report entitled "Wave Response of Proposed Improvement Plan 6 to the Small Boat Harbor at Ma'alaea, Maui, Hawaii" (Plan 6 Report), which states that "Plan 6 satisfies the [Corps'] criteria for providing adequate protection in the channel and berthing areas...from incident wind wave and swell climate." Also, the conceptual harbor configuration shown in Figure 15 on page 3-18 indicates that at a minimum Alternative 6 would provide for a 30 percent increase in the number of existing berths. An even greater increase in the number of berths could be achieved by refinement of a design based on the concept underlying Alternative 6. Therefore, the information contained in the FSEIS supports the conclusion that Alternative 6 would meet the purposes of the proposed action. Because the interior mole concept would accomplish the stated project purposes while restricting direct project-related impacts from an area used by Federal trust species, this alternative should continue to be considered.

The FSEIS further states Alternative 6 "would actually worsen existing navigation and safety conditions." This statement is not supported by the test results. Test results presented in the Plan 6 Report indicate that wave heights in the entrance channel would be greater than 2 feet (ft) only 7.5 percent of the time per year and that wave heights in the berthing area would be greater than 1 foot only 1.9 percent of the time per year. These results are below the Corps' limiting criteria for the proposed harbor design improvements (Appendix G report entitled "Wave Response of Proposed Improvements to the Small Boat Harbor at Ma'alaea, Maui, Hawaii"). Refinement of a design based on the concept underlying Alternative 6 could achieve even better navigation and safety. Therefore, test results indicate the potential for a refined design based on the interior mole concept to improve navigation and berthing while preventing direct project-related impacts in an area currently used by Federal trust species.

Page 3-7. Chapter 3. Alternatives. 3.2.2. Federal Alternatives Considered in Detail The FSEIS states the preferred alternative "is similar to the selected plan identified in the 1980 GDM/FEIS." The dimensions of the south breakwater extension, entrance channel, turning basin, and access channel presented in the FSEIS are identical to those presented in the DSEIS. However, the FSEIS states that the south revetted mole "has been substantially reduced in area from the design in the 1980 selected plan," which was presented as the selected alternative in the DSEIS. The amount of this reduction is not identified in the FSEIS, but based on the figures depicting the project site that were included in the documents, we estimate the reduction to be approximately 0.8 ac of fill. Since the dimensions of the other project features have not changed, the FSEIS is unclear how the total dredge acreage increases from 5.3 ac in the DSEIS to 6.1 ac in the FSEIS (as stated on page 3-22). How the quantity of dredged material is reduced by 39 percent when the area of dredging was increased also should be clarified. It is similarly unclear how the loss of coral-reef habitat from entrance channel dredging off the end of the east breakwater was reduced 23 percent from 2.6 ac in the DSEIS to 2 ac in the FSEIS without reorienting the proposed new channel. Clear and consistent information on the proposed project needs to be presented in the final documents to evaluate project-related impacts to fish and wildlife resources.

Page 3-19. Chapter 3. Alternatives. 3.5. Alternatives Eliminated from Detailed Planning It is stated that "during south swell conditions an internal oscillation would develop in the harbor, causing damage to berthed vessels." However, according to the Plan 6 Report, increases in harbor oscillations are potential rather than definite. Also, the harbor oscillation test results appear to be inconclusive due to limitations inherent in the Harbor D model used for the test. Furthermore, other project alternatives, including Alternative 1 (Preferred Alternative), were not tested for harbor oscillations for comparison with Alternative 6. Therefore, test results do not support the following conclusions: (a) Alternative 6 would cause harbor oscillations that would damage berthed vessels and (b) the preferred alternative would not cause harbor oscillations that could damage berthed vessels. Development of harbor oscillations may possibly be reduced by refining a design based on the interior mole concept. This refined design would also prevent project-related impacts in areas currently used by Federal trust species.

The FSEIS states that "the flushing characteristics of the harbor under Alternative Plan 6 were the worst of those analyzed, increasing the flushing period from the present 2.9 days to an estimated 6.3 days." However, the Appendix B report entitled, "Numerical Hydrodynamic Modeling and Flushing Study at Ma'alaea Harbor, Maui, Hawaii" indicates that a period of less than 10 days should be considered acceptable flushing time for a harbor basin. The biological effects of slowing flushing time within acceptable limits at Ma'alaea Harbor are not addressed in the report or in the FSEIS. Therefore, the estimated flushing time for Alternative 6 does not support the conclusion that refinement of a design based on the interior mole concept, which would restrict direct project-related from coral reef habitat currently used by Federal trust species, should be rejected.

It is stated on page 5-18 that "the water quality of the harbor would continue to degrade as a result of increased inland development unrelated to the proposed project. The increased vessel traffic anticipated as a result of the harbor improvements would increase turbidity in the harbor, resulting in additional exceedances of water quality standards for turbidity." Therefore, no matter what alternative is implemented, water quality in the harbor is expected to decrease as a result of increasing sedimentation. As stated in the FWS Draft FWCA report, the coral reef fronting the harbor is the habitat of major concern for the proposed project and the degraded, marine benthic habitats within the harbor are considered to be important but of lesser value. Given the chronic sediment conditions in the harbor and the significant value of marine resources in Ma'alaea Bay, the biological effects from the estimated flushing rate reduction should be investigated. The conclusion that adverse effects to fish and wildlife resources would be caused by the flushing rate reduction estimated for Alternative 6 is not supported by data given in the FSEIS. Therefore, it may be premature to use inadequate flushing as a reason to reject development of an alternative that would restrict direct project-related impacts from habitat currently used by Federal trust species.

SUMMARY COMMENTS

The latest proposed dredge and fill areas and amounts are not clearly presented in the FSEIS, and should be clarified in the final documents. The FWS's request for a workable design based on the concept underlying Alternative 6 is not accurately stated in the FSEIS. Thus, the Corps has not yet complied with our request for a refined design, and the issue of avoiding project-related impacts to coral-reef habitat at Ma'alaea remains unsettled. The Department recommends resolving this issue with FWS before issuing the SROD.

The FSEIS does not adequately address the concerns for protection of fish and wildlife trust resources that the Department previously presented. The FWS maintains the internal mole concept underlying Alternative 6 could be developed into a practical alternative that would be the least environmentally damaging among those under consideration to coral-reef habitat used by Federal trust species. This issue should be resolved prior to discussing potential project mitigation, and mitigation for unavoidable losses to fish and wildlife resources should be developed prior to the Corps' issuance of the Supplemental Record of Decision for the Ma'alaea Harbor project.

We appreciate the opportunity to provide these comments.

Sincerely,

Willie R. Taylor

Willie R. Taylor
Acting Director
Office of Environmental Policy
and Compliance

FINAL

FISH AND WILDLIFE COORDINATION ACT REPORT

MAALAEA HARBOR FOR LIGHT-DRAFT VESSELS

MAALAEA, MAUI, HAWAII

prepared by

U.S. Department of the Interior
Fish and Wildlife Service
Pacific Islands Office
Honolulu, Hawaii

prepared for

U.S. Army Corps of Engineers
Pacific Ocean Division
Fort Shafter, Hawaii

December 1994

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION

Authority, Purpose and Scope

This is the U.S. Fish and Wildlife Service's (Service) final report on revised plans developed by the U.S. Army Corps of Engineers (Corps) for navigation and berthing improvements at the Maalaea Harbor for Light-Draft Vessels, Maalaea, Maui, Hawaii. This report has been prepared under the authority of the Fish and Wildlife Coordination Act of 1934 [16 U.S.C. 661 et seq.; 48 Stat. 401], as amended, (FWCA) and other authorities mandating Department of the Interior (DOI) concern for environmental values. This report is also consistent with the National Environmental Policy Act of 1969 [42 U.S.C. 4321 et seq.; 83 Stat. 852], as amended (NEPA). The purpose of this report is to document the existing fish and wildlife resources in the proposed project area and to insure that fish and wildlife conservation receives equal consideration with other proposed project objectives as required under the FWCA. The report includes an assessment of the significant fish and wildlife resources in the proposed project area, an evaluation of potential impacts associated with the proposed project design alternatives, and the Service's position on the design alternative selected by the Corps for project implementation (preferred plan).

Maalaea Harbor was constructed in phases during 1952, 1955, and 1959. In 1967, the Corps completed a feasibility study on Hawaiian Islands harbors for light-draft vessels (Corps, 1967). In response to that study, federal participation in the proposed project was authorized in 1968 under Section 10 of the Rivers and Harbors Act of 1899 [30 Stat. 1151; 33 U.S.C. 403]. Also in 1968, the U.S. Congress approved a federal plan of improvement for navigation and berthing at Maalaea Harbor. Additional berths were added to the harbor by the State of Hawaii in 1979. A Corps post-authorization study and redesign for navigation and berthing improvements was approved in 1980, and a General Design Memorandum and Final Environmental Impact Statement (FEIS) for the redesigned project was prepared (Corps, 1980). A State of Hawaii Revised Environmental Impact Statement (State of Hawaii, 1981) was accepted by the Governor in 1982. Project funding became available in 1989, and a Draft Supplemental Environmental Impact Statement (DSEIS) for the proposed project was released for review (Corps, 1992). A Final Supplemental Environmental Impact Statement (FSEIS) was released in August 1994 (Corps, 1994).

Wave action and surge have caused problems at Maalaea Harbor since it was first opened. Navigation in the entrance channel has been hazardous, vessels berthed in the harbor have been damaged, and part of the harbor has been rendered unusable for berthing because of these factors. The purpose of the proposed project is to provide improvements that will reduce hazards to navigation in the entrance channel during high wave conditions, reduce surge inside the harbor, and provide additional berthing space within the harbor basin. The scope of the federal portion of the proposed project encompasses modifications of the harbor entrance channel, expansion of an existing turning basin and berth access channel, creation of additional space for berthing, and creation of fast land within the harbor for a fueling station. New harbor facilities and infrastructure, including the new berths, fueling station, restrooms, and water and electrical outlets, will be provided by the State of Hawaii as part of their contribution to the proposed project.

Coordination with Federal and State Resource Agencies

Service biologists have discussed the proposed project with staff of the National Marine Fisheries Service (NMFS) of the U.S. Department of Commerce (DOC), the Division of Aquatic Resources (DAR) of the Hawaii Department of Land and Natural Resources, and the Coastal Zone Management Program (CZMP) of the Hawaii Office of State Planning. Copies of the Service's 1979 Biological Reconnaissance Report were provided to the NMFS and DAR. Copies of the Service's 1980 FWCA Report were provided to the NMFS, DAR, and the U.S. Environmental Protection Agency (EPA). Copies of the Service's 1992 Planning Aid Letter were sent to the NMFS, EPA, and DAR. Hawaii DAR and CZMP concerns relative to the protection and conservation of important fish and wildlife resources were incorporated into the 1993 draft FWCA report on the revised proposed project, and copies of that report were provided to the NMFS, EPA, DAR, CZMP, and the Clean Water Branch (CWB) of the Hawaii Department of Health. Copies of this final FWCA report are being provided to the NMFS, EPA, DAR, CZMP, and CWB.

Prior Fish and Wildlife Service Studies and Reports

In March 1979, the Service released a Biological Reconnaissance Report on the concepts developed by the Corps for proposed navigation improvements at Maalaea Harbor (Service, 1979). This report incorporated the results of field work conducted at the harbor by Service biologists in 1979. In the report, the Service recommended that the Corps consider modifying the existing harbor entrance channel rather than cutting a new channel. The Service stated that if relocation of the channel was selected as the preferred alternative then the Corps should investigate artificial reef creation as mitigation for the loss of reef resources. The report also presented Service concern for the use and effectiveness of the harbor as a sediment trap for stormwater runoff and a recommendation that measures to minimize sedimentation of harbor waters from stormwater drainage be included in the proposed project design.

In July 1979, the Corps requested project-related section 7 consultation with the Service under the Endangered Species Act of 1973 [87 Stat. 884; 16 U.S.C. 1531 et seq.], as amended, (ESA). The Service responded by advising the Corps that the federally-listed endangered humpback whale, Megaptera novaeangliae, may occur in the general project area and that the Corps should consult with the NMFS on this species. The matter was referred to the NMFS by copy of the Service's response to the Corps.

Subsequent to public hearings held in 1979, the Corps modified the design alternatives for the proposed project. A preliminary FWCA report based on field surveys conducted by the

Service for the revised proposed project was issued in February 1980 (Service, 1980a). The preliminary report presented information contained in the 1979 Biological Reconnaissance Report with the addition of a comparative description of three proposed alternative configurations for relocation of the entrance channel and a recommendation for the Corps to initiate section 7 consultation with the NMFS on the humpback whale. Service concern over the discharge of silt-laden runoff from uplands into the harbor and the recommendation for employing measures to control sedimentation in harbor waters were reiterated.

A final FWCA report on the proposed project was released by the Service in June 1980 (Service, 1980b). The final report added to information included in the preliminary FWCA report and provided an in-depth evaluation and discussion of impacts related to the proposed federal plan of improvement. Measures recommended by the Service for minimizing and compensating for adverse project-related impacts on fish and wildlife resources were presented. Service concern regarding the discharge of silt-laden runoff from uplands into the harbor and the recommendation for employing measures to control sedimentation in harbor waters were restated.

Also in June 1980, the Service transmitted comments to the Corps through the DOI's Office of Environmental Affairs (OEA) on the Corps' Draft Design Memorandum No. 1 for Light-Draft Vessels, Maalaea Harbor, Maui, Hawaii. The Service concurred with the recommendation made by the NMFS in their biological opinion on the humpback whale that project-related blasting be restricted to the months of May through December when the whales are not expected to be present in Maalaea Bay. The Service recommended that the Corps incorporate sedimentation control measures into the project design to mitigate project-related adverse impacts on water quality. The Service expressed concern that greater boat usage in the harbor as a result of the proposed project will slow the settlement of newly-introduced sediments and increase the resuspension of existing sediments in harbor waters. This increase in suspended sediments would add to the threat to nearby coral-reef habitats already posed by the existing large load of upland sediments entering the harbor with stormwater runoff. The Service further recommended that the location of project-related spoil disposal sites be identified so that associated impacts could be addressed in the final project document and that project-related breakwaters be designed to provide safe access for fishers.

In December 1981, the Service reviewed the draft Hawaii State Environmental Impact Statement (EIS) for Improvements to the Maalaea Boat Harbor, Maalaea, Maui, Hawaii and provided comments on the document to the Hawaii State Office of Environmental Quality Control. The Service recommended that the Corps implement measures during the construction period to (1) prevent debris or any type of pollutant from entering the water, (2) insure that all construction materials treated with creosote or other preservatives be completely dry before those materials are placed in the water, (3) control and minimize erosion and turbidity, and (4) restrict blasting to within the months of May through December to avoid impacting humpback whales.

In February 1991, the Corps reinitiated section 7 consultation with the Service on federally listed or proposed species of plants and animals. The Service responded in the same month by concluding that the proposed project would not affect any listed, proposed or candidate endangered and threatened species within the Service's jurisdiction and recommending that the Corps consult with the NMFS regarding the effects of the proposed project on federally-listed sea turtles and whales. Also in February 1991, the Corps requested that the Service update the 1980 final FWCA report since the marine environment surrounding Maalaea Harbor could have changed since 1979 and since the Corps intended to prepare a supplement to update the 1980 EIS for the proposed project.

Based on this request, the Service conducted a brief reconnaissance survey at the site and provided a Planning Aid Letter (PAL) to the Corps in April 1992 (Service, 1992). The letter briefly addressed the direct loss of fish and wildlife habitats from dredging and filling and secondary impacts to reef corals from sedimentation. The Service stated that more detailed field studies would be conducted in order to update the 1980 FWCA report. Specific comments on adverse impacts related to the 1980 approved plan were provided, and the existence of another proposed design alternative being considered by the Corps, which included constructing a stub breakwater extension into the harbor basin, was acknowledged. The Service stated that implementing this other alternative would not significantly impact coral-reef habitats at the site but that it would apparently preclude berthing of a U.S. Coast Guard (USCG) cutter in the harbor. Service recommendations for mitigation were also presented, including the construction of an artificial reef and the perpetual protection of reef platform habitats within Maalaea Bay.

In February 1993, Service comments on the Corps' 1992 DSEIS were transmitted to the Corps through the OEA. The Service stated that the DSEIS addressed neither the potential project-related adverse impacts to aquatic resources identified in the 1992 PAL, nor any potential mitigation measures to offset losses to reef-flat communities in the proposed project area. The Service also stated that additional field studies would be conducted in order to submit an updated draft FWCA report for the proposed project.

In July 1993, the Service released a draft FWCA report on revised plans for the proposed project (Service, 1993). The Service identified (a) the coral reef fronting the harbor as the habitat of major concern because of its value to federally-threatened sea turtles and other marine species and (b) Alternative 6, which was presented in the DSEIS, as the least environmentally damaging alternative because of its ability to restrict major project-related impacts to within existing harbor boundaries. The Corps had previously rejected Alternative 6 without giving it serious consideration or development, and the Service recommended that the Corps give the development of Alternative 6 the same level of consideration given to the development of alternatives 1-3. The Service requested that the Corps refine a workable design based on the concept underlying Alternative 6 (i.e., an interior mole) for evaluation prior to the Service completing a final FWCA report on the revised plans and that the final FWCA report be incorporated into the FSEIS. Also, the Service recommended that the Corps incorporate measures to protect the water quality in

Maalaea Harbor as part of the proposed project and present these measures in the FEIS. Finally, the Service recommended that the Corps designate sites for the acquisition of construction stone and disposal of dredged spoil so that associated impacts could be evaluated and discussed in the FSEIS.

In November 1994, Service comments on the Corps's 1994 FSEIS were transmitted to the Corps through the DOI's Office of Environmental Policy and Compliance (formerly the OEA). The Service stated that (a) the FSEIS did not adequately address the concerns previously presented by the Service for the protection of fish and wildlife resources and habitats, (b) the Corps did not comply with our request to refine a workable design based on the interior mole concept for evaluation by the Service prior to preparation of the final FWCA report, and (c) the issue of avoidance of adverse project-related impacts to coral-reef habitat at Maalaea remained unresolved. The Service maintained that the internal mole concept, which underlies Alternative 6, has merit with regard to development of a practicable alternative that would meet the purposes of the proposed action while restricting direct project-related impacts to habitats currently used by Federal trust species. The Service recommended that resolution of this issue be achieved prior to serious discussions on potential project mitigation and that mitigation for unavoidable losses to fish and wildlife resources be developed prior to the Corps' issuance of the Final Record of Decision.

DESCRIPTION OF THE PROJECT AREA

The proposed project area is the island of Maui (20° 52' N and 156° 22' W) in the State of Hawaii. With 193 km (120 mi) of coastline encompassing approximately 1888 km^2 (729 mi^2) of land, Maui is the second largest island in the Hawaiian archipelago. The island was created by the eruptions of two volcanoes that were subsequently connected by a low isthmus formed from lava flows. Maui's highest peak, Pu'u Ula'ula on Haleakala Crater, reaches an elevation of 3055 m (10,023 ft) on the eastern side of the isthmus, and Pu'u Kukui reaches 1764 m (5788 ft) on the west side (University of Hawaii, 1983).

The proposed project site is located at Maalaea on the southern shore of the Maui isthmus in the northwestern corner of Maalaea Bay (Figure 1). Maalaea Harbor was constructed on a large fringing reef flat at the western end of Maalaea Bay. The shoreline of Maalaea Bay is approximately 12 km (7.5 mi) in length, but the bay is accessible along only two thirds of this shore. The harbor serves as the only public access point to Maalaea Bay from its western end. The closest small boat harbor to Maalaea is approximately 14 nautical miles away at Lahaina. Maalaea Harbor is currently used by both commercial and recreational boaters. In the past, the U.S. Coast Guard has based a 29-m (95-ft) patrol vessel at Maalaea Harbor for the primary purpose of conducting emergency search and rescue (SAR) operations. However, the last patrol vessel stationed at Maalaea Harbor was removed over three and a half years ago and decommissioned shortly thereafter. The USCG has continued SAR operations out of the harbor with two 7 m (24 ft) high-speed, rigid-hull inflatable boats, which have provided efficient SAR response coverage for the area (Pers. Com. Cmdr. Reed and Lt. Cmdr. Quedens, USCG, 1993).

Existing features at Maalaea Harbor include a south revetted mole that is approximately 335 m (1100 ft) long and 27 m (90 ft) wide, an east breakwater that is approximately 259 m (850 ft) long and 8 m (26 ft) wide, an entrance channel that is approximately 27 m (90 ft) wide and 4 m (13 ft) deep, and an interior basin that is approximately 4.6 hectares (11.3 acres) in size (Figure 2). Local interests have constructed a cold storage plant with a capacity of 45,455 kg (100,000 lb) and a boat haul-out and repair facility at the west end of the harbor basin. A one-lane concrete ramp at the northwestern corner of the basin serves as both a haul-out ramp and a trailered boat launching ramp.

The south revetted mole extends from shore entirely on the outer reef flat and is oriented parallel with the reef margin. The east breakwater extends across the inner reef flat with an initial orientation roughly perpendicular to the reef margin. Upon reaching the outer reef flat the east breakwater curves west toward the harbor entrance channel and eventually crosses the reef margin at an oblique angle just before it terminates. Three upland stormwater drainage channels empty into the northern side of the harbor basin.

The average daytime high temperature recorded at Pu'unene Airport, approximately 10 km (6.3 mi) north of Maalaea in the town of Kahului, is 24° C (75° F). Average annual precipitation recorded at the same location is 35 cm (13.8 in), although the windward slopes of the island receive 889-1016 cm (350-400 in) of rainfall per year. The majority of the rainfall at Maalaea occurs between October and April, but intermittent rainfall may be expected in any month of the year, including the summer months, which are generally drier (University of Hawaii, 1983).

Northeast tradewinds with an average velocity of 9-17 kts (10-20 mph) blow fairly consistently across Maui from May through September. Average wind velocities at Maalaea are often greater than 22 kts (25 mph) due to a Venturi effect created over the low isthmus between the island's steep eastern and western mountains (Corps, 1980). Between October and April winds may decrease in velocity and shift direction in response to the northerly winds that follow or the southwesterly winds that precede cold fronts and southerly winds of "Kona" storms. Thus, winter is the season of more frequent cloudiness and rainstorms (University of Hawaii, 1983).

The predominant ocean current flow near Maalaea Harbor has been characterized as a tradewind-generated surface movement generally toward the southwest. Under normal tradewind conditions, the speed of this current is typically less than 1 kt (1.2 mph) and is not strong enough to cause navigational problems. During periods of high swell activity, especially during Kona storms, strong wave-generated rip currents may develop (Corps, 1980). Although tidal currents in Maalaea Bay are usually too weak to affect navigation, tidal fluctuations working in concert with prevailing wind-driven currents may result in the nearly continuous flushing out of the harbor of suspended fines that are introduced into the harbor with stormwater runoff from upland sources.

During periods of high rainfall, the sediment load in nearshore waters of Maalaea Bay increases significantly as a result of drainage from erosion-prone uplands (Maciolek, 1971). The greatest increase occurs in the eastern portion of the bay where Waiakoa Gulch empties directly into the bay. In the mid-portion of the bay, Kealia Pond and adjacent wetland and mudflat areas act as a settling basin for four major drainages that are potential contributors to the sediment load of the bay (Maciolek, 1971; Kinzie, 1972). In the western portion of the bay, the three drainage channels that empty into Maalaea Harbor also contribute to the bay's total sediment load. Although the harbor does act to some degree as a sediment trap, finer sediments in the harbor are regularly resuspended by boat activity.

At the request of the State of Hawaii, the DOC's National Oceanic and Atmospheric Administration (NOAA) designated Maalaea Bay as a proposed protected area for endangered humpback whales. In November 1992, the U.S. Congress passed the Oceans Act of 1992 (P.L. 102-587), which established the Hawaiian Islands Humpback Whale National Marine Sanctuary. Maalaea Bay is included within the sanctuary's boundaries. In December 1992, the 283-ha (700-ac) Kealia Pond National Wildlife Refuge, located approximately 915 m (3000 ft) east of Maalaea Harbor, was established by the Service. The wetlands within this refuge are essential for the recovery of the endangered Hawaiian stilt, *Himantopus mexicanus knudseni*, and Hawaiian coot, *Fulica alai*, and provide important habitat for many species of migratory shorebirds and waterfowl. The sand dune beach that lies along the southern boundary of the refuge is used by the endangered hawksbill sea turtle, *Eretmochelys imbricata*, for nesting. The Service does not expect these wetlands or sand dunes to be adversely affected by the proposed modification of the harbor.

FISH AND WILDLIFE RESOURCE CONCERNS AND PLANNING OBJECTIVES

The Service's primary concerns with the proposed project include impacts to endangered species and other fish and wildlife resources and their habitats from dredging and filling in the marine environment. Specific Service planning objectives are to maintain and enhance the existing significant habitat values at the proposed-project site by (1) obtaining basic biological data for the proposed-project site, (2) evaluating and analyzing the impacts of proposed-project alternatives on fish and wildlife resources and their habitats, (3) identifying the proposed-project alternative least damaging to fish and wildlife resources, and (4) recommending mitigation for unavoidable project-related habitat losses consistent with the FWCA and the Service's Mitigation Policy.

Under the authority of the ESA, the DOI and the DOC share responsibility for the conservation, protection and recovery of federally-listed endangered and threatened species. Authority to conduct consultations has been delegated by the Secretary of the Interior to the Director of the Service and by the Secretary of Commerce to the Assistant Administrator for Fisheries of the NOAA. Section 7(a)(2) of the ESA requires federal agencies, in consultation with and with the assistance of the Service or NMFS, to insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitats. The Biological Opinion is the document that states the opinion of the Service or the NMFS as to whether the Federal action is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat.

The Service's Mitigation Policy (Service, 1981) outlines internal guidance for evaluating project impacts affecting fish and wildlife resources. The Mitigation Policy compliments the Service's participation under the NEPA and the FWCA. The Service's Mitigation Policy was formulated with the intent of protecting and conserving the most important fish and wildlife resources while facilitating balanced development of this nation's natural resources. The policy focuses primarily on habitat values and identifies four resource categories and mitigation guidelines. The resource categories are the following:

a. Resource Category 1: Habitat to be impacted is of high value for the evaluation species and is unique and irreplaceable on a national basis or in the ecoregion section.

b. Resource Category 2: Habitat to be impacted is of high value for the evaluation species and is relatively scarce or becoming scarce on a national basis or in the ecoregion section.

c. Resource Category 3: Habitat to be impacted is of high to medium value for the evaluation species and is relatively abundant on a national basis.

d. Resource Category 4: Habitat to be impacted is of medium to low value for the evaluation species.

The coral reef fronting Maalaea Harbor is the habitat of major concern. Although corals are very small and sensitive organisms, healthy coral colonies are fundamentally important in providing the basic foundation for habitat that supports diverse communities of other highly-specialized aquatic organisms. Corals contribute the bulk of the calcareous raw material that forms and maintains the basic structural framework of the reef. Coral colonies add significantly to the submarine topographic relief in which a large number of fish and invertebrate species find shelter and food. Coral polyps themselves are an important food source for some fishes and other marine life. The institutional significance of coral reefs has been established through their formal designation as "special aquatic sites" (40 CFR Part 230 §230.44 / FR v.45 n.249). Such sites possess special ecological characteristics of productivity, habitat, wildlife protection, or other important and easily disrupted ecological values and contribute to the general overall environmental health or vitality of an entire ecosystem of a region.

Coral reefs are relatively scarce on a national basis and are currently in a world-wide state of decline. In the main Hawaiian Islands, coral reefs are subjected to relatively frequent adverse impacts, and the extent of healthy and productive coral reefs may be declining on a local basis. The Service considers coral reef habitats to be Resource Category 2 habitats. The Service's resource goal for Category 2 habitat is no net loss of in-kind habitat values. Under this designation, the Service will recommend ways to avoid or minimize the losses. If losses are unavoidable, mitigation measures to immediately rectify, reduce, or eliminate these losses over time will be recommended. As necessary, compensation by replacement of the in-kind habitat values may be incorporated as integral project features.

Sea turtles and reef fishes have been selected as the evaluation species for the coral reef habitats that may be affected by the proposed project. Hawksbill sea turtles are federally listed and protected under the ESA as an endangered species. Hawksbills are carnivorous and feed on a variety of sponges and other smaller marine animals, including juvenile fishes, common on the Maalaea reef. Federally listed under the ESA, green sea turtles, Chelonia mydas, are protected as a threatened species. The Maalaea reef encompasses shallow substrates that support the growth of algal species commonly fed upon by green sea turtles and shallow ledges and depressions in the reef slope that provide suitable resting sites for C. mydas near these foraging areas. Reef fishes were selected because of their potential importance as sources of food and recreation for humans. The harbor area supports subsistence and sport fisheries for reef fishes, lobsters, crabs, octopi, and algae.

Hook and line fishing from the existing mole and breakwater, spear fishing on the reef slope, and hand harvesting of edible algae from intertidal and shallow subtidal areas fronting the harbor are commonly practiced. Also, reef fishes are among the marine resources most important to resident and visiting recreational skin and SCUBA divers.

EVALUATION METHODOLOGY

In 1979, the Service conducted field surveys at Maalaea Harbor to evaluate the proposed-project design criteria in effect at the time. The methodology used during the surveys included a brief reconnaissance of terrestrial flora and fauna within a radius of 61 m (200 ft) around the harbor and surveys of marine species and habitats. The marine surveys included the collection of data on the species composition and relative abundances of fishes, corals, other macroinvertebrates, and algae along 20-m (66-ft) transect lines placed on the inner reef flat, outer reef flat and reef margin, and reef slope outside of the harbor. These data were supplemented by observations of fish and benthic organisms made during random swims on the fringing reef flat and reef slope to a depth of 6 m (20 ft) and inside the harbor along the existing northern shoreline and shallows adjacent to the inner portion of the east breakwater. Details concerning the surveys have been reported previously (Service, 1979; 1980a; 1980b). Information gained from the surveys is incorporated into this report.

In 1992, Service biologists conducted a preliminary reconnaissance-level survey of the fringing reef outside of the harbor. The survey consisted of an inspection of subtidal marine habitats to a depth of 7.5 m (25 ft) along the south revetted mole and the east breakwater and within the existing entrance channel leading to the harbor mouth. Observations on the distribution and relative abundances of corals and reef fishes were made during random swims through these areas. The details of this reconnaissance have been reported previously (Service, 1992) and results of the survey are incorporated into this report.

In 1993, Service biologists conducted additional surveys at the harbor site in order to evaluate potential impacts of the revised, proposed-project alternatives on fish and wildlife resources. A brief reconnaissance of the terrestrial flora and fauna around the harbor was repeated for comparison with the 1979 survey results. Observations on the distribution and relative abundances of fishes, corals, other macroinvertebrates, and algae were compiled during random swims over substrates both inside and outside of the harbor. Within the harbor, surveys were made on the submerged western shoal and over the shallows adjacent to the east breakwater. Outside the harbor, surveys were conducted on the fringing reef to a maximum depth of 7.5 m (25 ft). Substrate coverage data collected along 150-m (492-ft) transects at the locations of the proposed channel dredging and mole and breakwater filling were used to assess the potential value of existing reef habitat. The complete results of this survey are contained in this report.

DESCRIPTION OF FISH AND WILDLIFE RESOURCES

Existing Conditions:

Terrestrial:

The terrestrial portion of the proposed project site has been highly altered by construction of the harbor and ancillary buildings, roads, parking lots, docks and piers. There are no wetlands or sensitive upland habitats located within the harbor area.

A type of mesquite known locally as kiawe, Prosopis pallida, and bristly foxtail, Setaria verticillata, are among the dominant terrestrial plants present at the harbor site. Both of these species are exotic introductions to Hawaii. According to local boaters, the large kiawe trees growing immediately west of the harbor act as windbreaks that help reduce navigational difficulties during periods of high winds. Coconut, Cocos nucifera, and ironwood, Casuarina equisetifolia, trees are present along the western end of the south revetted mole. Ground cover in this area consists principally of the seaside purslane, Sesuvium portulacastrum, and the beach fan flower known locally as beach naupaka, Scaevola sericea. A rare endemic wild cotton known locally as ma'o, Gossypium tomentosum, had previously been reported to exist in the general vicinity of Maalaea Harbor, but Service biologists did not observe ma'o at the proposed project site.

Service biologists observed common mynah birds, Acridotheres tristis, and house sparrows, Passer domesticus, at the site. Ring-necked pheasants, Phasianus colchicus torquatus, grey francolins, Francolinus pondicerianus, and lace-necked and barred doves, Streptopelis chinensis and Geopelia striata, respectively, may occasionally be found in the uplands surrounding the harbor (State of Hawaii, 1975). The only migratory bird observed by Service biologists during visits to the Maalaea Harbor is the wandering tattler, Heteroscelus incanus. However, other migratory shorebirds expected to use the intertidal flats at the site include ruddy turnstones, Arenaria interpres, golden plovers, Pluvialis dominica, and sanderlings, Caladris alba.

Terrestrial mammals at the site are limited to introduced species including the domestic cat, Felis catus, and dog, Canis familiaris, house mouse, Mus musculus domesticus, roof or black rat, Rattus rattus, brown rat, R. norvegicus, Polynesian rat, R. exulans hawaiiensis, and mongoose, Herpestes auropunctatus. Introduced skinks (Scincidae) and gekkos (Gekkonidae) are also present at the site (State of Hawaii, 1975).

Marine:

Lists of the marine organisms observed by Service biologists at the proposed project site during the 1993 surveys are presented in Tables 1-6. A total of 66 species of marine fishes (Table 1), eight species of reef corals (Table 2), 29 species of marine molluscs (Table 3), eight species of marine crustaceans (Table 4), 10 species of echinoderms (Table 5), and eight species of miscellaneous marine animals (Table 6) were recorded during the surveys.

A shoal that is trapezoidal in shape and submerged in approximately 1 m (3 ft) of water lies within the western half of the harbor. The low-relief shoal is covered with a thick layer of sand, mud and silt. During the 1993 surveys, Service biologists noted thick clumps of the red alga, Hypnea musciformis, floating just above the substrate over most of the shoal. The shoal is bordered on its northern and western edges by basalt boulders that have provided substrates for a few small colonies of the corals, Porites rus and Pocillopora damicornis. The nerite, Nerita picea, and the sea urchins, Diadema paucispinum and Echinometra mathaei, are also common on the boulders. The wrasses, Thalassoma duperrey and Stethojulis balteata, the damselfish, Abudefduf abdominalis, the surgeonfish, Acanthurus triostegus, the butterflyfish, Chaetodon lunula, the boxfish, Ostracion meleagris, and the moorish idol, Zanclus cornutus, are among the more conspicuous fishes seen near the boulders. Schools of the goatfish, Parupeneus vanicolensis, the flagtail, Kuhlia sandvicensis, the anchovy, Stolephorus purpureus, and the great barracuda, Sphyraena barracuda, are conspicuous above the shoal away from the boulders.

The eastern portion of the harbor includes an existing turning basin and a shallow reef flat adjacent to the east breakwater. The inner portion of this shallow reef is mostly covered with sand and a few scattered rocks. Like the shoal, this substrate was blanketed by extensive algal patches of Hypnea musciformis during the 1993 surveys. Other less abundant algae present on this reef include the green algae, Bryopsis pinnata, Codium reediae, C. reticulata and Ulva fasciata, and the brown alga, Sargassum echinocarpum. Mollusc species occurring on this reef include the limpet, Cellana exarata, the morula, Morula granulata, the nerite, Nerita picea, and the venus shell, Periglypta reticulata. The rock crab, Grapsus tenuicrustatus, is the most common crustacean occurring on the breakwater. Subtidally, the crab, Etisus splendidus, is the most conspicuous crustacean occurring near the breakwater. Juvenile wrasses (Labridae) and parrotfishes (Scaridae) closely associated with benthic algae are the dominant types of fishes present over the majority of this harbor reef flat.

Near the harbor mouth, the substrate of the harbor reef becomes rockier, and fishes typical of an exposed outer-reef community become more numerous. Within the harbor mouth itself, Service biologists have repeatedly observed large schools of the goatfish, Muloides vanicolensis, and smaller schools of the flagtail, Kuhlia sandvicensis, swimming between the ends of the east breakwater and south revetted mole. In addition to the mollusc species observed on the inner portion of the harbor reef, the dotted periwinkle, Littorina pintado, the cowrie, Cypraea caputserpentis, and the cone, Conus lividus, are also common closer to the end of the breakwater. The rock crab, Grapsus tenuicrustatus, and the collector urchin, Pseudoboletia indiana, are the most conspicuous macroinvertebrates living on the breakwater boulders.

The existing entrance channel is continuous with a broad sand channel that runs from the mouth of the harbor out to the extensive, offshore sand flats that characterize Maalaea Bay. The sand-covered entrance channel, originally dredged to a depth of 4.6 m (15 ft), is relatively depauperate of marine life. At the seaward end of the channel, isolated outcroppings of limestone that rise above the sand flats support scattered coral colonies, primarily Pocillopora meandrina and P. eydouxi, and localized aggregations of reef fishes. Outside of the harbor, the entrance channel is flanked by a fringing reef platform comprised of consolidated limestone pavement with small pockets of sand. Except for scattered coral heads, small crevices in the reef framework, and the sand pockets, the inner portion of this reef platform has a relatively flat topographic relief. The reef extends for several hundred basin, Hawaiian anchovy or "nehu," S. purpureus, are occasionally caught for bait. Fish and shellfish taken by local fishers include the surgeonfish, Acanthurus triostegus, the jack, Caranx ignobilis, the bonefish, Albula vulpes, the mullet, Mugil cephalus, the flagtail, Kuhlia sandvicensis, the goatfish, Mulloidichthys spp., spiny lobster (Panuliridae), octopus (Octopodidae), and grapsid crabs (Grapsidae). Occasional inshore runs of fish such as the mackerel scad known locally as "opelu," Decapterus macarellus, may occur.

The culturally important, edible red alga or "limu huluhuluwaena," Grateloupia filicina, has been recorded at the proposed project site (McDermid, 1990). This species has a patchy distribution throughout the Hawaiian Islands and is locally abundant in only a few areas in the state. Maalaea Bay is one of those areas, and the proposed project site is known to contain populations of G. filicina during summer and winter months (McDermid, 1990). Populations of this species develop and are maintained on intertidal and shallow subtidal hard substrates where intermittent sand scour occurs and where a source of freshwater is nearby. Another species of edible red algae, Gracilaria coronopifolia, or "limu manauea," is found on the seaward faces of the east breakwater and the south revetted mole (McDermid, 1990).

The coral reef fronting Maalaea Harbor also supports the green sea turtle and the hawksbill sea turtle. Green sea turtles are federally listed as threatened and are commonly sighted within the vicinity of the proposed project site. During the 1993 surveys, Service biologists observed a large male turtle, estimated to weigh approximately 136 kg (300 lbs), resting under a ledge in 3 m (10 ft) of water in front of the eastern end of the south revetted mole. Hawksbill sea turtles, which are federally listed as endangered, are observed within the proposed project area less frequently. Recent observations of hawksbill crawls and attempts to nest on the sand dune beach east of the project site occurred in 1991, 1993, and 1994.

Seven of the 25 algal species recorded at the site by McDermid (1990) have been documented by Forsyth and Balazs (1989) as being food resources used by green sea turtles in the main Hawaiian Islands. These species are Pterocladia capillacea, Amansia glomerata, Acanthophora spicifera, Codium edule, Uva fasciata, Uva reticulata, and Ahnfeltia concinna. Hypnea musciformis is also regarded as a potential food resource for green sea turtles in Hawaii (Pers. Com. G. Nitta, NMFS, 1993), and Bryopsis pinnata is a known food resource of green sea turtles at Johnston Atoll (Forsyth and Balazs, 1989). Both of these algal species are also present at Maalaea. All but U. reticulata are common on the reef platform outside of the harbor where the other eight species are known to exist on the reef substrate fronting the south revetted mole. Seasonal variations in distribution and abundance associated with some of these species have been observed; however, H. musciformis is considered abundant at the harbor throughout the year (McDermid, 1990). A variety of reef animals are fed upon by hawksbill sea turtles, including sponges, crustaceans, reptiles, small reef fishes, and other organisms (Coleman, 1991; Pers. Com. G. Nitta, NMFS, 1993).

Maalaea Bay is one of four major breeding, calving, and nursing areas for endangered humpback whales in Hawaii. During the 1979 survey, Service biologists observed six humpback whales near the proposed project site. Three of these whales were within one-half mile of the harbor. During the 1992 reconnaissance survey, Service biologists sighted an adult and calf approximately 150 m (500 ft) southeast of the tip of the east breakwater. A biological opinion assessing the potential project-related impacts to both green sea turtles and humpback whales has been issued by the NMFS (1990).

Future Without the Project:

Kinzie (1972) described the biota of Maalaea Bay as unusual in that the numbers and forms of various marine species, which are uncommon elsewhere in the Hawaiian Islands, are common in the bay. Several species of algae and corals, rarely found in Hawaii, are relatively abundant in the bay. The bay also has a rich fish and invertebrate fauna and is a favorite area for shell collectors. Humpback whales are common seasonal residents within Maalaea Bay.

Although the bay is potentially very productive in terms of biomass, that productivity may be limited by the effects of siltation (Kinzie, 1972). Maalaea Harbor currently acts as a silt trap for three drainage channels emptying into the harbor basin. Water visibility in the harbor is typically very poor and salinity is often lower than 35 parts per thousand. Nevertheless, the harbor does provide habitat for species tolerant of estuarine conditions, such as barracuda, flagtails, herrings, and other fishes. The reef platform immediately fronting Maalaea Harbor, especially adjacent to the south revetted mole, provides resting and potential foraging habitat for threatened green sea turtles. Further out from the harbor in deeper water, especially on the reef slope fronting the east breakwater, a zone of coral cover provides habitat for a wide variety of marine organisms, including endangered hawksbill sea turtles and food-fish species important to humans.

The reasons for the special character of the biological resources of Maalaea Bay remain largely unknown, and for this reason extreme caution in undertaking any action that would alter any aspect or condition of the bay has been urged (Kinzie, 1972). Without the proposed-project, the resuspension of large amounts of sediment, which may adversely impact the health of corals and filter-feeding organisms and reduce available light for photosynthetic organisms, would be avoided. The loss of potential green sea turtle habitat and a relatively rich area of coral important to hawksbill sea turtles, reef fishes, and many other organisms, as a result of proposed-project dredging and filling, would be avoided. Although the direct destruction of habitats within or fronting Maalaea Harbor would be avoided without the project, the unabated drainage of stormwater carrying sediments and chemical pollutants (eg., agricultural fertilizers, pesticides, and herbicides) into the harbor may result in adverse cumulative impacts to marine resources. Runoff from future development in the vicinity of Maalaea Harbor may add to this sediment and chemical load if new stormwater drainage is routed to the harbor unless steps are taken to protect good water quality in the harbor.

DESCRIPTION OF ALTERNATIVES EVALUATED

Five alternative actions are considered by the Corps in the FSEIS (Corps, 1994). One of the proposed actions is a No Action Alternative that would leave the existing harbor as it is with no action taken to install any of the proposed federal improvements. As presented in the FSEIS, the preferred alternative (Alternative 1) differs from the one contained in the DSEIS principally because (a) the widened end of the existing south revetted mole has been reduced, (b) the amount of dredged material has been reduced, and (c) the destruction of coral-reef habitat off the end of the east breakwater has been reduced. Subsequent to release of the FSEIS, the Corps provided the Service with a revised breakdown of dredge and fill estimates for the preferred alternative only. It should be noted that the dredge estimate for Alternative 1 is identical those for Alternatives 2 and 3. However, the fill estimates for Alternatives 1 through 3 differ from one another. Thus, the fill estimate for Alternative 1 was used with descriptive information in the FSEIS in order to estimate the fill acreages for Alternatives 2 and 3. Details summarized below on the four action alternatives identified in the FSEIS incorporate this new information.

Alternative 1: Preferred Alternative. This action would provide a breakwater extension of 189 m (620 ft) to the head end of the south revetted mole; a widened area stretching 122 m (400 ft) along the seaward side of the south revetted mole; a center mole fuel station 1.0 ha (2.6 ac) large; an east revetted mole 0.6 ha (1.5 ac) large; a realigned harbor entrance channel 186 m (610 ft) long, 46-55 m (150-180 ft) wide, and 3.5-4.5 m (12-15 ft) deep; a turning basin 0.7 ha (1.7 ac) large and 3.5 m (12 ft) deep; a main access channel 219 m (720 ft) long, 24 m (80 ft) wide and 2.4 m (8 ft) deep; a berthing area 0.3 ha (0.8 ac) large; and the removal of 24 m (80 ft) from the head end of the east breakwater. Approximately 20,645 m^3 (27,000 yd^3) of reef material would be dredged from 4.0 ha (9.9 ac) for construction of the harbor basin, including the turning basin, access channel, berthing area, and new entrance channel. The reef area to be filled would be approximately 3.5 ha (8.6 ac). Approximately 56,700 tons of commercial quarry stone would be used for revetted mole construction. Approximately 18,275 m^3 (23,900 yd^3) of concrete would be used to construct armor units for the breakwaters (Figure 3).

Alternative 2: Same as Alternative 1, except that the widened area along the seaward side of the south revetted mole would be replaced with a wave absorber 61 m (200 ft) long. Approximately 20,645 m^3 (27,000 yd^3) of reef material would be dredged from 4.0 ha (9.9 ac). Approximately 3.2 ha (8.0 ac) of reef would be filled (Figure 4).

Alternative 3: Same as Alternative 1, except that the widened mole area along the seaward side of the south revetted mole would be eliminated, and the south breakwater extension would be detached from the existing structure and would be 198 m (650 ft) long. Approximately 20,645 m^3 (27,000 yd^3) of reef material would be dredged from 4.0 ha (9.9 ac). Approximately 3.2 ha (7.8 ac) reef would be filled (Figure 5).

Alternative 4: This action would consist of an extension of the east breakwater of 259 m (850 ft); a center mole fuel station 1.0 ha (2.6 ac) large; an east revetted mole 0.6 ha (1.5 ac) large; an entrance channel 293 m (960 ft) long, 46-61 m (150-200 ft) wide, and 3.5-4.5 m (12-15 ft) deep; a turning basin 1.1 ha (2.8 ac) large and 3.5 m (12 ft) deep; a berthing area 0.3 ha (0.8 ac) large; and a main access channel 183 m (600 ft) long, 24 m (80 ft) wide, and 2.4 m (8 ft) deep. Approximately 62,165 m^3 (81,300 yd^3) of reef material would be dredged from 3.9 ha (9.6 ac), and 2.3 ha (5.6 ac) of reef would be filled. Approximately 45,900 yd^3 of stone would be used in the construction of the east breakwater extension (Figure 6).

Alternative 5: No Corps Action. This alternative would dictate no further federal action for the project.

PROJECT IMPACTS

Terrestrial Resources:

Construction activities associated with the proposed project are not expected to adversely impact terrestrial biological resources at the harbor. However, acquisition of armor stone for breakwater construction and disposal of excess dredged spoil on land could result in adverse impacts to federally-listed or proposed endangered and threatened species and other wildlife outside of the immediate project site. The FSEIS states that stone material can be obtained from three commercial quarries on Maui. Since exact upland borrow and spoil disposal sites have not been designated, the Service cannot evaluate the potential impacts at those sites.

Marine Resources:

With the exception of the No Action Alternative, all project-related actions under consideration would result in direct and secondary adverse impacts to marine fish and wildlife resources. Implementation of Alternatives 1, 2, or 3 would each result in the direct and permanent alteration of approximately 4.0 ha (9.9 ac) of marine benthic habitat from channel, berthing area, and turning basin dredging. With the implementation of Alternative 4, approximately 3.9 ha (9.6 ac) of benthic habitat would be dredged for these purposes. Concurrently, the direct and permanent elimination of approximately 3.5 ha (8.6 ac), 3.2 ha (8.0 ac), 3.2 ha (7.8 ac), and 2.3 ha (5.6 ac) of benthic habitat from filling for breakwater and mole construction would result from the implementation of Alternatives 1, 2, 3, and 4, respectively.

The major dredging impacts associated with Alternatives 1 through 4 include the direct loss of corals, demersal fishes, sedentary macroinvertebrates, and benthic algae and the permanent alteration and elimination of existing marine benthic habitat. Based on new figures provided by the Corps since release of the FSEIS, Alternatives 1, 2, and 3 would require dredging of approximately 1.6 ha (4.0 ac) of reef substrate fronting the east breakwater to create a new harbor entrance channel, approximately 0.9 ha (2.3 ac) of existing harbor bottom for access channel improvement, approximately 1.1 ha (2.8 ac) of existing harbor bottom for turning basin improvement, and approximately 0.3 ha (0.8 ac) for berthing area expansion. The dimensions and orientation of these features would be the same for each of these three alternatives. Although part of the new entrance channel would cross barren sand on the existing channel floor, most of it would traverse an area of relatively rich coral where the substrate is covered by consolidated limestone pavement (54%), live coral (40%), coral rubble (5%), and unconsolidated calcareous sand (1%). The seaward limit of the proposed entrance channel is approximately 18 m (60 ft) from the area where Service biologists observed the adult and calf humpback whales in 1991.

Based on the FSEIS, the new entrance channel created by implementing Alternative 4 would result in the destruction of 1.6 ha (3.9 ac) of reef substrate, although less live coral would be lost since the reef platform at this location is mostly consolidated pavement interspersed with pockets of sand. Nevertheless, this area of substrate includes green sea turtle resting and potential foraging habitat, which would be destroyed by implementing this alternative. In addition, 0.5 ha (1.1 ac), 1.1 ha (2.6 ac), and 0.3 ha (0.8 ac) of existing harbor bottom would be dredged for access channel, turning basin, and berthing area construction, respectively.

Although reef surfaces freshly exposed by dredging often eventually become recolonized by reef-building organisms, poor water quality resulting from the unabated discharge of terrigenous sediments into Maalaea Harbor may inhibit normal recovery at the site and prevent the use of affected areas by reef-dwelling species. Even though a new harbor entrance channel would provide additional "edge" habitat, and thereby increase habitat

diversity within the project vicinity, the new channel may not provide suitable replacement habitat for the reef fishes displaced by the dredging. This is expected since the proposed entrance channel will be similar in structure to the existing channel that is relatively devoid of marine organisms, probably due to the impacts of high turbidity and sedimentation. Reef fishes displaced by dredging may be unable to recruit into surrounding reef habitats if those habitats are occupied and successfully defended by resident fishes. Thus, there may be a net decrease in the standing crop of reef fishes on the portion of reef platform modified by dredging of the new entrance channel.

Implementation of Alternatives 1 through 4 would each result in the filling of approximately 0.6 ha (1.5 ac) of nearly 100% sediment-covered harbor shallows adjacent to the east breakwater to create an east revetted mole. Likewise, filling of the existing harbor shoal to create the center mole would destroy 1.2 ha (2.9 ac) of similar habitat. The infauna residing in the sediments, the macroalgae growing on and over the substrate, and the corals colonizing the shoal boulders would be lost. These resources provide food and shelter for juveniles of several important foodfishes, including wrasses, parrotfishes, goatfishes, and barracudas.

Implementation of Alternative 1 would result in the filling of reef in order to widen the end of the south revetted mole. The Service estimates this widened area to be approximately 0.3 ha (0.8 ac). Although the reef substrate at this location is only about 9% covered with live coral, the ledge under which Service biologists observed a resting green sea turtle in 1993 lies very near to the proposed footprint of this fill. Any ledges and depressions used for resting by green sea turtles that may lie within the mole expansion footprint would be lost under the proposed fill. Alternative 2 includes a wave absorber at the end of the south revetted mole and no mole widening. The Service estimates that construction of the wave absorber would destroy approximately 0.1 ha (0.2 ac) of substrate comprised mostly of relatively flat reef pavement. No modification to the end of the south revetted mole would be made under Alternative 3.

Alternatives 1 and 2 also include a new breakwater extension attached to the end of the south revetted mole that would cover approximately 1.4 ha (3.4 ac) and 1.5 ha (3.6 ac) of reef slope. A portion of the new breakwater would cross barren sand on the existing channel floor, and part of it would traverse reef substrate that is approximately 40% covered by live coral coverage. The Corps estimates that construction of the entrance channel and breakwater extension together would destroy approximately 1.5 ha (3.7 ac) of this area of live coral coverage. With the implementation of Alternative 3 a new detached breakwater of similar size would be constructed across the existing entrance channel and in front of the ends of the south revetted mole and east breakwater. Green sea turtle resting habitat fronting the south revetted mole and relatively rich coral habitat off the end of the east breakwater would be lost under this new detached breakwater. Implementation of Alternative 4 would result in filling approximately 1 ha (2.4 ac) of reef, mostly fronting the south revetted mole. The east breakwater extension would destroy green sea turtle resting and potential foraging habitat fronting the south revetted mole.

With the exception of the No Action Alternative, all other alternatives presented in the FSEIS would secondarily impact corals and other filter-feeding organisms and algae by temporarily degrading nearshore water quality as a result of increased levels of suspended sediments and turbidity generated by project-related blasting and dredging of reef substrate, dewatering of dredged spoil, and discharging of fills. Secondary impacts may include smothering of reef corals and other filter-feeders from excessive sediment deposition, abrasion of coral polyps by current-driven suspended sediments, and reduced primary productivity of benthic algae, zooxanthellae, and phytoplankton from decreased light levels. As stated in the FSEIS, turbidity within the harbor will not be controlled during construction.

U.S. Army Corps of Engineers. 1992. *Draft Supplemental Environmental Impact Statement for Maalaea Harbor for Light-Draft Vessels, Maui, Hawaii.* Pacific Ocean Division, Honolulu Engineer District, Hawaii. 43 pp. + Appendices.

U.S. Army Corps of Engineers. 1994. *Final Supplemental Environmental Impact Statement for Maalaea Harbor for Light-Draft Vessels, Maui, Hawaii.* Pacific Ocean Division, Honolulu Engineer District, Hawaii. 97 pp. + Appendices.

U.S. Coast Guard. 1993. Letter from Chief of Staff, U.S. Coast Guard (USCG), Honolulu, to U.S. Army Engineer District, Honolulu, regarding comments on the Supplemental Environmental Impact Statement for the proposed Maalaea Harbor project and planned USCG scope of operations at Maalaea Harbor. 2 pp.

U.S. Fish and Wildlife Service. 1979. *Biological Reconnaissance Report on Concepts Developed by the Honolulu District of the U.S. Army Corps of Engineers for Navigation Improvements at the Maalaea Small Boat Harbor, Maalaea, Maui, Hawaii.* Pacific Islands Office, Ecological Services Division, Honolulu. 21 pp. + Appendix.

U.S. Fish and Wildlife Service. 1980a. *Preliminary Report, Maalaea Small Boat Harbor, Maalaea, Maui, Hawaii.* Pacific Islands Office, Ecological Services Division, Honolulu. 21 pp.

U.S. Fish and Wildlife Service. 1980b. *Final Report, Maalaea Small Boat Harbor, Maalaea, Maui, Hawaii.* Pacific Islands Office, Ecological Services Division, Honolulu. 25 pp.

U.S. Fish and Wildlife Service. 1981. *U.S. Fish and Wildlife Service Mitigation Policy.* Federal Register (46) 15: 7644-7663.

U.S. Fish and Wildlife Service. 1992. *Planning Aid Letter, Maalaea Small Boat Harbor, Maalaea, Maui, Hawaii.* Pacific Islands Office, Ecological Services Division, Honolulu. 4 pp.

U.S. Fish and Wildlife Service. 1993. *Draft Fish and Wildlife Coordination Act Report on Maalaea Harbor for Light-Draft Vessels, Maalaea, Maui, Hawaii.* Pacific Islands Office, Ecological Services Division, Honolulu. 44 pp.

APPENDIX F

ENDANGERED SPECIES

DEPARTMENT OF THE ARMY
PACIFIC OCEAN DIVISION, CORPS OF ENGINEERS
FORT SHAFTER, HAWAII 96858-5440

REPLY TO
ATTENTION OF

July 23, 1997

Planning and Operations Division

Mr. Eugene Nitta
Pacific Area Office
National Marine Fisheries Service
2570 Dole Street
Honolulu, Hawaii 96822-2396

Dear Mr. Nitta:

The Incidental Taking Statement accompanying the Biological Opinion issued by the National Marine Fisheries Services (NMFS) for the Ma'alaea Light-Draft Harbor Project on July 23, 1990 includes a condition which must be complied with as follows:

> Blasting will be restricted to the months of June through November inclusive.

During the development of the Mitigation Plan for the project it was concluded that there may be circumstances when blasting could be accomplished during the period June through November, with the approval of the NMFS Protected Resources Program Manager (PRPM) for the Western Pacific, and that the contractor's bl sting plan would also have to be approved by the PRPM. We wo ld appreciate your concurrence that the above restriction contained in the Incidental Taking Statement is not an absolute prohibition.

Should you have any questions, please feel free to contact Mr. Bill Lennan at 438-2264 or Mr. Stanley Boc at 438-9526 of my Planning and Operations Division staff.

Sincerely,

Ray H. Jyo, P.E.
Director of Engineering
and Technical Services

Bill

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213

MAR 16 1998 F/SWRx1:ETN

Ray H. Jyo, P.E.
Director of Engineering
and Technical Services
Pacific Ocean Division
U.S. Army Corps of Engineers
Fort Shafter, Hawaii 96858-5440

Dear Mr. Jyo:

This responds to your inquiry regarding compliance with one of the conditions in the July 23, 1990 Biological Opinion for the Ma'alaea Light-Draft Harbor Project which is states "Blasting will be restricted to the months of June through November inclusive." This condition is intended to protect endangered humpback whales that may be present in or near the proposed project site during the winter whale season. Should the Corps of Engineers wish to consider blasting for the project outside of the approved window based on new information or other project requirements, a request to the National Marine Fisheries Service should be made in writing sufficiently in advance so that an adequate review of the request and information can be conducted. Depending upon the circumstances, this may require re-initiation of Section 7 consultation.

I may be reached at (808) 973-2987 should you have any questions.

Sincerely,

Eugene T. Nitta

Eugene T. Nitta
Protected Species Program
Manager

3/18

3/1

Provide cy to OPS

4. CP

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Ecoregion
300 Ala Moana Blvd, Room 6307
P.O. Box 50167
Honolulu, Hawaii 96850

In Reply Refer To: MSS

DEC 05 1994

Mr. Ray H. Jyo, P.E.
Director of Engineering
Department of the Army
U.S. Army Engineer District
Ft. Shafter, Hawaii 96858
Attention: Planning Division

Dear Mr. Jyo:

The U.S. Fish and Wildlife Service (Service) has received your letter dated November 25, 1994 inquiring about the possible need to reinitiate section 7 consultation for hawksbill turtles (Eretmochelys imbricata) in the vicinity of the proposed harbor improvements for the Ma'alaea Harbor on Maui. We have reviewed information about the recent sightings of hawksbill turtles and conclude that the rarity of land sightings at our National Wildlife Refuge and the rather large distance of these sightings from the Ma'alaea boat harbor are insufficient to warrant the reinitiation of section 7 consultation. Therefore, we concur with your determination that the proposed harbor improvements are not likely to adversely effect the hawsbill turtle and that formal consultation with the Service is not required. We defer to the National Marine Fisheries Service for analysis of impacts to turtles in the waters surrounding the harbor.

Thank you for your interest in protecting endangered species. Feel free to contact me or Ms. Margo Stahl, Branch Chief for Interagency Cooperation, at 808\541-2749 should you have any additional questions.

Sincerely,

Brooks Harper

Brooks Harper
Field Supervisor
Pacific Islands Office

cc: National Marine Fisheries Service
Honolulu Office

Bill

B

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213
TEL (310) 980-4000; FAX (310) 980-4018

OCT 30 1995 F/SW033:ETN, 2 Director

Mr. Ray H. Jyo, P.E.
Director of Engineering
U.S. Army Engineer District
Fort Shafter, Hawaii 96858

—Constr

Attention: Planning Division

Dear Mr. Jyo:

(4) PP-A

Thank you for your letter regarding section 7 consultation for the proposed improvements to the Maalaea Small Boat Harbor. Our last formal consultation for this project was completed on July 23, 1990 with subsequent informal consultation as well. New information has been provided by the Corps of Engineers, the state Division of Aquatic Resources and the U.S. Fish and Wildlife Service regarding the recent sightings of endangered hawksbill turtles (Eretmochelys imbricata) in the area fronting Kealia Pond. Although this species was not considered in the July 23, 1990 Biological Opinion for this project, its limited presence does not substantively change the conclusions of that Opinion.

Hawksbill turtles are more commonly found in proximity to their known nesting sites on the Big Island of Hawaii and Molokai. There are scattered observations of solitary hawksbills around most of the other main Hawaiian Islands. Hawksbill nesting on the beach fronting Kealia Pond National Wildlife Refuge was confirmed in late July 1991 and in August 1993. A disoriented, gravid female hawksbill was killed attempting to cross the road behind the beach berm a few days prior to the discovery of the 1993 nest. We are aware of no historical data that would indicate that the area had been previously used by hawksbill turtles as a nesting site.

The U.S. Fish and Wildlife Service has concluded that the proposed harbor modifications would not adversely affect hawksbill turtles on their terrestrial habitats based on the distance from the harbor, rarity of sightings, and lack of historical data for the site as significant habitat. Impacts to hawksbill turtles in the marine environment in Maalaea Bay from the proposed harbor improvements are more difficult to assess with the available data. However, given that there have been confirmed nestings, it is reasonable to assume that at least one or two hawksbill turtles may be present in Maalaea Bay during the nesting season and that adverse effects from construction may occur. These impacts include potential disturbance, injury and mortality from blasting similar to those evaluated previously for green turtles. On the basis of the above, the NMFS believes that the proposed activity is not likely to jeopardize the continued existence of hawksbill turtles in Hawaiian waters. A revised Incidental Take Statement for the July 23, 1990 Biological Opinion is enclosed to include hawksbill turtles. Specific terms and conditions are included in the Incidental Take Statement to reduce the potential for injury and mortality to listed sea turtles.

One last note of clarification concerning a statement about potential impacts to humpback whales on page four in the July 23, 1990 Biological Opinion is provided. Our primary concern about construction impacts was the effect of blasting and potential for injury and disturbance to humpback whales during the winter whale season. Dredging, filling, and the construction of revetments may result in some adverse effects, but not likely significant enough to result in a "take" if conducted with reasonable care.

Consultation must be reinitiated if the amount or extent of taking specified in the Incidental Take Statement is exceeded, new information becomes available revealing effects of the project on listed species that were not previously considered, the project is subsequently modified in a manner that causes an effect to listed species that was not considered, or if a new species or critical habitat is designated that may be affected by the project.

Please contact Mr. Eugene Nitta at (808) 973-2987 if you have any questions concerning this consultation.

Sincerely,

Hilda Diaz-Soltero
Regional Director

Enclosure

cc: F/SWO33 - Nitta
F/PR2
FWS, Honolulu

Statement Regarding Incidental Taking Pursuant to Section 7(b)(4) of the Endangered Species Act of 1973, as Amended

Section 7(b)(4) of the Endangered Species Act requires that when a proposed agency action is found to be consistent with Section 7(a)(2) of the Act and the proposed action is likely to take individuals of some species incidental to the action, the National Marine Fisheries Service will issue a statement that specifies the impact (amount or extent) of such incidental taking, and will provide reasonable and prudent measures that are necessary to minimize such impacts. Terms and conditions that must be complied with are set forth to implement these measures.

Based on the available information regarding green turtle and hawksbill turtle distribution around Maalaea Small Boat Harbor project site, the following allowable levels of incidental take for green and hawksbill turtles have been determined for the proposed construction activities. An incidental take (by injury or mortality) of one green turtle and one hawksbill turtle during the course of construction is set for this activity. Also, five turtles per day of either species may be disturbed or temporarily displaced during the course of construction. If the incidental take meets or exceeds this level, the Corps of Engineers (Corps) must reinitiate consultation. The National Marine Fisheries Service (NMFS), Pacific Area Office will cooperate with the Corps in the review of the incident to determine the need for developing further mitigation measures.

If blasting is required to facilitate excavation for the improvements at Maalaea Small Boat Harbor, the following reasonable and prudent measures and terms and conditions must be complied with:

(1) Blasting will be restricted to the months of June through November inclusive.

(2) The Protected Species Program, Pacific Area Office, (PAO), Southwest Region, National Marine Fisheries Service (NMFS), Honolulu, Hawaii, must be notified at least 10 days before initiation of blasting in order to monitor blasting activities. Personnel from NMFS must be allowed to monitor any or all portions of the construction activities.

(3) Due caution must be taken by the applicant to insure that no green turtles are in the immediate

vicinity (100 yards) of any blasting. Blast sites must be monitored and surveyed by small boats and divers and considered clear of sea turtles before blasting can occur.

(4) Charge size must be limited to the smallest practicable for each shot. Maximum charge size must be determined for each activity allowed under the Permit through consultation with the NMFS, the Corps of Engineers and the applicant. All explosives should be placed in drilled holes to reduce blast damage.

(5) Any incidents of disturbance or injury/mortality to listed species must be reported within 24 hours of one working day to the Protected Species Program Manager, PAO (808-973-2987/FAX 808-973-2941).

(6) A final report summarizing the information gathered during the monitoring of the project site must be submitted within 30 days after the completion of the project to the Protected Species Program, PAO. The report should include, among other information, the number of turtles observed, captured and removed from the area, the number of blasts, size of the charge(s) used in a blast, and time of day of the blast.

This incidental take statement applies only to the threatened green turtle and endangered hawksbill turtle. In order to allow an incidental take of a marine mammal species, the taking must be authorized under Section 101(a)(5) of the Marine Mammal Protection Act of 1972, as amended.

APPENDIX G

LETTERS OF COMMENT AND RESPONSES

State of Hawaii, Department of Defense

Comment 1. The design, construction and operation of piers, wharves, harbor facilities and storage yards needs to be seriously evaluated to mitigate the impact of potential tsunami and tropical cyclone/hurricane storm driven waves and coastal inundation conditions. Specifically, deepening of the harbor, possible alteration of the existing grade and shoreline may dictate that the design and construction of facilities within the project area provide safe emergency shelter, ingress, and egress for both wheeled vehicles and marine vessels.

Response. All Federal project features, which consist of breakwater modifications and channel dredging, will be designed and constructed in accordance with appropriate Corps of Engineers' engineering and design regulations as referred in ER 1110-3-1150 (Engineering and Design for Civil Works Projects). The specific design of local protection features such as wharves, yards, and other structures and not part of this Federal action will be considered by the State of Hawaii prior to their construction.

State of Hawaii, Department of Health

Comment 2. Efforts to upgrade the sewage treatment facilities and add pump-out facilities at Ma'alaea Harbor may not be sufficient to address our concerns regarding the pollution and water quality of the harbor and surrounding area. A comprehensive master plan to collect, treat and dispose of wastewater needs to be developed. All wastewater plans must conform to applicable provisions of the Department of Health's Administrative Rules, Chapter 11-62, "Wastewater System." We reserve the right to review these detailed wastewater plans for conformance to applicable rules.

Response. The Hawaii Department of Land and Natural Resources, Division of Boating and Ocean Recreation (DBOR), is responsible for providing the sewage treatment and pump-out facilities. The development of a comprehensive master plan for sewage treatment for areas outside the harbor is beyond the scope of this effort. The DBOR will coordinate the detailed wastewater plans with your department when they are developed.

State of Hawaii, Department of Transportation

Comment 3. The future widening of Honoapiilani is unlikely to be constructed before the harbor expansion project is completed. The applicant should therefore provide interim improvements at Honoapiilani Highway/Old Ma'alaea Road intersection including left-turn storage, acceleration, and deceleration lanes on Honoapiilani Highway and separate right- and left-turn lanes on Old Ma'alaea Road. The details of the intersection improvements and the identification of any other measures to mitigate traffic impacts should be included in a Traffic Impact Analysis Report that must be submitted for our review and approval.

Response. Since submittal of your comment in October 1994, the Maui Ocean Center, located adjacent to the harbor has constructed improvements to Honoapiilani Highway, as well as a new entrance with a traffic signal. For any of the additional recommended improvements that are not already developed in conjunction with other nearby development, the DBOR would provide the remaining measures in conjunction with its portion of the proposed project. Sections 5.12 and 5.18.6 of the DSIIEIS provide these comments. The plans will be submitted by the Hawaii DBOR for your review and approval.

The State of Hawaii commissioned a traffic impact analysis for the 1994 Final Supplemental Environmental Impact Statement. That traffic impact analysis was provided for review and comment in Appendix D of that document.

Comment 4. The applicant should commit to installing traffic signals at the intersection of Honoapiilani Highway/Old Ma'alaea Road. We recommend that the conduits for the traffic signals be installed as part of the required interim intersection improvements. In the meantime, the applicant should conduct and submit periodic traffic signal warrant studies on a schedule as determined by our department.

Response. For any of the additional recommended improvements that are not already developed in conjunction with other nearby development, the DBOR would provide the remaining measures in conjunction with its portion of the proposed project. Sections 5.12 and 5.18.6 of the DSIIEIS provide these comments.

Comment 5. All roadway improvements shall be provided at no cost to the State.

Response. All roadway improvements will be provided by the Hawaii DBOR, at the State's expense.

Comment 6. Construction plans for work within the State highway right-of-way must be submitted for our review and approval.

Response. Construction plans for work within the highway right-of-way will be submitted for your review and approval.

Office of the Mayor, County of Maui

Comment 7. Areas mauka of the shoreline fall in the County's jurisdiction under CZM Regulations. Because of this, the State will have to apply for a Special Management Area (SMA) permit for the areas so affected.

Response. DBOR is currently seeking confirmation from the County of Maui that an SMA is not required for this project.

Comment 8. We note that this project provides for the creation of approximately 100 new recreational berths. It has been our experience that under present regulations, berths are often transferred between owners by allowing the transfer of ownership of vessels with berths. We feel that the State should address this issue as part of their process of expanding the number of available berths.

Response. Of the additional 125 vessels that would be accommodated in the expanded harbor, 62 would be recreational, 39 would be commercial (occupational) fishing, and 24 would be commercial passenger. According to the DBOR, for the 30 percent of boats in Ma'alaea Harbor with commercial permits, the slip is considered an asset of the business. When the business is sold, the slip and all other assets of the company are transferred to the new owner. DBOR has no plans at present to change this policy.

Board of Water Supply, County of Maui

Comment 9. We have reviewed the proposed final SEIS and continue to see reference to land-based infrastructure and water consumption impacts. No description and analysis of potable water consumption and impacts is made. Therefore, we do not concur with your response statement which asserts that water consumption is addressed in the final SEIS. We maintain that water consumption and growth, being fundamental infrastructure components, should be addressed in the final document. Historical and anecdotal information on growth trends in coastal South Maui are available through the Maui Planning Department. In addition, water consumptive trends are found in the Maui County Water Use and Development Plan along with a discussion of trends in South Maui in particular.

Response. Thank you for pointing out our omission in addressing water consumption in the draft SEIS. The issue is addressed in Sections 3.15.2, Infrastructure, and 5.14, Socioeconomics of the DSIIEIS. The existing water system, water source, and capacity of the existing system are described, as well as the present water consumption at the harbor, in Section 3.15.2. Section 5.14 identifies an additional 875,000 gallons per month of water supply that would be required with the expanded harbor use. It also states that your office has indicated that new sources of water may need to be developed to meet such a demand. When detailed plans are being developed, DBOR will coordinate with your office to assure the water supply for the harbor is developed.

Department of Parks and Recreation, County of Maui

Comment 10. We have reviewed the FSEIS and have no comments to offer at this time.

Response. Thank you for your interest.

County of Maui, Department of Public Works and Waste Management

Comment 11. Alternative means of disposal of dredged material and rock shall be utilized other than disposal at the County landfills.

Response. All dredged material is expected to be used to construct harbor improvements. However, there may be some excess or unsuitable material generated that will need to be disposed. We will work with your office to ensure that any such material will be properly disposed.

John C. Baldwin

Comment 12. We have had to go out to sea numerous times to save our boat during high surf. The harbor as it exists is not a safe harbor.

Response. Safety and vessel damage issues are addressed in Sections 2.3, (Need for the Action); 3.12.3 (Boating and Navigation); and 5.10.2 (Boating and Navigation) of the current DSIIEIS .

James B. Cash

Comment 13. Leave Maui, Ma'alaea Harbor as it is and relocate boat owners to a better location for their needs.

Response. Alternative locations for a new harbor was determined to not be a reasonable alternative, as discussed in Section 4.3.1.6 of the DSIIEIS. It does not meet two of the three identified purposes of providing solutions to the navigational and surge problems currently experienced at Ma'alaea Harbor. In addition, there is greatly increased potential for environmental damage to previously undeveloped areas and would introduce new vessel traffic into areas not now disturbed. The costs of developing a new harbor as opposed to improvement and expansion of an existing harbor are also prohibitive. Also, the National Marine Fisheries Service and U.S. Fish and Wildlife Service strongly oppose development of new harbors, and such development is contrary to Hawaii CZM policy to consolidate harbor development to existing harbor sites wherever possible.

Roy S. Genatt, D.C.

Comment 14. The new breakwater extension proposed for Ma'alaea Harbor will destroy the Off-the-Wall surf site and will adversely affect a specialized reef species.

Response. You are correct that the Off-the-Wall surf site would be lost. Project design modifications have been made to avoid impacts to two other surf sites. We are uncertain which specialized reef species you mention. However, effects on coral reef and aquatic life are addressed in Section 5.8, Biological Resources, of the DSIIEIS.

U.S. Department of the Interior

Comment 15. The preferred alternative plan presented in the FSEIS differs from the one contained in the Draft Supplemental Environmental Impact Statement. However, we are unable to evaluate the revised alternative plan because pertinent information on the areas and amounts of the proposed project-related dredging and filling is missing, inconsistent, and conflicting.

Response. See response to comment no. 19 below.

Comment 16. The FSEIS was issued before submission of the Fish and Wildlife Service's (FWS) Final Fish and Wildlife Coordination Act (FWCA) report. The DOI, Environmental Protection Agency, and FWS all recommended the Final FWCA report be included.

Response. The Final Fish and Wildlife Coordination Act report was not received in time to include it in the FSEIS. However, the Final FWCA report is included in Appendix E of the DSIIEIS. In addition, the HED in July 1997 provided the Fish and Wildlife Service with copies of the mitigation report and CZM consistency determination, and invited additional comments in accordance with the Fish and Wildlife Coordination Act for inclusion in this second draft SEIS. As of May 1998, no additional comments have been received.

Comment 17. In the Draft FWCA report, the FWS identified Alternative 6 as the least damaging alternative plan to Federal trust species, as it would restrict direct dredge and fill impacts to within existing harbor boundaries. The FSEIS incorrectly states that the Corps has responded to a request from FWS for "additional consideration of an alternative which would restrict all improvements within the existing harbor boundaries to avoid any impacts to the marine environment outside the harbor." FWS requested the Corps to develop a workable project design based on the concept underlying Alternative 6 and provide the design to the FWS for evaluation prior to preparation and submission of a Final FWCA report. Instead the Corps further analyzed Alternative 6 as presented in the DSEIS, and included the test results in the FSEIS. The FWS should have been given an opportunity to complete the Final FWCA report prior to Corps' issuance of the FSEIS. Thus, the issue of avoidance of adverse project-related impacts to coral reef habitat at Ma'alaea Harbor remains unsettled.

Response. See response to comment no. 18 below with respect to a feasible design based on the Alternative 6 concept. Impacts to coral reef habitat have been avoided to the extent possible with the designs of all alternatives.

Comment 18. The FSEIS states "Alternative 6 would not meet the purposes of the proposed action" as listed on page 2-1. However, Appendix G contains a report entitled "Wave Response of Proposed Improvement Plan 6 to the Small Boat Harbor at Ma'alaea, Maui, Hawaii" (Plan 6 Report), which states that "Plan 6 satisfies the (Corps') criteria for providing adequate protection in the channel and berthing areas . . . from incident wind wave and swell climate." The FSEIS further states Alternative 6 "would actually worsen existing navigation and safety conditions." This statement is not supported by the test results. Test results presented in the Plan 6 Report indicate that wave heights in the entrance channel would be greater than 2 feet only 7.5 percent of the time per year and that wave heights in the berthing area would be greater than 1 foot only 1.9 percent of the time per year. These results are below the Corps' limiting criteria for the proposed harbor design improvements. Refinement of a design based on the concept underlying Alternative 6 could achieve even better navigation and safety.

Also, the conceptual harbor configuration shown in Figure 15 on page 3-18 indicates that at a minimum Alternative 6 would provide for a 30 percent increase in the number of existing berths. An even greater increase in the number of berths could be achieved by refinement of a design based on the concept underlying Alternative 6. Therefore, the information in the FSEIS supports the conclusion that Alternative 6 would meet the purposes of the proposed action. This alternative should continue to be considered.

Response. There has been some confusion regarding the statement in the FSEIS that Alternative 6 would actually worsen existing navigation and safety conditions. Because of this confusion, the DSIIEIS, Section 4.4.1.2, provides additional discussion and clarification of the issue, which is not related to wave heights in the entrance channel and berthing areas.

All alternatives would meet the project purpose of reducing wave heights to below the established criteria. A December 1997 revision and extension of the previous study to assess the wave response of the various alternative plans for the harbor confirmed the general results of the previous study. The updated study is contained in Appendix K of the DSIIEIS, and is summarized in Section 4.4.1.1.

However, the navigational safety issue is related not to wave HEIGHT, but to wave LENGTH, vessel length, and vessel speed. The Corps of Engineers Waterways Experiment Station (WES) found that **any** configuration based on the Alternative 6 concept would create a dangerous "following sea" condition, which is defined as waves that are traveling in the same direction as the vessel. Wave height is not the most important parameter influencing the vessel's behavior; vessel speed and wave length were the primary factors. However, when the speed of the vessel is less than 8 knots and the wave length is greater than ½ the length of the vessel, the vessel begins losing maneuverability. At speeds of 4 knots or less, the vessel stops responding to the rudder. All vessels less than 98 feet long would be navigating in a following sea nearly 100 percent of the time with this configuration. With the slow "no wake" speed limit in the entrance channel (less than 5 knots) and with the addition of possible collisions with rock structures on both sides of the entrance channel, vessels would be routinely subjected to extremely hazardous navigation conditions.

It would make no difference how the interior is aligned for Alternative 6. The entrance channel would still be subjected to direct southerly wave attack and following sea conditions. Therefore, additional detailed study on a potential modified design for Alternative 6 was not conducted.

Comment 19. The FSEIS states the preferred alternative "is similar to the selected plan identified in the 1980 GDM/FEIS." The dimensions of the south breakwater extension, entrance channel, turning basin, and access channel presented in the FSEIS are identical to those presented in the DSEIS. However, the FSEIS states that the south revetted mole "has been substantially reduced in area from the design in the 1980 selected plan," which was presented as the selected alternative in the DSEIS. The amount of this reduction is not identified in the FSEIS, but based on the figures depicting the project site that were included in the documents, we estimate the reduction to be approximately 0.8 ac of fill. Since the dimensions of the other project features have not changed, the FSEIS is unclear how the total dredge acreage increases from 5.3 ac in the DSEIS to 6.1 ac in the FSEIS (as stated on page 3.22). How the quantity of dredged material is reduced by 39 percent when the area of dredging was increased also should be clarified. It is similarly unclear how the loss of coral-reef habitat from entrance channel dredging off the end of the east breakwater was reduced 23 percent from 2.6 ac in the DSEIS to 2 ac in the FSEIS without reorienting the proposed new channel.

Response. For the DSIIEIS, several clarifications and refinements have been made with regard to project dimensions and quantities. Figure 15 in Chapter 4 shows a comparison of the 1980 Recommended Plan and the present plan. Additionally, in Section 4.4.2.1, the modifications to reduce impacts to surf sites and aquatic habitat are described in more detail. The size of the seaward extension of the revetted mole at the base of the south breakwater extension was downscaled, and the toe of the revetted mole would be maintained within 100 feet of the existing structure. The revetted mole would also be tapered, and the south breakwater extension would be constructed with a single layer of concrete armor units instead of multiple layers of armor units. Dredge and fill quantities have been calculated in more refined detail, as can be seen on Table 2 in Chapter 4. A coral study performed recently for this project can be found in Appendix D of the DSIIEIS and is summarized in Section 4.4.2.4. That study provided more accurate information regarding existing coral resources; therefore, the amount of coral habitat that would be affected by each of the alternatives has been determined to be higher than originally estimated in the Draft and Final Fish and Wildlife Coordination Act Reports.

Comment 20. It is stated in Chapter 3, Alternatives, 3.5, Alternatives Eliminated from Detailed Planning, that "during south swell conditions an internal oscillation would develop in the harbor, causing damage to berthed vessels." However, according to the Plan 6 Report, increases in harbor oscillations are potential rather than definite. Also, the harbor oscillation test results appear to be inconclusive due to limitations inherent in the Harbor D model used for the test. Furthermore, other project alternatives were not tested for harbor oscillations for comparison with Alternative 6.

Response. The oscillations study was updated in 1997 in order to incorporate improvements in the modeling technology and to evaluate the potential for harbor oscillation for all alternatives. The results of the updated study indicated that Alternatives 1 and 6 may be expected to experience stronger oscillations than the existing harbor, particularly at lower frequencies, but that oscillation at low frequencies does not present safety problems. This study can be found in Appendix K of the DSIIEIS , and is summarized in Section 4.4.1.4.

Comment 21. The FSEIS states that "the flushing characteristics of the harbor under Alternative Plan 6 were the worst of those analyzed, increasing the flushing period from the present 2.9 days to an estimated 6.3 days." However, the Appendix B report entitled, "Numerical Hydrodynamic Modeling and Flushing Study at Ma'alaea Harbor, Maui, Hawaii" indicates that a period of less than 10 days should be considered acceptable flushing time for a harbor basin. The biological effects of slowing flushing time within acceptable limits at the harbor are not addressed in the report or in the FSEIS. Therefore, the estimated flushing time for Alternative 6 does not support the conclusion that refinement of a design based on the interior mole concept should be rejected.

It is stated on page 5-18 that "the water quality of the harbor would continue to degrade as a result of increased inland development unrelated to the proposed project. The increased vessel traffic anticipated as a result of the harbor improvements would increase turbidity in the harbor, resulting in additional exceedences of water quality standards for turbidity." Therefore, no matter what alternative is implemented, water quality in the harbor is expected to decrease as a result of increasing sedimentation. Given the chronic sediment conditions in the harbor and the significant value of marine resources in Ma'alaea Bay, the biological effects from the estimated flushing rate reduction should be investigated. The conclusion that adverse effects to fish and wildlife resources would be caused by the flushing rate reduction estimated for Alternative 6 is not supported by data given in the FSEIS. Therefore, it may be premature to use inadequate flushing as a reason to reject development of an alternative that would restrict direct project-related impacts from habitat currently used by Federal trust species.

Response. Although the referenced report as background did provide an old recommendation that 10 days was considered to be an acceptable flushing time, it specified a more up-to-date criteria of 5 days established by EPA. However, further analysis in 1997 (Wang 1998) with respect to flushing utilizes a more recent EPA definition for harbor flushing, which reports flushing time as the amount of a conservative substance that is flushed from the basin over a 24-hour period. It found that Alternative 1 would reduce the average flushing time from 50 percent to 38 percent, and Alternative 6 would further reduce the average flushing time for the harbor to 26 percent. Section 4.4.1.3 and Appendix K of the DSIIEIS provide further details.

The water quality and biological effects of reduced harbor flushing are discussed in Sections 5.5, 5.8.2. and 5.8.2.6 of the DSIIEIS. None of the alternatives have been eliminated from consideration because of harbor flushing effects.

Further evaluation of harbor sedimentation has been conducted since the 1994 FSEIS was released. More detailed information is now available on planned development upland from the harbor. Based on that available information, the harbor sedimentation rate is expected to decrease in the future with the conversion of uplands from agricultural to urban uses. In addition, drainage improvements are planned with several of these developments, as discussed in sections 3.6, Water Quality; 5.4 Water Quality, 5.18.2 which discusses mitigation for Water Quality effects, and 5.19, Cumulative Effects. Cumulative effects on water quality would be both beneficial and adverse. The sediment load of stormwater drainage is expected to decrease significantly. Turbidity effects are likely to be improved in the harbor, even with additional vessel traffic. The effects of other potential components of stormwater input, such as pesticides and herbicides for landscaping purposes and other urban constituents, would be adverse, but the reduction in agricultural chemical inputs may offset those adverse effects.

Comment 22. The issue regarding the development of a practical design based on the Alternative 6 concept should be resolved prior to discussing potential project mitigation, and mitigation for unavoidable losses to fish and wildlife resources should be developed prior to the Corps' issuance of the Supplemental Record of Decision for the project.

Response. The response to comment no. 18 above addresses the issue of the practicability of Alternative 6. In addition, a mitigation plan developed for the CZM consistency evaluation provides mitigation for the unavoidable project impacts (see Appendix C DSIIEIS). The mitigation plan, as well as other mitigation commitments, are discussed in Section 5.18.

U.S. Department of the Interior, Geological Survey

Comment 23. We were not allowed sufficient time to review the FSEIS.

Response. Our letter accompanying the FSEIS requested that comments be returned within 30 days of the date of the publication of the Notice of Availability of the FSEIS in the OEQC Bulletin or the Federal Register, whichever is later. The expected publication dates were given as August 23 and September 2, respectively, so comments would be expected by about October 2. Your letter was dated August 29, 1994; however, your comments were not due until about October 2. The misunderstanding is unfortunate. You do have another opportunity for comment with the review of this DSIIEIS.

U.S. Department of Transportation, U.S. Coast Guard

Comment 24. The FSEIS has not addressed the impact to U.S. Coast Guard Station Maui's search and rescue missions. The impact during the dredging of Maalaea Harbor will increase the response time to distress vessels and personnel. The impact during the reconstruction of the existing boat ramp if it is closed off completely would increase the response time of the unit's vessels by 15 to 20 minutes if they were to be launched at the Kihei boat ramp or 25 to 30 minutes at Mala Wharf in Lahaina.

Response. The harbor is not expected to be closed during the dredging or construction of the protective structures; therefore, it is unlikely that the Coast Guard's response time would be affected. Plans have not yet been finalized by the State of Hawaii for the reconstruction of the existing boat ramp and it is not known at this time if the ramp will be closed. The DBOR will coordinate with you to ensure that your requirements are incorporated into construction plans, and so that you can be prepared to overcome problems to your operations caused by construction activities.

Hawaii Office of State Planning, Office of the Governor

Comment 25. The proposed improvements to the Maalaea Harbor were reviewed for consistency with Hawaii's CZM Program. We do not concur with the CZM assessment and finding that the activity is consistent to the maximum extent practicable.

Response. The Hawaii DBEDT issued a determination of consistency with Hawaii's Coastal Zone Management Program in 1996. The CZM determination and the mitigation plan are provided in Appendix C of the DSIIEIS.

Hawaii Department of Business, Economic Development and Tourism

Comment 26. Some of the proposed improvements, are partially within the State Land Use Urban District and partially within the State Land Use Conservation District.

Response. The Hawaii Board of Land and Natural Resources issued a Conservation District Use permit on October 28, 1994.

Isaac Davis Hall

Comment 27. The FSEIS fails to satisfy both state and federal requirements for an adequate EIS. With regard to state requirements procedures for the preparation of an SEIS were not followed, content requirements have not been satisfied, and comments received during the review process did not receive adequate responses.

Response. Specifics were not provided, so it is not possible to respond in a substantive fashion.

Comment 28. The Board of Land and Natural Resources (BLNR) should not have initiated the permitting process for a CDUA permit until the SEIS for the project as a whole had been prepared, circulated to the public, accepted by the governor and a Record of Decision issued by the Army Corps of Engineers.

Response. This issue is outside the scope of the actions being considered in this EIS. These issues must be directed to the BLNR.

Comment 29. The FSEIS does not consider the impact of this project upon the endangered hawksbill turtle.

Response. The FSEIS did consider the impact of the project on the hawksbill turtle. The HED determined that because the occurrence of the turtle is so rare, that the proposed project was not likely to affect these species. The NMFS concurred with that determination, as did the U.S. Fish and Wildlife Service. Subsequent to release of the FSEIS, additional information came to light, and coordination with NMFS resulted in the determination that one or two hawksbill turtles may be present in Ma'alaea Bay during the nesting season and that adverse effects from construction could occur, including disturbance, injury and mortality. The NMFS provided a revised Incidental Take Statement to allow the incidental take of one of these animals during construction. Section 5. 8.3 of the DSIIEIS discusses these impacts, as well as the consultation with NMFS and measures that will be employed to avoid and minimize adverse effects to turtles (Section 5.18.4).

__Comment 30.__ The wave data included within the SEIS are sketchy and based upon extrapolations from data collected elsewhere and applied inaccurately. The effect of refraction of the Big Island and refraction and diffraction from Molokai are both ignored. The July 1993, study "Wave Response to Proposed Improvements" does not use the Corps' best computer program for determining swell direction as influenced by refraction and diffraction from Kahoolawe, Molokini, Hawaii and the southeast portion of Maui including Kihei and Makena. In fact it completely omits Molokini, Hawaii and Maui and considers Kahoolawe to only a small degree. The Corps' May 1994 analysis entitled "Harbor Response to Wind Waves and Swell" completely fails to consider the effect of the strong northeast winds upon the harbor which cause convective overturning of harbor water, greatly increasing the harbor's drainage.

__Response.__ The updated wave response study (1997) (see Appendix K of the DSIIEIS) utilizes more accurate data regarding wave conditions in the project area. In previous studies deep water wave estimates were based on measures collected at Barbers Point on Oahu. For the current study, incident wave data were obtained from a deep water buoy located southwest of the island of Lanai. The availability of deep water data nearer the vicinity of Ma'alaea Harbor greatly improves the validity of the overall results. The current study also incorporates improved model technology. Since initial studies were conducted, spectral wave modeling capabilities for wind waves and swell have been added to the model and several harbor modeling parameters have been investigated and optimized. These adjustments had a notable impact on model performance. The results of this study are summarized in Section 4.4.1.1 of the DSIIEIS.

The harbor flushing studies have acknowledged the harbor's two-layer circulation pattern. This is discussed in more detail in Sections 3.7, 4.4.1.3, and 5.5 of the DSIIEIS.

__Comment 31.__ Significant, critical comments were received from "sister" agencies of the Army Corps which received no responses at all. The U.S. Fish and Wildlife Service submitted comments supporting Alternative 6, which would not require blasting outside the harbor, the granting of the CDUA application or the destruction of significant surf sites. Many other comments never received responses.

__Response.__ We are not aware of any comments which received no response. We cannot respond in a substantive manner without specific details.

__Comment 32.__ The adverse traffic impacts of this project are not mitigated. It would take a four-lane highway to increase the capacity from Level of Service F to an adequate level of service and no four-lane highway will be constructed and in place by the time this project is implemented.

Response. As explained in the 1994 FSEIS and in Section 5.12 of the current DSIIEIS , traffic increases attributable to the proposed project would not change the levels of service along Honoapiilani Highway itself from the projected levels of service during both the a.m. and p.m. peak hours. Therefore, no mitigation would be required for Honoapiilani Highway. The effects of the traffic attributable to the additional berthing spaces would result in a decrease in the level of service for traffic exiting the harbor at all three unsignalized intersections. See also response to comments nos. 3 and 4 above.

Comment 33. This action is not consistent with the federal or state Coastal Zone Management Act.

Response. See response to comment no. 26 above.

Comment 34. The Corps has completely failed to analyze alternative locations as required by law. The best location for a harbor in the vicinity is the old pier by Suda Store. It has no waves, no surf and far less surge.

Response. The need for additional berthing space was only one of three project purposes and needs identified. Alternative harbor locations would satisfy only one of three project purposes—provide opportunity for the addition of berthing spaces and attendant harbor facilities. It would not meet the other two identified project purposes—to improve the surge problems at Ma'alaea Harbor, and to reduce navigation hazards in the existing harbor entrance channel. Therefore, alternative harbor locations do not meet the project purpose and need. Also, see response to comment no. 13 above.

Comment 35. Other issues to be raised are those contained in the letter dated September 16, 1994 from Mark Smaalders, Resource Analyst for the Sierra Club Legal Defense Fund, which is attached hereto and is incorporated by reference.

Response. Please see the comments provided in that letter below, and refer to the responses to those comments.

Michelle C. Kremer, Surfrider Foundation

Comment 36. The SEIS is thorough in its analysis of surf site impacts. If the project goes forward as planned, we must insist that conditions be placed on the issued permit requiring some form of in-kind mitigation for any impairment or destruction of the existing surf spots.

Response. Impacts to surf sites have been avoided and/or minimized to the extent possible with the proposed alternative. The first design would have adversely affected three separate surf sites. The current design modifications eliminate impacts to two of those sites. Mitigation being proposed for the loss of the Off-the-Wall surf site is to provide better access to the water for surfers, as well as showers and other amenities, in the harbor. Creation of a new surf site was not considered feasible in the development of the mitigation plan because of required modifications to the sea bottom and its associated environmental impacts.

Anthony J. Lannutti

Although an opinion was offered as to the need for the project and its effects on coral reefs, no specific comment on the SEIS was provided.

Randy and Rosalind Mason

Although an opinion was offered regarding opposition to the proposed project, no specific comment on the SEIS was provided.

Jack Mueller, P.E.

Comment 37. Until the Honoapiilani Highway capacity is enlarged and the level of service is reduced to an acceptable level, no additional traffic can be added to the highway.

Response. See response to comment no. 32.

Comment 38. The Honoapiilani Highway is presently operating at level of service F, according to the Department of Transportation. DOT's figures do not agree with the figures of the consultant you quote. Your conclusions in 4.13.2 and 4.13.3 are incorrect.

Response. The Department of Transportation (DOT) is the agency which commissioned the traffic study for this project, and is responsible for the information contained in that report. We accept the DOT's study results and we utilized only the DOT's report to identify impacts to traffic. These are DOT's figures.

Comment 39. If sewerage facilities are not concurrently installed and ready to use, the new berths will sit empty.

Response. Please see Section 4.3.2 of the DSIIEIS which states: "The first element of the State's overall plan would be to upgrade the sewage disposal system."

Comment 40. I disagree entirely with your conclusions and suggest you carefully examine the detailed study of Ma'alaea Bay by B.K. Dynamics and Westinghouse Environmental Systems Department. The currents are not what you describe and certainly not what we have observed living right on the bay and frequently swimming and snorkeling in this area. In addition, to blame the beach erosion in the 1950's on "condominium sea walls" built in the 1970's is a stretch of imagination beyond my comprehension. We are continuing to monitor and record the condition of our sandy beach and when and if a new breakwater is installed our records will undoubtedly provide of substantial value to all of our property owners.

Response. The description of currents was based on actual field observations, as well as modeling. "Numerical Hydrodynamic Modeling and Flushing Study at Ma'alaea Harbor documents the results of the field study and modeling that was performed on Ma'alaea Harbor. The field study and modeling documented that the surface currents within and in the vicinity of the Ma'alaea Harbor are dominated by the northeast tradewinds.

With respect to beach erosion, it is well known that a near-vertical sea wall inhibits the deposition of sand at its base due to its high energy reflective nature. It is also documented that there is a minimal amount of littoral motion in this reach. This is shown in the field by the lack of dredging of shoaled material in the entrance channel since the harbor was originally constructed in the 1950's, as well as the small or nonexistent fillet at the front of the breakwaters.

Comment 41. I disagree with your projection of a rise in property values as a result of the harbor improvements. What provisions are being made to compensate the property owners when property values go down?

Response. The projections of a rise in property values are based on the professional judgment of HED real estate appraisers. No compensation is required for property owners.

Comment 42. I wonder why "Harbor oscillations were not considered in the earlier study by Lillycrop et al." Also, from Chapter 5 Conclusions, "a. Plan 6 is satisfactory . . ." and then b. and c. with conclusions based on different conditions. Was any baffling ever thought of or discussed. Too bad you can't be more objective in your evaluations of alternatives.

Response. Harbor oscillations were not raised as a concern until the development of Alternative 6, with its addition of confined corners and with no breakwater from the south waves. It was at that time decided to conduct a study to determine whether harbor oscillations might be a problem with Alternative 6, and that study was then updated to include the other alternatives. You can find the updated study in Appendix K of the DSIIEIS. The results of that study are that harbor oscillations would be expected to increase at low frequencies with both Alternatives 1 and 6, but that these oscillations would not be problem.

The FSEIS stated that Plan 6 is satisfactory in reducing harbor surge, which relates to the height of the waves in the entrance channel and berthing areas. What is not satisfactory is related to the orientation of the interior mole and the wave LENGTH, creating a dangerous "following sea" condition. Also see response to comments nos. 17 and 20.

We are uncertain as to the meaning of your comment regarding baffling.

The Surfer's Journal

Comment 43. Surfing is important to the economy and culture on Maui, and provides high quality, intensely valuable recreational experiences for both locals and visitors. There is no proven strategy for mitigating the loss of a break, especially a world class break like Ma'alaea.

Response. The Ma'alaea Pipeline surf break, which is known internationally as one of the best waves in the world, would not be affected by the proposed project. One surf site known as Off-the-Wall would be lost, and impacts to two other surf sites have been avoided with project modifications.

Tim Slack

Comment 44. I have concern that the length of the south breakwater extension will not be sufficient to block swells coming up the Alalakeiki Channel during kona storms. The FSEIS has been very well done.

Response. Our analysis has determined that the south breakwater extension will be sufficient to block swells due to kona storms.

Steven Taussig

No comment was offered on the FSEIS.

Sierra Club Legal Defense Fund, Inc.

Comment 45. The proposed activity fails to satisfy the Corps legal obligations under the National Environmental Policy Act. The FEIS fails to adequately evaluate reasonable alternatives to the harbor expansion, direct and indirect impacts resulting from the proposed harbor expansion, impacts to water quality and resultant secondary impacts on marine resources, impacts to surf sites, including Ma'alaea Pipeline, impacts of utilizing potentially toxic fill material. In addition, the FSEIS fails to include a substantive response to all comments received, including comments from agencies, citizens' groups and individuals, despite an obligation to respond to all substantive comments and any opposing views on issues raised.

Response. Responses to specific comments are provided below.

Comment 46. The Corps did not adequately address concerns raised by other federal agencies in fulfillment of their duty to protect wildlife resources. One example is the Corps' decision to issue the FSEIS prior to completion of a final Fish and Wildlife Coordination report, despite recommendations from the U.S. Fish and Wildlife Service, the Department of Interior and the Environmental Protection Agency that the final FWCA report be included in the FSEIS.

Response. See response to comment no. 16 above. The FSEIS did contain the reports and recommendations of the Secretary of the Interior on the wildlife aspects of the project. It contained the most recent report available. There is no requirement to include an FWCA report in this EIS. Only those reports which will be presented to the Congress or to any agency with authority to authorize the construction of water-resource development projects need to contain the FWCA reports. The report which will be presented to the decisionmaker is the Record of Decision, which will include any FWCA reports, as well as the Final Supplement II EIS, and all other required compliance documents. In addition, all recommendations of the FWS in the Final FWCA Report have been considered and are addressed in the DSIIEIS.

Comment 47. The Corps has failed to fulfill their statutory obligation to evaluate alternatives to the proposed Ma'alaea Harbor expansion, with the result that the FSEIS cannot fulfill its purpose of informing "decisionmakers and the public of the reasonable alternatives which would avoid or minimize adverse impacts. The Corps has failed to respond to the requests presented by the USFWS in its draft FWCA report, which identified Alternative 6 as the least damaging to fish and wildlife resources, and requested that the Corps (a) refine and analyze a workable project design based on an interior mole concept and (b) provide the USFWS with the results for evaluation prior to preparation and submission of a final FWCA report for inclusion into the FSEIS. The Corps instead responded by analyzing Alternative 6 as originally presented, and by incorporating the test results in the FSEIS. This action by the Corps has left unresolved the issue of avoidance of adverse project-related impacts to coral reef habitat at Ma'alaea.

Response. See response to comments nos. 16, 17, and 18 above. The FSEIS and DSIIEIS present reasonable alternatives to the proposed action.

Comment 48. The Corps' rejection of Alternative 6 as it was modeled is not consistent with the standards established by the Corps in the FSEIS for evaluation of alternatives. The Corps states (FSEIS at 1-2) that "Alternative 6 would not meet the purposes of the proposed action". According to the Corps wave response study, Alternative 6 was found to satisfy the Corps' criteria for providing the harbor with protection from the incident wind wave and swell climate. The Corps errs when it states in the FSEIS that Alternative 6 "would actually worsen existing navigation and safety conditions." In addition, the conceptual harbor configuration shown in the FSEIS indicates that, at a minimum, Alternative 6 would provide for a 30 percent increase in the number of existing berths. With further refinement, it is likely that an even greater increase in the number of berths could be realized. Consequently, the statement that Alternative 6 does not meet the purposes of the proposed action is incorrect.

Response. Alternative 6 would not meet all three of the purposes of the proposed action because it would fail to reduce navigation hazards in the entrance channel. See response to comment no.18 above.

Comment 49. The Plan 6 Wave Study states that Alternative 6 "can potentially lead to a significant increase in the amplitude of harbor oscillation. This information was used by the Corps to eliminate Alternative 6 from consideration, but no study of surge reduction was undertaken by the Corps for any of the alternatives under active consideration. The conclusions that Alternative 6 would cause harbor oscillations that could damage berthed vessels and that the preferred alternative would not cause harbor oscillations that could damage berthed vessels are not supported by the Corps own testing data. With the refinement of a design based on the concept underlying Alternative 6, it may be possible to reduce the potential for the development of harbor oscillations.

Response. See response to comment no. 20.

Comment 50. The Corps did not consider other means of achieving stated project goals. Such alternatives include development of multiple projects to satisfy the three project objectives. Specifically the Corps should evaluate the possibility of making internal harbor modifications to reduce the existing surge and navigation hazards, in conjunction with the development of an alternative project, possibly including dry storage of boats or landward expansion of harbor, to provide additional harbor capacity.

Response. These suggested alternatives are discussed in Section 4.3.1. Because no internal modification design could be found which would be acceptable with respect to navigational safety, that alternative in combination with other alternatives to provide additional harbor capacity, was not considered in detail.

Comment 51. The FSEIS fails to analyze the impacts of the increased boating activity that is expected to result from the expansion of the harbor. The FSEIS contains no analysis of impacts resulting from the increased use of the marine environment that will accompany harbor expansion, stating that "the increase in the number of fishing boats would likely lead to a small increase in fishing pressure on the commercially important species, including the bottom fishery. The exact incremental increase is unknown, but is expected to be small." The FSEIS offers no data to support this conclusion. It fails to perform even a basic analysis of the fishing areas used by existing slip-holders at Ma'alaea and their capacity to support additional use.

Response. The DSIIEIS in Section 3.12.3, 3.12.4, 4.5.1, 4.5.2, 5.8, 5.10.2, 5.11, and 5.19 provide information on the impacts of the increased boating activity that is expected to result from the expansion of the harbor. Sections 5.10.2 and 5.11, as well as the Updated Economic Analysis in Appendix A, provide information on the number of new fishermen that would be operating out of Ma'alaea Harbor, as well as an analysis of the effect on the fishery catch statewide and in Maui, and the effects on fishing areas.

Comment 52. The FSEIS offers no breakdown of the percentages of slips at the expanded harbor that will be allocated to commercial fishing or charter vessels, or how large such vessels will be. The FSEIS does not provide evidence that those vessels on the waiting list for new slips in the expanded harbor are in fact currently in regular use and are exploiting the same resources now that they will be if berthed at Ma'alaea. If it is true that many of the vessels that seek berths at Ma'alaea are currently trailered and regularly used, there would appear to be no need for expansion of the number of slips at Ma'alaea.

__Response.__ Sections 5.10.2 and 5.11 and the Updated Economic Analysis in Appendix A provide the breakdown of the number of slips that would be allocated to various uses, as well as the number of those that are currently operating out of the harbor and how many new commercial fishing operations are expected. The list of over 200 on the waiting list for berths is sufficient information to support the need for additional berthing capacity.

__Comment 53.__ The FSEIS dismisses impacts to Molokini Atoll Marine Life Conservation District with the statement that the State Department of Land and Natural Resources intends to limit the number of commercial permits at Ma'alaea, and will develop regulations for the use of Molokini. No evaluation is presented of the likelihood of such action being taken, however, nor of the effectiveness of such measures, despite the requirement that EIS's indicate the likelihood that mitigation measures will be adopted or enforced. Finally, no consideration is given to the fact that marine resources in areas other Molokini Atoll may be impacted as a result of increased boating activity at Ma'alaea.

__Response.__ Since the statements that the State Department of Land and Natural Resources intends to limit the number of commercial permits and will develop regulations for the use of Molokini are not mitigation measures, there is no requirement to evaluate the likelihood that those measures will be adopted or enforced. However, since Hawaii Administrative Rules have in fact been adopted to establish boundaries for the District, identify prohibited activities, and provide for permits for prohibited activities under certain contains, as well as establishing penalties for noncompliance, this *reasonably foreseeable future action* as identified in the FSEIS did occur. Effects to Molokini Conservation District are further discussed in the DSIIEIS in sections 3.14, 5.11, and 5.13.

__Comment 54.__ The FSEIS mischaracterizes conclusions presented in the National Marine Fisheries Service Biological Opinion when it states "According to the Biological Opinion from the National Marine Fisheries Service (NMFS) issued on 25 April 1990, the project is expected to have an adverse effect on the endangered humpback whale in Hawaii, but with mitigation will have less adverse effect than the present situation." The Biological Opinion states "the increased vessel activity associated with the expansion and operation of the proposed small boat harbor at Ma'alaea, Maui, may adversely affect humpback whales in Hawaiian waters. This determination is based on the likelihood of displacing humpback whales from a portion of cow/calf habitat and subsequently impeding recovery of the North Pacific Population as a result of potentially lowered recruitment. While the exact proportion of impact attributable to the expansion cannot be estimated, it is additive to the increasing level of vessel traffic in west Maui waters." Thus NMFS has taken the position that harbor expansion will worsen the present situation with respect to boat and whale interaction, and will consequently adversely affect the endangered humpback whale population. As a consequence, the FSEIS must further assess impacts on humpback whales resulting from expansion of the harbor.

Response. Although the Biological Opinion does contain the language you quote, it also states that the proposed activities are not likely to jeopardize the continued existence of humpback whales or green sea turtles in Hawaiian waters. Increased vessel activity associated with the expansion and operation of the harbor may adversely affect humpback whales, based on the likelihood of displacing whales from a portion of the cow/calf habitat. Despite the potential for adding vessel traffic, the benefits of consolidating vessel activity in existing facilities and preserving nearshore cow/calf habitat in other areas of west Maui outweigh the possible adverse effects of displacement of humpback whales. NMFS also stated that adverse impacts to whales from vessel traffic will be reduced compared to impacts from expected increases in vessel traffic without the project. Therefore, the long-term overall net effect on the humpback whale population, particularly with the implementation of measures to protect it during construction, would be beneficial. Sections 5.8.3 and 5.19 of the DSIIEIS provide a discussion of effects on endangered species.

The reasonable and prudent alternatives and conservation measures identified in the Biological Opinion will be implemented in conjunction with any project construction. The likelihood of those measures being accomplished is excellent, since the Corps, NMFS, and the State will be monitoring the construction activities. In addition, the Corps and DBOR decisionmakers do not intend to violate the Endangered Species Act. This statement constitutes the EIS's evaluation of the likelihood that these measures will be implemented.

Comment 55. The FSEIS states that there may be some increase in boat/green turtle contact, and reduction of turtle foraging and nesting habitat, but that this is not expected to cause any adverse impact to the turtle population of Ma'alaea Bay. This statement does not accurately reflect the NMFS Biological Opinion, which states that green turtles may be adversely affected by harassment and displacement as a result of added vessel traffic associated with the expansion. NMFS stated that an adverse impact to green turtles in the project vicinity may occur and such impact must be fully analyzed in the EIS. In addition, the likelihood that the green turtle population of Ma'alaea Bay may be jeopardized should be fully analyzed.

Response. The Corps has adopted NMFS Biological Opinion as its evaluation of impacts to endangered species. That document was included in the FSEIS, which is incorporated into this DSIIEIS. The impacts to such species have been fully analyzed.

Comment 56. The FSEIS states that no effects are expected on endangered hawksbill turtles. More recent information is available, however, which the Corps is obligated to consider in the FSEIS. According to information obtained from NMFS, two hawksbills were observed nesting at Ma'alaea in the summer of 1993, one of which was killed after being hit by a car. The total nesting population in Hawaii in 1993 was 24 turtles, meaning that the two at Ma'alaea represented some 8 percent of that year's known nesting population. Observations during the 1994 nesting season have recorded only 3 nesting females statewide, confirming prior indications that hawksbill nesting in Hawaii may be cyclical, with turtles nesting once every 2 years. This information implies that the total female nesting population may consist of as few as 25 individuals. Taken in this light, the record of two nesting attempts at Ma'alaea Bay in 1993 is extremely significant and must be analyzed in a revised EIS.

Response. Subsequent to NMFS 1990 Biological Opinion, information came to light that an endangered hawksbill turtle nested in Ma'alaea Bay. Nesting on the beach fronting Kealia Pond National Wildlife Refuge was confirmed. In 1993, HED determined that the proposed project was not likely to affect the hawksbill turtle. FWS concurred in 1994. In 1995 NMFS stated that at least one or two hawksbill turtles may be present in Ma'alaea Bay during the nesting season and that adverse effects from construction could occur, including disturbance, injury and mortality from blasting. A revised Incidental Take Statement was provided to supplement the 1990 Biological Opinion to include the hawksbill turtle. Measures identified in the Incidental Take Statement to reduce the potential for injury and mortality to turtles will be implemented, as required by law. Section 5.8.3 discusses impacts to federally listed species and consultation with NMFS and FWS. The proposed project complies with the Endangered Species Act.

Comment 57. In a Biological Reconnaissance Report issued in 1979, the USFWS recommended that the Corps consider modifying the existing harbor channel entrance rather than cutting a new channel. The report also recommended that measures to reduce sedimentation of harbor waters from stormwater drainage be included in the proposed project design. The latter concern was reiterated in both a preliminary FWCA report issued in February 1980 and in a final FWCA report released in June 1980. In its most recent draft FWCA report, the Service recommended that the Corps develop measures to protect the quality of water in Ma'alaea Harbor from project-related impacts and incorporate these measures as part of the proposed project. Despite this recommendation by the USFWS that the Corps develop measures to protect the quality of water within Ma'alaea from project-related impacts, the Corps' Public Notice for Ma'alaea Harbor states explicitly that "turbidity within the harbor will not be controlled during construction." The Corps does not fully evaluate impacts to water quality, but instead identifies the existing storm water drainage ditches as the primary cause of sedimentation and high turbidity levels.

Response. The most recent FWCA report (at that time, the draft) was used as the FWS recommendations. As you stated, in that report the Service recommended that the Corps develop measures to protect the quality of water in Ma'alaea Harbor *from project-related impacts* and incorporate these measures as part of the proposed project. The existing sediment input from the stormwater discharge IS the primary cause of sedimentation and high turbidity levels. Water quality impacts are discussed in detail, including direct, indirect, and cumulative impacts, in Sections 3. 6, 5.4, 5.5, and 5.19. Section 5.18.2 lists numerous measures that would be implemented to protect the water quality of the harbor and bay *from project-related impacts.*

Comment 58. The impacts of anticipated increases in sediment loads coming into the harbor, in combination with the increases in boat traffic and potential changes in harbor flushing characteristics, must all be fully analyzed in a revised EIS.

Response. Sediment loads coming into the harbor are expected to decrease in the future, not increase. Sections 3.6, 5.4, 5.5, and 5.19 discuss future sediment loading, impacts due to the increases in boat traffic and changes in harbor flushing characteristics with respect to water quality. In addition, Appendix H of the DSIIEIS contains a preliminary evaluation pursuant to 40 CFR 230, Guidelines for the Specification of Disposal Sites for Dredged or Fill Material (404(b)(1) Evaluation), which is incorporated into the DSIIEIS and which contains further details regarding water quality impacts.

Comment 59. The proposed alternative would permanently and irrevocably destroy or impair three unique surf sites and this impact must be more fully considered than it has been in the current FSEIS.

Response. The proposed project would result in the loss of one surf site. Impacts to the other two surf sites have been avoided through design modifications. See Sections 4.4.2.1 and 5.10.1 of the DSIIEIS .

Comment 60. The Section 404 Evaluation states that the disposal operation is not expected to violate the Toxic Effluent Standards of Section 307 of the Clean Water Act. However, no data on the toxicity of harbor sediments, which will be dredged and used as fill, are included in the FSEIS.

Response. See Sections 3.6, 4.4.2.3, and 5.4 for the results of the bottom sediment analysis completed in 1996. The laboratory results of the analyses are presented in Appendix B of the DSIIEIS. None of the substances tested were above allowable limits, and most were below the detection limits.

KEY TO COMMENT LETTERS/RESPONSES

U. S. Department
of Transportation

United States
Coast Guard

Officer In Charge
U.S. Coast Guard
Station Maui

Maalaea Harbor
Maui, HI. 96793
808 244 7235

11460
13 SEP 94

District Engineer (CEPOD-ED-PV)
US Army Corps of Engineers
Attn: W.B. Lennan
Building 230
Ft. Shafter, Hi. 96858-5440

Gentlemen:

Subj: ENVIRONMENTAL IMPACT FOR MAALAEA HARBOR, CW94-0003

Extensive review of the Final Supplemental Environmental Impact Statement for Maalaea Harbor and Public Notice No. CW94-0003 has not addressed the impact to U.S. Coast Guard Station Maui's search and rescue missions.

The impact during the dredging of Maalaea harbor will increase the response time to distress vessels and personnel. The difference between minutes could mean life or death.

The impact during the reconstruction of the existing boat ramp, if it is closed off completely. Would increase the response time of the units vessels by 15 to 20 minutes, if they were to be launched at the Kihei boat ramp or 25 to 30 minutes at Mala Wharf in Lahaina. This would not include any additional time to transit to the distressed vessels location.

If you have any questions please call 808/244-7235.

M.P. LEAVITT

Copy: Group Operations Officer

A

United States Department of the Interior

OFFICE OF THE SECRETARY
Washington, D.C. 20240

NOV 15 1994

ER 92/1122

Lieutenant Colonel M. Bruce Elliott
District Engineer
U.S. Army Corps of Engineers District, Honolulu
Attn: CEPOD-ED-6D-PV/Lennan
Building 230
Fort Shafter, Hawaii 96858-5440

Dear Lieutenant Colonel Elliott:

The U.S. Department of the Interior (Department) has reviewed the July 1994 Final Supplemental Environmental Impact Statement (FSEIS) for Ha'alaea Harbor for Light-Draft Vessels, Maui, Hawaii. The following comments are provided for your consideration when preparing the Supplemental Record of Decision (SROD).

GENERAL COMMENTS

The preferred alternative plan presented in the FSEIS differs from the one contained in the Draft Supplemental Environmental Impact Statement (DSEIS). The principal differences are: (a) the widening of the existing south revetted mole has been "substantially reduced", (b) the amount of dredged material has been reduced from 44,000 cubic yards (yds^3) to 27,000 yds^3, and (c) the destruction of coral-reef habitat off the end of the east breakwater has been reduced from 2.6 acres (ac) to 2 ac. However, we are unable to evaluate the revised alternative plan because pertinent information on the areas and amounts of the proposed project-related dredging and filling is missing, inconsistent, and conflicting.

In addition, the FSEIS was issued before submission of the Fish and Wildlife Service's (FWS) Final Fish and Wildlife Coordination Act (FWCA) report. The Department, Environmental Protection Agency, and our FWS all recommended the Final FWCA report be included. In the Draft FWCA report, our FWS identified Alternative 6 as the least damaging alternative plan to Federal trust species. Implementing Alternative 6 would involve construction of an internal mole, which would result in restricting direct dredge and fill impacts to within existing harbor boundaries. Alternative 6 conveys a concept rather than a specific detailed plan. As a result, FWS requested the Corps of Engineers (Corps) develop a workable project design based on the concept underlying Alternative 6 and provide the design to the FWS for evaluation prior to preparation and submission of a Final FWCA report. Instead, the Corps further analyzed Alternative 6 as presented in the DSEIS, and included the test results in the FSEIS. Our FWS should have been given an opportunity to complete the Final FWCA report prior to Corps' issuance of the FSEIS. Thus, the issue of avoidance of adverse project-related impacts to coral-reef habitat at Ha'alaea Harbor remains unsettled.

B

SPECIFIC COMMENTS

Page 1-2, Chapter 1, Summary, 1.3, Issues Yet To Be Resolved The FSEIS incorrectly states that the Corps has responded to a request from FWS for "additional consideration of an alternative which would restrict all improvements within the existing harbor boundaries to avoid any impacts to the marine environment outside the harbor." The Corps responded by conducting "further study of Alternative 6." The FWS did not request further study of Alternative 6 in the July 1993 Draft FWCA report. They requested "that the Corps refine a workable design based on the concept underlying Alternative 6." Thus, our request remains unfulfilled. A response to FWS's request should be made the final documents.

The FSEIS states "Alternative 6 would not meet the purposes of the proposed action" as listed on page 2-1. However, Appendix G contains a report entitled "Wave Response of Proposed Improvement Plan 6 to the Small Boat Harbor at Ha'alaea, Maui, Hawaii" (Plan 6 Report), which states that "Plan 6 satisfies the (Corps') criteria for providing adequate protection in the channel and berthing areas...from incident wind wave and swell climate." Also, the conceptual harbor configuration shown in Figure 15 on page 3-18 indicates that at a minimum Alternative 6 would provide for a 30 percent increase in the number of existing berths. An even greater increase in the number of berths could be achieved by refinement of a design based on the concept underlying Alternative 6. Therefore, the information contained in the FSEIS supports the conclusion that Alternative 6 would meet the purposes of the proposed action. Because the interior mole concept would accomplish the stated project purposes while restricting direct project-related impacts from an area used by Federal trust species, this alternative should continue to be considered.

The FSEIS further states Alternative 6 "would actually worsen existing navigation and safety conditions." This statement is not supported by the test results. Test results presented in the Plan 6 Report indicate that wave heights in the entrance channel would be greater than 2 feet (ft) only 7.5 percent of the time per year and that wave heights in the berthing area would be greater than 1 foot only 1.9 percent of the time per year. These results are below the Corps' limiting criteria for the proposed harbor design improvements (Appendix G report entitled "Wave Response of Proposed Improvements to the Small Boat Harbor at Ha'alaea, Maui, Hawaii"). Refinement of a design based on the concept underlying Alternative 6 could achieve even better navigation and safety. Therefore, test results indicate the potential for a refined design based on the interior mole concept to improve navigation and berthing while preventing direct project-related impacts in an area currently used by Federal trust species.

Page 3-7, Chapter 3, Alternatives, 3.2.2, Federal Alternatives Considered in Detail The FSEIS states the preferred alternative "is similar to the selected plan identified in the 1980 GDM/FEIS." The dimensions of the south breakwater extension, entrance channel, turning basin, and access channel presented in the FSEIS are identical to those presented in the DSEIS. However, the FSEIS states that the south revetted mole "has been substantially reduced in area from the design in the 1980 selected plan," which was presented as the selected alternative in the DSEIS. The amount of this reduction is not identified in the FSEIS, but based on the figures depicting the project site that were included in the documents, we estimate the reduction to be approximately 0.8 ac of fill. Since the dimensions of the other project features have not changed, the FSEIS is unclear how the total dredge acreage increases from 5.3 ac in the DSEIS to 6.1 ac in the FSEIS (as stated on page 3-22). How the quantity of dredged material is reduced by 39 percent when the area of dredging was increased also should be clarified. It is similarly unclear how the loss of coral-reef habitat from entrance channel dredging off the end of the east breakwater was reduced 23 percent from 2.6 ac in the DSEIS to 2 ac in the FSEIS without reorienting the proposed new channel. Clear and consistent information on the proposed project needs to be presented in the final documents to evaluate project-related impacts to fish and wildlife resources.

Page 3-19, Chapter 3, Alternatives, 3.5, Alternatives Eliminated from Detailed Planning It is stated that "during south swell conditions an internal oscillation would develop in the harbor, causing damage to berthed vessels." However, according to the Plan 6 Report, increases in harbor oscillations are potential rather than definite. Also, the harbor oscillation test results appear to be inconclusive due to limitations inherent in the Harbor D model used for the test. Furthermore, other project alternatives, including Alternative 1 (Preferred Alternative), were not tested for harbor oscillations for comparison with Alternative 6. Therefore, test results do not support the following conclusions: (a) Alternative 6 would cause harbor oscillations that would damage berthed vessels and (b) the preferred alternative would not cause harbor oscillations that could damage berthed vessels. Development of harbor oscillations may possibly be reduced by refining a design based on the interior mole concept. This refined design would also prevent project-related impacts in areas currently used by Federal trust species.

The FSEIS states that "the flushing characteristics of the harbor under Alternative Plan 6 were the worst of those analyzed, increasing the flushing period from the present 2.9 days to an estimated 6.3 days." However, the Appendix B report entitled, "Numerical Hydrodynamic Modeling and Flushing Study at Ha'alaea Harbor, Maui, Hawaii" indicates that a period of less than 10 days should be considered acceptable flushing time for a harbor basin. The biological effects of slowing flushing time within acceptable limits at Ha'alaea Harbor are not addressed in the report or in the FSEIS. Therefore, the estimated flushing time for Alternative 6 does not support the conclusion that refinement of a design based on the interior mole concept, which would restrict direct project-related from coral reef habitat currently used by Federal trust species, should be rejected.

It is stated on page 5-18 that "the water quality of the harbor would continue to degrade as a result of increased inland development unrelated to the proposed project. The increased vessel traffic anticipated as a result of the harbor improvements would increase turbidity in the harbor, resulting in additional exceedances of water quality standards for turbidity." Therefore, no matter what alternative is implemented, water quality in the harbor is

expected to decrease as a result of increasing sedimentation. As stated in the FWS Draft FWCA report, the coral reef fronting the harbor is the habitat of major concern for the proposed project and the degraded, marine benthic habitats within the harbor are considered to be important but of lesser value. Given the chronic sediment conditions in the harbor and the significant value of marine resources in Ha'alaea Bay, the biological effects from the estimated flushing rate reduction should be investigated. The conclusion that adverse effects to fish and wildlife resources would be caused by the flushing rate reduction estimated for Alternative 6 is not supported by data given in the FSEIS. Therefore, it may be premature to use inadequate flushing as a reason to reject development of an alternative that would restrict direct project-related impacts from habitat currently used by Federal trust species.

SUMMARY COMMENTS

The latest proposed dredge and fill areas and amounts are not clearly presented in the FSEIS, and should be clarified in the final documents. The FWS's request for a workable design based on the concept underlying Alternative 6 is not accurately stated in the FSEIS. Thus, the Corps has not yet complied with our request for a refined design, and the issue of avoiding project-related impacts to coral-reef habitat at Ha'alaea remains unsettled. The Department recommends resolving this issue with FWS before issuing the SROD.

The FSEIS does not adequately address the concerns for protection of fish and wildlife trust resources that the Department previously presented. The FWS maintains the internal mole concept underlying Alternative 6 could be developed into a practical alternative that would be the least environmentally damaging among those under consideration to coral-reef habitat used by Federal trust species. This issue should be resolved prior to discussing potential project mitigation, and mitigation for unavoidable losses to fish and wildlife resources should be developed prior to the Corps' issuance of the Supplemental Record of Decision for the Ha'alaea Harbor project.

We appreciate the opportunity to provide these comments.

Sincerely,

Willie R. Taylor
Acting Director
Office of Environmental Policy
and Compliance

United States Department of the Interior

U.S. GEOLOGICAL SURVEY
WATER RESOURCES DIVISION
677 Ala Moana Blvd., Suite 415
Honolulu, Hawaii 96813

IN REPLY REFER TO:

August 29, 1994

District Engineer
U.S. Army Engineer District, Honolulu
Attention: EPOD-ED-PV/Lennan
Building 230
Fort Shafter, Hawaii 96858-5440

Dear Sir:

Enclosed is the joint Federal and State of Hawaii Final Supplemental Environmental Impact Statement for the Ma'alaea Harbor for Light-Draft Vessels which we were not allowed sufficient time to review.

Sincerely,

William Meyer

William Meyer
District Chief

Enclosure

C

OFFICE OF STATE PLANNING
Office of the Governor
MAILING ADDRESS P.O. BOX 3540, HONOLULU, HAWAII 96811-3540
STREET ADDRESS 250 SOUTH HOTEL STREET, 4TH FLOOR
TELEPHONE (808)587-2846, 587-2800
FAX Director's Office 587-2848
Planning Division 587-2824

Ref. No. C-888

October 14, 1994

Mr. Ray H. Jyo, P.E.
Director of Engineering
Department of the Army
U.S. Army Engineer District, Honolulu
Building 230
Ft. Shafter, Hawaii 96858-5440

Dear Mr. Jyo:

Subject: Hawaii Coastal Zone Management (CZM) Program Federal Consistency for Improvements to the Maalaea Harbor, Maui

The proposed improvements to the Maalaea Harbor, consisting of realigning the entrance channel and modifying the existing breakwater, were reviewed for consistency with Hawaii's CZM Program. We do not concur with the CZM assessment and finding that the activity is consistent to the maximum extent practicable. The proposal, which includes the preferred Alternative Plan 1 and three other alternative plans, is not consistent with the objectives and policies of the Hawaii CZM Program and the Hawaii CZM Law, Chapter 205A, Hawaii Revised Statutes. Although we have no objections to constructing improvements to the Maalaea Harbor, we have specific concerns about impacts to recreational resources and coastal ecosystems as explained below.

Conflicts with CZM Recreational Resources Policies

It is a CZM policy to protect public recreational opportunities. This includes managing coastal uses to ensure that public use and enjoyment of coastal areas are not precluded or disrupted.

D

The harbor improvements proposed in Alternative Plans 1 through 4 will destroy at least one popular surf site (Off-the-Wall) and reduce the quality of waves at a second surf site (Buzz's No. 2), and eliminate a sandy beach within the harbor. The Hawaii CZM Law requires the replacement of coastal resources having significant recreational value, including surfing sites and sandy beaches, when such resources will be unavoidably damaged by development. The proposal does not include replacing the recreational resources which would be destroyed. We conclude that the proposed improvements directly conflict with CZM recreational resource policies. A finding that the project is inconsistent with CZM recreational resource policy was stated in the Final Supplemental Environmental Impact Statement (SEIS) for the project (July 1994, p 5-16).

Conflicts with CZM Coastal Ecosystems Policies

It is a CZM policy to preserve valuable coastal ecosystems of significant or economic importance. Maalaea Bay is rich in biological resources such as the endangered humpback whale, the threatened green sea turtle, high water quality and diverse marine ecosystems comprising of coral reefs, fishes and limu (algae) beds. These resources are also economically important to both the County of Maui and the State.

The harbor improvements will destroy up to 13.0 acres of aquatic habitat and associated biological community (SEIS, p. 5-5). According to the U.S. Fish and Wildlife Service (FWS) report dated July 1993, the aquatic habitat to be destroyed or affected is a significant marine ecosystem of coral reef, diverse marine fauna and algae. The FWS also identified the affected area as an important resting and feeding habitat for the threatened green sea turtle.

We are concerned that the harbor improvements will increase boating activity in Maalaea Bay which is identified as a major humpback whale nursery area in the U.S. National Marine Fisheries Service (NMFS) "Endangered Species Act Section 7 Consultation Biological Opinion (July 23, 1990, p. 3). The NMFS biological opinion (p. 8) concludes that, "the increased vessel activity associated with the expansion and operation of the proposed small boat harbor at Maalaea, Maui, may adversely affect humpback whales in Hawaiian waters." This potential for the project to adversely affect the endangered humpback whale is a direct conflict with CZM coastal ecosystems policies.

Water quality degradation is anticipated from construction activities and the increased boating activity. According to the SEIS (p. 5-18), "the increased vessel traffic anticipated as a result of the harbor improvements would increase turbidity in the harbor, resulting in additional exceedences of water quality standards for turbidity." A CZM coastal ecosystems policy is to prohibit land and water uses which violate state water quality standards. In addition, we find it unacceptable that turbidity within the harbor will not be controlled during construction, according to the SEIS (p. 5-19).

CZM Consistency Objection

For the reasons cited above, Hawaii CZM Federal consistency is denied for the Maalaea Harbor improvements as proposed. However, the proposal can be brought into compliance with Hawaii's CZM Program through one of the following options.

1. Select an alternative design which will not destroy or affect any surf sites or sandy beaches, and will have negligible impacts on marine resources. The Alternative Plan 6, which was eliminated from consideration because it did not meet the project objectives, or other plans which would not destroy surf sites or substantially degrade marine resources will be considered for CZM consistency. Such alternative plans may be submitted for CZM consistency review and must be accompanied with information confirming that surf sites and sandy beaches will not be degraded or destroyed, and that impacts on marine resources will be negligible.

2. Provide replacement surf sites of equal quality to the existing sites, replace the sand beach and mitigate all impacts to marine resources so that net effect of the project is negligible.

3. Provide the needed berthing spaces at other sites where significant coastal ecosystems and recreational resources would not be destroyed or degraded.

4. The options above, may be combined to meet the project objectives.

The project may be resubmitted for CZM consistency review as long as the proposal is similar to, or meets the intent of the four options discussed above. We

are available to assist in developing a proposal that complies with Hawaii's CZM Program.

You have the right to appeal this CZM Federal consistency objection with the Secretary of Commerce, U.S. Department of Commerce, on the grounds described in the Code of Federal Regulations at 15 CFR 930(H).

We appreciate your cooperation in complying with Hawaii's CZM Program. If you have any questions, please call John Nakagawa of our CZM office at 587-2878.

Sincerely,

Norma Wong

Norma Wong
Director

cc: Administrator, NOAA, U.S. Department of Commerce
Office of Ocean and Coastal Resource Management
U.S. National Marine Fisheries Service, Pacific Area Office
U.S. Fish and Wildlife Service, Pacific Islands Office
Department of Health, Clean Water Branch
Department of Land & Natural Resources, OCEA & DOBOR
Planning Department, County of Maui

UFFICE OF STATE PLANNING
Office of the Governor
MAILING ADDRESS P.O. BOX 3540 HONOLULU, HAWAII 96811-3540
STREET ADDRESS 250 SOUTH HOTEL STREET, 4TH FLOOR
TELEPHONE (808)587-2846 587-2800

Ref. No. C-912

November 4, 1994

Mr. Ray H. Jyo, P.E.
Director of Engineering
Department of the Army
U.S. Army Engineer District, Honolulu
Building 230
Ft. Shafter, Hawaii 96858-5440

Dear Mr. Jyo:

Subject: Hawaii Coastal Zone Management (CZM) Program Federal Consistency for Improvements to the Maalaea Harbor, Maui

The Office of Ocean and Coastal Resource Management (OCRM), NOAA, informed us on October 28, 1994, of an error in our CZM consistency objection letter dated October 14, 1994. We mistakenly informed you that our CZM consistency decision could be appealed to the Secretary of Commerce in accordance with 15 CFR 930(H). Appeals to the Secretary do not apply to direct Federal activities. However, Secretarial mediation, provided in 15 CFR 930(G), is available for Federal activities as authorized in 15 CFR 930.43.

We also want to clarify that the specific CZM policies which are the basis for our CZM consistency objection are enforceable policies of the Hawaii CZM Law, Chapter 205A, Hawaii Revised Statutes (HRS), and the Federally approved Hawaii CZM Program. Our CZM consistency objection was based on the project's conflicts with CZM policies which were stated in our letter dated October 14, 1994. As recommended by the OCRM, we are providing the statutory citations below for the applicable CZM policies. The following citations are meant to supplement the findings discussed in our CZM consistency objection.

Conflicts with CZM Recreational Resources Policies

The project is in conflict with the following CZM recreational resources policies.

Section 205A-2(c)(1)(B), HRS. Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by:

(ii) Requiring replacement of coastal resources having significant recreational value, including but not limited to surfing sites, fishponds, and sand beaches, when such resources will be unavoidably damaged by development; or requiring reasonable monetary compensation to the State for recreation when replacement is not feasible or desirable;

(iii) Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value;

(v) Ensuring public recreational use of county, state, and federally owned or controlled shoreline lands and waters having recreational value consistent with public safety standards and conservation of natural resources; and

(vi) Adopting water quality standards and regulating point and nonpoint sources of pollution to protect, and where feasible, restore the recreational value of coastal waters.

Conflicts with CZM Coastal Ecosystems Policies

The project is in conflict with the following CZM coastal ecosystems policies.

Section 205A-2(c)(4)(B), HRS. Preserve valuable coastal ecosystems, including reefs, of significant biological or economic importance;

(C) Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses, recognizing competing water needs; and

Mr. Ray H. Jyo, P.E.
Page 3
November 4, 1994

(D) Promote water quantity and quality planning and management practices which reflect the tolerance of fresh water and marine ecosystems and prohibit land and water uses which violate state water quality standards.

Conflicts with CZM Economic Uses Policies

In addition to the above policies, we also find that the project proposal conflicts with the following CZM economic uses policy due to the potential adverse social and environmental impacts of the project proposal in the CZM area. The social impacts are due to the losses of surf sites, the sandy beach, limu gathering opportunities, and marine resources. The environmental impacts were described in the CZM consistency objection in the coastal ecosystems discussion.

Section 205A-2(5)(B), HRS. Ensure that coastal dependent development such as harbors and ports, and coastal related development such as visitor industry facilities and energy generating facilities, are located, designed, and constructed to minimize adverse social, visual, and environmental impacts in the coastal zone management area.

As stated in our October 14, 1994, letter we are not opposed to constructing improvements to Maalaea Harbor as long as CZM impacts are eliminated or minimized. If you have any questions, please call John Nakagawa of our CZM office at 587-2878.

Sincerely,

Norma Wong

Norma Wong
Director

cc: Administrator, NOAA, U.S. Department of Commerce
Office of Ocean and Coastal Resource Management, NOAA

MAJOR GENERAL EDWARD V. RICHARDSON

ROY C. PRICE SR.

STATE OF HAWAII
DEPARTMENT OF DEFENSE
OFFICE OF THE DIRECTOR OF CIVIL DEFENSE
3949 DIAMOND HEAD ROAD
HONOLULU, HAWAII 96816-4495

October 11, 1994

Mr. Ray H. Jyo, P.E.
Director of Engineering
Department of the Army
U.S. Army Engineer District, Honolulu
Fort Shafter, Hawaii 96858-5440

Mr. Ray H. Jyo, P.E.
October 11, 1994
Page 2

If you have any further questions, please call Mr. Mel Nishihara of my staff at 734-2161.

Sincerely,

ROY C. PRICE, SR.
Vice Director of Civil Defense

JOHN WAIHEE
GOVERNOR OF HAWAII

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

PETER A. SYBINSKY, Ph.D.
[redacted]
DIRECTOR OF HEALTH

In reply, please refer to:

September 30,1994

92-429/epo

Mr. Ray A. Jyo, P.E.
Director of Engineering
U.S. Army Engineer District, Honolulu
Ft. Shafter, Hawaii 96858-5440

Dear Mr. Jyo:

Subject: Final Supplemental Environmental Impact Statement
Ma'alaea Harbor for Light Draft Vessels
Maui, Hawaii
TMK: 3-6-01, 34, 43, 49, 50 and 3-8-14, 28, 31

Wastewater Concerns

We appreciate the intent to upgrade the sewage treatment facilities at Ma'alaea Harbor and to add pump-out facilities. However, such efforts may not be sufficient to address our concerns regarding the pollution and water quality of the harbor and surrounding area. A comprehensive master plan to collect, treat and dispose of wastewater needs to be developed.

All wastewater plans must conform to applicable provisions of the Department of Health's Administrative Rules, Chapter 11-62, "Wastewater System." We reserve the right to review these detailed wastewater plans for conformance to applicable rules.

Should you have any questions, please contact Ms. Lori Kajiwara of the Wastewater Branch at 586-4290.

Sincerely,

Bruce S. Anderson for

Peter A. Sybinsky, Ph.D.
Director of Health

c: WWB

G

LINDA CROCKETT LINGLE
Mayor
TELEPHONE 243-7855

OFFICE OF THE MAYOR
COUNTY OF MAUI
WAILUKU, MAUI, HAWAII 96793

September 12, 1994

Commander
U.S. Army Engineer District, Honolulu
Building T-1
Fort Shafter, Hawaii 96825-5440

ATTENTION: CEPOD-ED-PV (Lennan)

Dear Mr. Lennan:

RE. Supplemental Environmental Impact Statement for Maalaea Harbor for Light-Draft Vessels, Maui, Hawaii

Thank you for the opportunity to review the Supplemental Environmental Impact Statement for Maalaea Harbor. As noted in the prior comments of the Planning Department, dated January 14, 1993, concerns were identified in areas such as surfing impacts, auxiliary impacts, growth, and traffic. We also noted that the areas mauka of the shoreline fall in the County's jurisdiction under CZM Regulations. Because of this, the State will have to apply for a Special Management Area permit for the areas so affected.

We also note that this project provides for the creation of approximately 100 new recreational berths. It has been our experience that under present regulations, berths are often transferred between owners by allowing the transfer of ownership of vessels with berths. We feel that the State should address this issue as part of their process of expanding the number of available berths.

We look forward to the Corps of Engineers' and the State of Hawaii's responses to these and related issues during the Special Management Area permit application process.

Sincerely,

LINDA CROCKETT LINGLE
Mayor, County of Maui

J

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
AND WASTE MANAGEMENT
LAND USE AND CODES ADMINISTRATION
250 SOUTH HIGH STREET
WAILUKU, MAUI, HAWAII 96793

September 19, 1994

Mr. Ray Jyo
Dept. of the Army
U.S. Army Engineer District, Honolulu
Fort Shafter, Hawaii 96858-5440

SUBJECT: Final Supplemental Environmental Impact Statement (FSEIS)
MAALAEA HARBOR FOR LIGHT-DRAFT VESSELS

Dear Mr. Jyo:

We reviewed the subject FSEIS and have the following comments:

1. Comments from the Engineering Division:

This division has reviewed this submittal and has no comments at this time.

2. Comments from the Wastewater Reclamation Division:

This division has reviewed this submittal and has no comments at this time.

3. Comments from the Solid Waste Division:

a. Alternative means of disposal of dredged material and rock shall be utilized other than disposed of at the County landfills.

The applicant is requested to contact the Solid Waste Division at 243-7875 for additional information.

4. Comments from the Land Use and Codes Administration:

This division has reviewed this submittal and has no comments at this time.

Very truly yours,

George N. Kaya

GEORGE N. KAYA
Public Works & Waste Management
Director

K

BOARD OF WATER SUPPLY
COUNTY OF MAUI
P.O. BOX 1109
WAILUKU, MAUI, HAWAII 96783-7109

October 3, 1994

Mr. Ray H. Jyo, P.E., Director of Engineering
Department of the Army
U.S. Army Engineer District, Honolulu
Ft. Shafter, Hawaii 96858-5440

Dear Mr. Jyo,

Re: Proposed harbor for light-draft vessels at Maalaea, Maui; Comments on Final Supplemental Environmental Impact Statement dated July 1994

Enclosed with the copy of the proposed final SEIS were responses from your office to comments we made in our letter dated February 11, 1994. Copies of the subject letter and your response letter are attached.

We have reviewed the proposed final SEIS and continue to see no reference to land-based infrastructure and water consumption impacts. Our review included Chapters 4 and 5 as directed by your office and a search through other sections of the document. We see a discussion of ocean water quality only. No description and analysis of potable water consumption and impacts is made. Therefore, we do not concur with your response statement which asserts that water consumption is addressed in the final SEIS.

We maintain that water consumption and growth, being fundamental infrastructure components, should be addressed in the final document. Historical and anecdotal information on growth trends in coastal South Maui are available through the Maui Planning Department. In addition, water consumptive trends are found in the Maui County Water Use and Development Plan along with a discussion of trends in South Maui in particular. You can also contact the Board's Water Resource Division at ph:243-7835 for reference to further information.

Sincerely,

David R. Craddick, Director

ELK:
c: DOT-Harbors Division
DLNR-Boating & Ocean Rec.
DLNR-Office of Conservation and Environmental Affairs
Maui Planning Department

"By Water All Things Find Life"

L

C-30

DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
P.O. BOX 1109
WAILUKU, MAUI, HAWAII 96783-7109

February 11, 1993

U.S. Army Engineer District, Honolulu
Attn: CEPOD-ED-PV/Lennan
Building T-1
Fort Shafter, Hawaii 96825-5440

Re: Supplemental Environmental Impact Statement for Maalaea Harbor for Light-Draft Vessels; Maui, Hawaii

Dear Mr. Lennan,

The Supplemental Environmental Impact Statement does not address water consumption, or other issues pertaining to water infrastructure. The increase in harbor utilization will generate both primary and secondary increases in water consumption. These impacts should be addressed. If these items were addressed in the 1980 or 1982 documents, such analysis is likely outdated.

The applicant should be made aware that water for construction & other uses, both for land based portions of this project and land based improvements related to this project, may not be available until new sources have been developed to service the area. The project may require substantial system improvements.

Drought & salt tolerant plants should be utilized in landscaped portions of this project.

Sincerely,

for David Craddick
Director

elk

"By Water All Things Find Life"

REPLY TO ATTENTION OF

1 5 AUG 1994

Planning Division

Mr. David Craddick, Director
Department of Water Supply
County of Maui
P.O. Box 1109
Wailuku, Hawaii 96793-7109

Dear Mr. Craddick:

Thank you for your letter of comment dated February 11, 1993 on the draft Supplemental Environmental Impact Statement (SEIS) for Ma'alaea Harbor for Light-draft Vessels, Maui, Hawaii. Your comments were considered during selection of the preferred alternative, and your comments and this response are reproduced in Appendix C of the final SEIS. The responses below follow the order of your comments.

a. Thank you for pointing out our failure to address water consumption in the draft SEIS. The issue is addressed in Chapters 4 and 5 of the final SEIS.

b. As you suggested, drought and salt tolerant plants will likely be used in landscaped portions of this project. Every effort will be made to use native Hawaiian plants.

Sincerely,

Ray H. Jyo, P.E.
Director of Engineering

PARKS AND RECREATION
COUNTY OF MAUI

1580 KAAHUMANU AVENUE, WAILUKU, HAWAII 96793

Mayor
CHARMAINE TAVARES
Director
MIKE DAVIS
Deputy Director

(808) 243-7230

October 11, 1994

Mr. Ray H. Jyo, P.E.
Director of Engineering
Department of the Army
U.S. Army Engineer District, Honolulu
Fort Shafter, Hawaii 96858-5440

Subject: Ma'alaea Harbor Improvements

Dear Mr. Jyo:

We have reviewed the subject Federal and State Final Supplemental Environmental Impact Statement (FSEIS) and have no comments to offer at this time.

Thank you for allowing us to comment on the FSEIS. We are returning the project's documents for your disposition.

Sincerely,

Charmaine Tavares

CHARMAINE TAVARES
Director

CT/rt

Enclosure

M

SIERRA CLUB LEGAL DEFENSE FUND, INC.

The Law Firm for the Environmental Movement

223 South King Street, 4th Fl., Honolulu, HI 96813 (808) 599-2436 Fax (808) 521-6841

November 9, 1994

M. Bruce Elliot
Lieutenant Colonel, U.S. Army
District Engineer (CEPOD-ED-PV)
Building 230
Ft. Shafter, HI 96858-5440

Re: Ma'alaea Harbor, Maui - Reinitiation of Consultation With National Marine Fisheries Service Concerning <u>Endangered Hawksbill Turtles</u>

Dear Colonel Elliot:

On behalf of the Protect Ma'alaea Coalition, Save Our Surf and Life of the Land, we are hereby notifying the U.S. Army Corps of Engineers ("Corps"), as the federal proponent of the proposed expansion of Ma'alaea Harbor, of the Corps' duty to reinitiate formal consultation with the National Marine Fisheries Service ("NMFS") as a result of new information that has become available concerning the use by the endangered hawksbill turtle of the beaches near Ma'alaea for nesting.

The only analysis of the impact of the project on hawksbill turtles contained in the Final Supplementary Environmental Impact Statement ("FSEIS") is contained in NMFS' letter to the Corps dated February 25, 1993. The determination in that letter, that the project is not likely to adversely affect hawksbills, is based upon "the occurrence of a solitary hawksbill turtle (<u>Eretmochelys imbricata</u>) nest in Ma'alaea Bay [in 1991]." The letter points out that "[c]onsultation must be reinitiated if new information becomes available revealing effects of the project on listed species that were not previously considered." Such reinitiation is mandated by law. 50 C.F.R. § 402.16.

It has become clear that the extent of hawksbill use of the Ma'alaea area by nesting hawksbill turtles is not limited to a single incidence three years ago. In 1993, there were at least two confirmed hawksbill sightings, including at least one confirmed nesting, in the area. Very recently, there were at least two more confirmed sightings, and a report of an additional sighting very near the harbor. I enclose a copy of an article in the November 2, 1994 edition of The Maui News discussing the recent sightings.

N

According to the interim recovery plan for hawksbill turtles, the most important action recommended by NMFS for recovery of this endangered species is the elimination of adverse human induced habitat alteration, in order to maintain foraging and resting habitats and nesting beaches. NMFS' Endangered Species Act Biennial Report to Congress - Status of Recovery Programs 1992-1994 ("Biennial Report") identifies, as "Major Impacts" adversely affecting hawksbill recovery, propeller and collision injuries from recreational and other ship traffic, and destruction of coral reef habitat from sedimentation and siltation. Biennial Report, p.47.

The proposed expansion of Ma'alaea Harbor will, without question, increase vessel traffic in the vicinity of the hawksbills' nesting habitat. It is also clear that the proposed harbor expansion will destroy acres of coral reef, and that both the construction of improvements and the resulting increase in vessel traffic will cause an increase in siltation of other coral reef habitats.

In view of the potential for a severe and tragic impact on the small remaining population of hawksbills in the area posed by the proposed project, the Corp is required to reinitiate consultation with NMFS before proceeding any further with the proposed project.

Very truly yours,

Paul H. Achitoff

cc: Protect Ma'alaea Coalition
Save Our Surf
Life of the Land
Keith Ahue
Deanna Wieman
David Parsons
George Balazs
Karen Evans
Norma Wong

...LUKU CHIROPRACTIC

Dr. Roy S. Genatt (Gen. Mgr.)
1129 Lower Main St. #103
Wailuku, Hawaii 96793
(808) 242-6826 • Fax (808) 242-1162

September 2, 1994

Us Army Corps of Engineers
Building 230
Ft Shafter, HI 96858-5440

Re: Public Notice No. CW-0003

To whom it may concern:

I am opposed to the new break water extension proposed for Haalaea harbor. This will destroy another surf site-the off wall surf site. It will also adversley effect a specialized reef species. Yes, I am a surfer and a professional licensed physician and if it means anything to anyone surf sites are like rare gems.They are the things dreams are made out of. Please help protect our surf sites, our reefs, our environment from future development.

Thank you for your time and attention.

Sincerely,

Roy S. Genatt DC

Roy S. Genatt, D.C.

RSG/po

Q

ISAAC DAVIS HALL
ATTORNEY AT LAW
2087 WELLS STREET
WAILUKU, MAUI, HAWAII 96793
(808) 244-9017
FAX (808) 244-6775

OF COUNSEL
G. RICHARD GESCH

September 27, 1994

District Engineer
U.S. Army Engineer District, Honolulu
Attention: CEPOD-ED-PV/Lennan
Building 230
Fort Shafter, Hawaii 96858-5440

Re: Final Joint Federal and State Supplemental Environmental Impact Statement for the Maalaea Harbor for Light-Draft Vessels

Dear District Engineer:

This letter is written on half of the Protect Maalaea Coalition. We have been informed that comments on the Final Supplemental EIS for the Maalaea Harbor for Light Draft Vessels may be submitted through October 2, 1994.

It is plain that this document fails to satisfy both state and federal requirements for an adequate EIS.

With regard to state requirements, (1) procedures for the preparation of an SEIS were not followed, (2) content requirements have not been satisfied and (3) comments received during the review process did not receive any responses, in some situations, and adequate responses, in others.

With regard to federal requirements, the document is also deficient in multiple fashions. These defects are set out in the comments which have been submitted on the SEIS as well as in several documents attached hereto, including the Petition to Intervene submitted on the CDUA application to subdivision submerged lands and the letter attached thereto from staff at the Sierra Club Legal Defense Fund, Inc.

The Corps has completely failed to analyze alternative locations as required by law. The best location for a harbor in the vicinity is the old pier by Suda Store. It has no waves, no surf and far less surge. It has no coral reef.

R

The SEIS must be redrafted. No implementing actions should be taken on the basis of this SEIS.

Thank you for the opportunity to comment on this matter.

Sincerely yours,

Isaac Hall

IH/jp
cc: Protect Maalaea Coalition
Encl.

PETITION FOR A CONTESTED CASE HEARING
EXHIBIT "A"
BOARD OF LAND AND NATURAL RESOURCES

1.2. Name: The Protect Maalaea Coalition is a Hawaii non-profit corporation whose members are surfers, condominium owners, native Hawaiians, environmentalists and members of the Maalaea Community Association whose purpose is to preserve the natural resources, to conserve the environment and beauty and to prevent the deterioration of Maalaea Bay and the surrounding area of Maui County, Hawaii.
Phone: c/o Isaac Hall (see below)
Address: c/o Isaac Hall (see below)

Name: Raymond J. Galli and Ada H. Galli
Phone: c/o Isaac Hall (see below)
Address: c/o Isaac Hall (see below)

Name: Nelson Edward Ion and Linda Rose Ion
Phone: c/o Isaac Hall (see below)
Address: c/o Isaac Hall (see below)

Name: Rodney Kilborn
Phone: c/o Isaac Hall (see below)
Address: c/o Isaac Hall (see below)

Name: Jamie Hunter
Phone: c/o Isaac Hall (see below)
Address: c/o Isaac Hall (see below)

3.4. Attorney (if any): Isaac Hall
Phone: 808-244-9017
Address: 2087 Wells St.
Wailuku, Maui, HI 96793

5. Subject matter: The Conservation District Use application ("CDUA") for the subdivision of submerged lands for Maalaea Small Boat Harbor, Wailuku, Maui; Docket No.: MA-2681.

6. Date of public hearing: March 10, 1994
Date of Board meeting: July 22, 1994, continued until September 23, 1994

7. Legal authority under which hearing, proceeding or action is being made:

HRS §§91, 171, 205, 205A, 343, the regulations adopted pursuant to these statutory provisions and Article XI §9 of the Hawaii State Constitution.

8. Nature of your specific legal interest in the above matter, including tax map key of property affected:

Four of the Petitioners, Raymond S. Galli, Ada H. Galli, Nelson Edward Ion and Linda Rose Ion, own real property which adjoins the proposed project. The Gallis own property which adjoins the state land used for the Maalaea Small Boat Harbor. They reside in a unit in the Maalaea Yacht Marina Condominium, TMK 3-8-14:24-HPR 559. They will be adversely affected by this project.

The Ions own property which adjoins the state land used for the Maalaea Small Boat Harbor. They reside in a unit in the Maalaea Yacht Marina Condominium, TMK 3-8-14:24-HPR 39. They will be adversely affected by this project.

Petitioners Rodney Kilborn and Jamie Hunter regularly surf at sites which will be destroyed if the project as a whole is implemented; namely "Off the Walls," "Buzzes," and the "Maalaea Pipeline." They and other surfers who are members of the Protect Maalaea Coalition will be adversely affected by this project because these three significant surf sites will be destroyed.

The Protect Maalaea Coalition and its members, seek to prevent the deterioration of Maalaea Bay. The Maalaea Bay and areas surrounding the Maalaea Small Boat Harbor are habitats not only for the endangered humpback whale but also for the endangered hawksbill turtle. Significant portions of a valuable reef system will be blasted and ruined by this project as a whole. The effects on the marine ecosystem will also be significant and adverse.

The Protect Maalaea Coalition and its members are also concerned about the traffic and sewage impacts of the project. The Level of Service for the Honoapiilani Highway is already at LOS F. The traffic demand created by this project, as a whole, along with the "Maalaea Triangle," will degrade that level further, creating public health and safety problems for Maui County's residents and petitioners.

The adverse impacts associated with more boats and boat traffic at Maalaea will also adversely affect members of the Protect Maalaea Coalition.

Petitioners have a legal interest in these proceedings through the environmental right of action provided in the Hawaii State Constitution. See Article XI, §9. The proposed application is not consistent and does not comply with the objectives of the conservation district; it is incompatible with the locality and surrounding areas; it does not preserve and improve upon the beauty and open space characteristics of the area and the proposed structures and activities do not harmonize with the physical and environmental conditions of the area.

9. <u>The specific disagreement, denial or grievance with the above matter:</u>

A. This CDUA application to subdivide state submerged lands in the conservation district, placing them within the jurisdiction of the Division of Boating and Ocean Recreation, is the first phase of a multi-phased project to expand the Maalaea Boat Harbor. Through the review of this phase of the project, the cumulative impacts of the project as a whole must be addressed.

B. BLNR should not have initiated the permitting process until the Supplemental Environmental Impact Statement ("SEIS") for the project as a whole had been prepared, circulated to the public, accepted by the governor and

a Record of Decision issued by the Army Corps of Engineers. This process has not been completed to date.

One important purpose of the mandatory environmental review process contained in HRS Chapter 343 is to assure that EISs are available, when required, for interested agency reviewers, interested public citizens and the decision-makers. The Office of Environmental Quality Control ("OEQC") has stated in its "Guidebook" on Chapter 343, on page 9, that

> Acceptance of an EIS is required before the proposed action or project can proceed to the permitting stage.

Here, the Board of Land and Natural Resources ("BLNR") permitted the filing of this application on November 8, 1993, agency review of the application, a public hearing to take place upon the application on March 10, 1994 before the environmental process had been completed. BLNR scheduled action on the application first on July 22, 1994 (a) before the Governor accepted the SEIS (on August 31, 1994) and (b) before the Army Corps issued a Record of Decision (terminating the federal process for the joint EIS). The deferral of decision cannot be issued before October 2, 1994.

Now that the SEIS is available, new agency review must take place, a new public hearing must be scheduled and, thereafter, action may be taken upon this application. Action on this application cannot be taken on September 23, 1994 because the SEIS was not available to agencies reviewing the CDUA application, was not available during the public hearing on March 10, 1994, and was not available to interested members of the public until this matter was first scheduled for action.

A petition to intervene must be requested, according to BLNR Rules, at the time of the public hearing (if a public hearing is required) or at the time of the meeting (if a public hearing is not required). Intervention which is requested thereafter may be granted if good cause is established. Here, a new public hearing should be scheduled and at that time a timely petition to intervene will be requested.

Even if a new public hearing is not scheduled, good cause exists for granting the petition to intervene which is now filed. The SEIS is the primary informational document which assesses the impacts of this project as a whole. The Protect Maalaea Coalition could not make an informed decision about whether intervention was necessary until this document was completed and made part of this CDUA application. Good cause exists for granting intervention now because the SEIS was not available at the time of the public hearing and was not available at the time of the first action meeting.

C. The SEIS is inadequate and cannot provide a basis for informed decision-making for reasons including, but not limited to, the following:

(1) The SEIS does not consider the impact of this project upon the endangered hawksbill turtle. The turtle is ignored because NOAA in a letter dated February 25, 1993 states that the nesting of a single turtle in1991 is insufficient to initiate consultation, but also states that consultation must be reinitiated if new information becomes available. New information became available through DLNR's own aquatic biologist, who observed two endangered hawksbill turtles nesting along the shoreline of Maalaea Bay east of the harbor in the summer of 1993. One pregnant turtle was run over by a car within one mile of the project. The other successfully nested. One half of the eggs were taken for hatching in captivity and the other half were left for natural hatching and eventually hatched out. Expert testimony will be provided during the contested case that the area immediately surrounding the Maalaea Small Boat Harbor is a significant habitat for hawksbill turtles and a biological opinion must be prepared before implementing this project. After sites in Kona and

perhaps Molokai, this Maalaea habitat is the second, or third, biggest habitat in the State for the hawksbill turtle.

(2) The wave data included within the SEIS is sketchy and based upon extrapolations from data collected elsewhere and applied inaccurately here. The effect of refraction of the Big Island and refraction and diffraction from Molokai are both ignored. Expert testimony will be presented during the contested case regarding the true wave patterns experienced in the Maalaea Small Boat Harbor vicinity.

(3) The "Wave Response to Proposed Improvements" of the Army Corps dated July, 1993 does not use the Corps' best computer program for determining swell direction as influenced by refraction and diffraction from Kahoolawe, Molokini, Hawaii and the southeast portion of Maui including Kihei and Makena. In fact it completely omits Molokini, Hawaii and Maui, and considers Kahoolawe to only a small degree. The Corps' May, 1994 analysis entitled "Harbor Response to Wind Waves and Swell" completely fails to consider the effect of the strong Northeast winds upon the Harbor which cause "convective overturning" of Harbor water, greatly increasing the Harbor's drainage.

(4) Significant, critical comments were received from "sister" agencies of the Army Corps which received no responses at all. The U.S. Fish and Wildlife Service submitted comments supporting Alternative 6, which would not require blasting outside the harbor, the granting of this CDUA application or the destruction of significant surf sites. Many other comments never received responses.

(5) The adverse traffic impacts of this project are not mitigated. It would take a four-lane highway to increase the capacity from Level of Service

F to an adequate level of service and no four-lane highway will be constructed and in place by the time this project is implemented.

The Protect Maalaea Coalition will be challenging the adequacy of this SEIS. If this challenge is successful, all decision-making based upon the SEIS, including any action on this CDUA application, will be voided.

D. This action is not consistent with the federal or state Coastal Zone Management Act. The Office of State Planning has already informed BLNR of this.

E. This CDUA application must be denied.

10. Outline of specific issues to be raised:

A. The actions accomplished through the approval of this CDUA application are the first phase of the project as a whole and require addressing the cumulative impacts of the project as a whole before any CDUA application can be granted;

B. A completed SEIS must be available before proceeding to the permit process and, therefore, a new public hearing, new agency review and a new action meeting are required;

C. The SEIS for this project is inadequate;

D. This project is not consistent with the federal and/or state Coastal Zone Management Acts;

E. These state submerged lands are part of the corpus of the Ceded Lands Trust and the Public Lands Trust and approval of this application will violate the Trusts' responsibilities imposed through both Trusts;

F. Other issues to be raised are those contained in the letter dated September 16, 1994 from Mark Smaalders, Resource Analyst for the Sierra Club

Legal Defense Fund, Inc. to Mr. Bruce Elliot of the Army Corps, which is attached hereto as Exhibit "A" and hereby incorporated by reference.

G. This CDUA application must be denied.

11. Outline of basic facts:

The submerged lands lying outside of the current Maalaea Small Boat Harbor are proposed to be blasted to construct a new channel entrance, a new 640 foot breakwall and other improvements outside of the current Maalaea Small Boat Harbor. It has been decided that these submerged lands must be subdivided and placed under the management of the Division of Boating and Ocean Recreation in order to facilitate the expansion of the Maalaea Small Boat Harbor. These submerged lands are part of the corpus of the Ceded Lands Trust and the Public Lands Trust. A CDUA application for the subdivision of submerged lands was filed on November 8, 1993 and a public hearing took place upon the application on March 10, 1994.

At the time, a Supplemental EIS was being prepared for the project as a whole. BLNR scheduled this matter for action in August, 1994; however staff recommended denial because the SEIS was not available or accepted. The Governor accepted the SEIS on August 31, 1994 and this matter was thereafter scheduled for action on September 23, 1994.

This action may have a significant adverse impact upon the endangered hawksbill turtle; however impacts on the endangered hawksbill turtle have never been addressed. This project will destroy significant surf sites. This project will blast and eradicate a significant coastal reef and have other adverse impacts upon the marine ecosystem.

This project will have adverse traffic impacts. The noise and other impacts resulting from an expanded harbor will adversely affect residents surrounding the harbor.

The proposed conditional approval of this project would violate the substantial rights of the petitioners for all of the reasons set out in HRS §91-14(g)(1)-(6). The conditional approval does nothing to deal with the significant environmental, ecological, recreational adverse affects which will result from the approval of this project.

12. The relief or remedy to which you seek or deem yourself entitled:

Petitioners request that the Board deny the application for a CDUA permit and grant this petition. Petitioners' property interests will be adversely affected. Petitioners will be directly and adversely affected by this project. Their interests are distinguishable from those of the public. No parties to the proceeding have a similar position. As additional parties Petitioners will not render the proceedings inefficient or unmanageable.

The above-named persons and organizations hereby request and petition the Board of Land and Natural Resources for a contested case hearing in the matter described above.

DATED: Wailuku, Maui, Hawaii 5·22·94

Isaac Hall
Attorney for Petitioners

SIERRA CLUB LEGAL DEFENSE FUND, INC.

The Law Firm for the Environmental Movement

223 South King Street, Austin Building, Suite 400, Honolulu, Hawaii 96813 (808) 599-2436 fax (808) 521 6841

September 16, 1994

M. Bruce Elliot
Lieutenant Colonel, U.S. Army
District Engineer (CEPOD-ED-PV)
US Army Corps of Engineers
Building 230
Ft. Shafter, Hawaii 96858-5440

RE: Public Notice No. CW94-0003

Dear Colonel Elliot:

We submit the following comments in response to U.S. Army Corps of Engineers ("Corps") Public Notice CW94-0003, issued August 15, 1994, regarding compliance with Section 404 of the Clean Water Act("CWA")(33 U.S.C 1344), and intent to discharge dredged and fill material into Ma'alaea Harbor, Maui. Based on our analysis of the Final Supplemental Environmental Impact Statement ("FSEIS") prepared by the U.S. Army Engineer District, Honolulu, and the mitigation measures proposed by the Corps in the public notice for the project, we believe that the proposed activity fails to satisfy the Corps' legal obligations under Section 404 of the Clean Water Act. In addition, the proposed activity does not comply with the requirements of Sections 7 and 9 the Endangered Species Act ("ESA") (16 U.S.C § 1536 and § 1538) and Section 101 of the Marine Mammal Protection Act ("MMPA")(33 U.S.C. § 1371).

It is imperative that the Corps re-evaluate the impacts of the project, the adequacy of the proposed mitigation, compliance with the ESA and MMPA, and compliance with the requirements of Section 404 of the CWA. As part of this process, and pursuant to 33 CFR § 327 and § 336, we hereby request that the U.S. Army Corps of Engineers hold a public hearing to consider the effects of the proposed discharge of dredged and fill material. We make this request on behalf of the Protect Ma'alaea Coalition, Save Our Surf and Life of the Land, whom we represent on this issue.

Our specific comments follow.

EXHIBIT A

Coral Reefs

Coral reefs are considered by Section 404 (b)(1) guidelines to be "Special Aquatic Sites," and are given special consideration in the guidelines. 40 CFR § 230.1 (d) states:

> From a national perspective, the degradation of special aquatic sites . . . is considered to be among the most severe environmental impacts covered by these guidelines. The guiding principle should be that degradation or destruction of special sites may represent an irreversible loss of valuable aquatic resources.

The Corps' preferred alternative involves the destruction or alteration of approximately 11.9 acres of coral reef, coral rubble, and sand bottom. The U.S. Fish and Wildlife Service ("USFWS") has identified the coral reef fronting the harbor as the habitat of major concern at Ma'alaea because of its high value to threatened green sea turtles and to reef fish. Draft Fish and Wildlife Coordination Act ("FWCA") report at 22. The USFWS has also determined that reef habitats are relatively scarce on a national basis, and that the extent of healthy and productive coral reefs on a local basis may be declining.

As a result of concerns over impacts to coral reefs and other resources at Ma'alaea Bay, the USFWS requested in its Draft FWCA report (at 23) that "the Corps refine a workable design based on the concept underlying alternative 6." Alternative 6 specifies an interior mole, would involve no dredging or filling outside of the existing Ma'alaea Harbor, and would minimize impacts to coral reef resources.

To date, the Corps has failed to comply with this request. The Corps' response to the draft FWCA report, contained in an August 1, 1994 letter to Brooks Harper of the USFWS, provides information on the Corps' reasons for rejecting alternative 6 as it was modeled by the Corps' engineers, but fails to explain why the Corps could not "refine a workable design based on the concept underlying alternative 6", and fails to clearly demonstrate that such an alternative is not practicable. Such a demonstration is required by 40 CFR § 230.10 (a)(3). Pursuant to that regulation, the Corps must demonstrate that no design based on an interior mole configuration, or other design that does not impact coral reef resources, is practicable.

Turbidity

The Corps has failed to meet its statutory obligations to ensure that water quality standards are not exceeded, and that

water quality is not significantly degraded. Water quality at Ma'alaea Harbor is frequently below state standards at present: monitoring at Ma'alaea Harbor by the Hawai'i State Department of Health shows that, "[i]n three years of sampling, criteria have consistently been exceeded for turbidity in over one-third of all measurements." FSEIS at 4-6. This condition is expected to worsen as a result of the proposed harbor expansion. According to the FSEIS (at 5-2):

> [t]urbidity would be increased while dredging, blasting, filling, and dredge spoil dewatering activities are completed. Additional exceedences in water quality standards for turbidity would be expected, both during construction, and as a result of increased turbulence caused by the additional vessel traffic.

Remarkably, despite its acknowledgement that the proposed project will exacerbate ongoing violations of the water quality standard, the Corps has no plans to limit turbidity within the harbor. The Corps' Public Notice for Ma'alaea harbor states (at 6) that "[t]urbidity within the harbor will not be controlled during construction." As you know, the Corps has a legal obligation to ensure that water quality standards are not exceeded as a result of activities that are regulated by Section 404 of the CWA. 40 CFR § 230.10 (b) states:

> No discharge of dredged or fill material shall be permitted if it: (1) causes or contributes, after consideration of disposal site dilution and dispersion, to violations of any applicable State water quality standard.

As part of its compliance with Section 404 requirements, the Corps must address how it will ensure that its activities do not contribute to the further exceedence of state water quality standards for turbidity at Ma'alaea Harbor.

Significant Degradation of the Waters of The United States

40 CFR § 230.10 (c) states: "[e]xcept as provided under section 404(b)(2), no discharge of dredged or fill material shall be permitted which will cause or contribute to significant degradation of the waters of the United States." The proposed project will cause significant degradation of the waters of the United States at Ma'alaea Bay, as a result of (but not limited to) impacts on water quality, coral reefs (addressed above) and surf sites.

(A) Water Quality Impacts. The deterioration of water quality associated with the proposed project has serious implications for marine life within Ma'alaea Bay. The USFWS has consistently expressed concerns over the impacts of increased turbidity associated with the harbor expansion. In a Biological Reconnaissance Report issued in 1979, the USFWS recommended that the Corps consider modifying the existing harbor channel entrance rather than cutting a new channel. The report also recommended that measures to reduce sedimentation of harbor waters from stormwater drainage be included in the proposed project design. The latter concern was reiterated in both a preliminary FWCA report issued in February 1980, and in a final FWCA report released in June 1980. Comments by the USFWS, transmitted to the Corps through the Department of Interior's Office of Environmental Affairs in June 1980, again reiterated these concerns:

> The Service recommended that the Corps incorporate sedimentation control measures into the project design to mitigate project-related adverse impacts on water quality. The Service expressed concern that greater boat usage in the harbor as a result of the proposed project will slow the settlement of newly-introduced sediments and increase the re-suspension of existing sediments in harbor waters. This increase in suspended sediments would add to the threat to nearby coral-reef habitats already posed by the existing heavy load of upland sediments entering the harbor with stormwater runoff.

July 1993 FWCA Report at 3.

In its most recent (draft) FWCA report (July 1993) the USFWS notes that:

> Ma'alaea Bay is a productive system that may be limited by the effects of siltation. The biota of Ma'alaea Bay has been described as being unusual in that the abundance and diversity of marine species, which are uncommon elsewhere in the Hawaiian islands, are common in the bay. The reasons for the special character of the biological resources of the bay remain largely unknown and <u>extreme caution in undertaking any action which would alter any aspect or condition of the bay</u> has been urged (Kinzie, 1972). The maintenance of good water quality in Ma'alaea Harbor is of great importance since cumulative impacts to water quality could contribute to the degradation of the biological resources and ecological features of Ma'alaea Bay.

> <u>Therefore, the Service recommends that the Corps develop measures to protect the quality of water in Ma'alaea Harbor from project related impacts and incorporate these measures as part of the proposed project</u>.

July 1993 FWCA report at 21 (emphasis added).

Despite this explicit recommendation by the USFWS that the Corps develop measures to protect the quality of water within Ma'alaea Harbor from project-related impacts, and despite its obligation under 40 CFR § 230.10 (d) to minimize potential adverse impacts on the aquatic ecosystem, the Corps' Public Notice for Ma'alaea Harbor states explicitly (as quoted above) that "[t]urbidity within the harbor will not be controlled during construction." Taken in combination with the Corps' failure to address exceedences of the state water quality standard for turbidity this constitutes a complete abdication of the Corps' statutory obligation to ensure that water quality is not degraded as a result of this project.

(B) Surf Sites. As outlined in the Corps' Public Notice, the proposed action would result in the complete destruction of the Off-the-Wall surf site and would also result in the modification of Buzz's No. 1 and No. 2 sites. Surf sites support water-related recreation activities, and impacts to such activities are regulated under 40 CFR § 230.10 (c). Findings of significant degradation are to place special emphasis on the persistence and permanence of the effects of the dredge and fill activity. The guidelines for water-related state (§ 230.52) that "[o]ne of the more important direct impacts of dredged or fill disposal is to impair or destroy the resources which support recreation activities." The proposed alternative would permanently and irrevocably destroy or impair three unique surf sites, and thereby constitutes a significant degradation of the waters of the United States.

<u>Compliance with the Toxic Effluent Standards of Section 307 of the Clean Water Act.</u>

40 CFR § 230.10(b)(2) prohibits discharge of dredged or fill material if it violates any applicable toxic effluent standard or prohibition under Section 307 of the Clean Water Act. The Section 404(B)(1) Practicable Alternatives Analysis and Evaluation (hereinafter "Section 404 Evaluation") (in FSEIS Appendix A) states (at 11) that the "disposal operation is not expected to violate the Toxic Effluent Standards of Section 307 of the Clean Water Act." However, no data on the toxicity of

harbor sediments, which will be dredged and used as fill, are included in the FSEIS.

The U.S. Environmental Protection Agency raised this concern in their comments of January 15, 1993 (at 3), in which they called upon the Corps to "provide data to support the assumption that dredged and fill material is not contaminated as stated in Appendix A, 404(b)(1) Guideline Analysis." The Corps has provided no data in the FSEIS to support its assumption that harbor sediments will meet Section 307 Toxic Effluent Standards, and does not address this issue in its 15 August, 1994 response to the EPA (see FSEIS Appendix C). There is reason to believe that these sediments may be contaminated: other sites in the Hawaiian Islands have recorded very high levels of toxic pollutants in harbor sediments, and the stormwater that drains into Ma'alaea Harbor is known to carry both sediments and chemical pollutants, including agricultural fertilizers, pesticides and herbicides. See USFWS FWCA report at 15. In addition, the Corps itself has stated, in the course of its Section 404 Evaluation (at 10), that contaminants may pose a risk at the harbor:

> (t)he accumulation of contaminants in the harbor waters and bottom sediments presents the potential for bioaccumulation in the marine life inhabiting the site. In addition, the presence of contaminants in the bottom sediments raises problems for disposal of maintenance dredged material through the life of the project.

The Corps is required, in the course of its Section 404 Evaluation, to make a factual determination of the degree to which the material proposed for discharge will introduce, relocate, or increase contaminants (40 CFR § 230.11 (d)). In making this determination, the Corps must evaluate the possibility of chemical contamination of the material to be discharged, pursuant to 40 CFR § 230.60-61. The Corps is allowed to make use of prior evaluations, chemical and biological tests, scientific research, and experience in making its determination, but is required to document the information used in making such a determination (40 CFR § 230.60). In addition, the Corps is required (§ 230.60(b)) to consider the following factors in making its determination: (1) potential routes of contaminants or contaminated sediments to the extraction site; (2) pertinent results from tests previously carried out on the material at the extraction site, or carried out on similar material for other permitted projects in the vicinity; (3) any potential for significant introduction of persistent pesticides from land runoff; (4) any records of spills or disposal of petroleum products or substances designated as hazardous under section 311

of the Clean water Act; (5) information in Federal, State and local records indicating significant introduction of pollutants from various sources along the potential routes of contaminants to the extraction site.

The FSEIS fails completely to document the information used by the Corps in reaching its conclusion that the sediments of Ma'alaea Harbor meet Section 307 Toxicity Standards, and fails to demonstrate that the Corps has considered the factors listed above in reaching its conclusion. The Corps must provide this information before it can be considered in compliance with Section 404(b)(1) of the Clean Water Act.

Mitigation

The Corps' Public Notice fails to commit to or accurately describe significant mitigation either recommended or required by the USFWS and the NMFS. The Public Notice (at 6-7) lists but fails to commit to several mitigation measures recommended by the USFWS. In addition, the Corps' Public Notice completely omits a recommendation on the development of measures to protect the quality of water in Ma'alaea Bay from project-related impacts.

The public notice mischaracterizes conclusions presented in the NMFS Biological Opinion when it states (at 9):

> According to the Biological Opinion from the National Marine Fisheries Service (NMFS) issued on 25 April 1990, the project is expected to have an adverse effect on the endangered humpback whale in Hawaii, but with mitigation will have less adverse effect than the present situation.

The Biological Opinion submitted by NMFS does not indicate that the harbor expansion will have a less adverse effect than the present situation. It explicitly states: "(t)he increased vessel activity associated with the expansion and operation of the proposed small boat harbor at Ma'alaea, Maui, may adversely affect humpback whales in Hawaiian waters." NMFS Biological Opinion at 8. NMFS thus has taken the position that harbor expansion will worsen the present situation. NMFS states that the adverse effects of displacement of whales from the waters around Ma'alaea Harbor are outweighed by the benefits of consolidating vessel activity in existing facilities. It also states, however, that "future development of new harbors and boat ramps along the west Maui coast may likely exceed the jeopardy threshold." Biological Opinion at 8. Expansion of the harbor is thus one more instance of development in west Maui that the Biological Opinion states may lead to exceedence of the jeopardy threshold. The Corps' refusal to commit to the limitations required by the Biological Opinion is another reason why the proposed project is not acceptable.

Threatened and Endangered Species

(A) Humpback Whales. The Corps has committed to implementing all of the recommendations provided in NMFS' Biological Opinion. Section 404(b)(1) Evaluation at 8. It has not, however, committed to abiding by the terms outlined in the Statement Regarding Incidental Taking Pursuant to Section 7(b)(4) of the Endangered Species Act of 1973 ("Section 7 Statement")(see FSEIS Appendix A). The Section 7 Statement outlines (at 1) "terms and conditions that must be complied with"; these include a requirement that blasting be restricted to the months of June through November inclusive. In its Public Notice, the Corps has stated that "[i]n general, blasting will be avoided during December through May if possible. If blasting must occur, charges will be kept small. . . ." (Emphasis added). As you must be aware, the Corps is obligated by the Endangered Species Act ("ESA") and the Marine Mammal Protection Act ("MMPA") to abide by the terms of the NMFS Section 7 Statement; should the Corps proceed with blasting in the months of December through May, as it has indicated it may do, it will be in violation of the ESA and MMPA.

Furthermore, careful evaluation of the Corps' obligations under the ESA and MMPA indicate that dredging and filling must also be restricted to June through November. The Biological Opinion prepared by the NMFS states that disturbance and injury to humpback whales may result from harbor construction activities such as "blasting, dredging and filling" that occur during the winter humpback breeding and calving season. As you know, disturbance and injury to humpback whales falls within the definition of harassment, and is prohibited by the ESA and MMPA in the absence of an incidental take authorization. The NMFS Section 7 Statement issued for this project expressly states (at 2) that it applies only to the endangered green sea turtle, and that no marine mammal take (pursuant to § 101(a)(5) of the MMPA) is authorized until appropriate small take regulations are in place and related "Letters of Authorization" are issued. Although we do not support any dredging and filling activities associated with this project as it is currently proposed, if the project were to move forward, the lack of an incidental take authorization means that the Corps must restrict all dredging and filling activities to the months of June through November, or be in violation of the ESA and MMPA.

(B) Hawksbill Sea Turtles. The Public Notice for Ma'alaea Harbor makes reference to a February 25, 1993 letter from the

The failure to address harbor oscillations for the selected alternative is particularly troubling due to the fact that Plan 6 -- which shows "unacceptable" surge conditions -- recorded the lowest exceedence of the Corps' 1 ft. wave height exceedence criteria of any plan tested. Plan 6 exceeded this criterion only 1.9% of the time, while the 4 alternatives under consideration showed exceedences varying between 2 and 17.7%, with the Selected Alternative achieving a 6.1% exceedence. See Plan 6 Wave Study at 14. In failing to evaluate the harbor oscillations, other than to state in the SFEIS (at 5-8) that surge in the harbor will be "reduced substantially" with any of the four alternate plans, the Corps has not demonstrated that the selected alternative will meet one of its three primary goals.

Conclusion

In summary, the project as presented in the Public Notice fails to comply with numerous legal requirements, including but not limited to the Marine Mammal Protection Act, the Endangered Species Act, and the Clean Water Act. It is undisputed that the project will have a significant adverse impact on endangered species, coral reefs, water quality, and recreation resources; it is not clear that, as designed, the project will even satisfy its stated goals. For these reasons, we are strongly opposed to its implementation.

We look forward to your response to our request for a public hearing. Please do hesitate to contact us with any questions.

Very truly yours,

Mark Smaalders

Mark Smaalders
Resource Analyst

cc: Eugene Nitta, NMFS
Robert Smith, USFWS
Deanna Wieman, EPA
John Nakagawa, OSP
Hawaii State Department of Health
Protect Ma'alaea Coalition
Save Our Surf
Life of the Land
Surfrider Foundation

Surfrider Foundation

17 October 1994

District Engineer
U.S. Army Engineer District Honolulu
Attn: CEPOD-ED-PV/Lennan
Building 230
Fort Shafter, HI 96858-5440

RE: Ma'alaea Harbor Expansion

Dear District Engineer,

The Surfrider Foundation is a 25,000 member, non-profit environmental organization dedicated to the preservation and enhancement of the world's waves and beaches. We are fundamentally opposed to any project that will eliminate or adversely impact any surf spot or beach area.

The preferred alternative for the Ma'alaea Harbor Expansion proposes to eliminate one surf spot and affect two others in an unknown manner. The SEIS is thorough in its analysis of surf site impacts. For these reasons we must oppose the proposed project.

We would prefer that any harbor expansion or improvements be within the existing footprint of the harbor or landward. This eliminates the adverse impacts on the waves and adjacent beach.

However, if the expansion goes forward as planned, we must insist that conditions be placed on the issued permit requiring some form of in-kind mitigation for any impairment or destruction of the existing surf spots.

Sincerely,

Michelle C. Kremer
Coastal Issues Coordinator

NATIONAL OFFICE • 122 SOUTH EL CAMINO REAL, #67 • SAN CLEMENTE, CA 92672 • (714) 492-8170 • FAX (714) 492-8142

S

August 25, 1994

Anthony J. Lannutti
215 Paoakalani Ave., Apt. 8
Honolulu, Hawai'i 96815

U.S. Army Engineers District, Honolulu
Attn.: CEPOD-ED-PV Lennan
Building T-1
Fort Shafter
Hawai'i 96825-5440

Dear Sir:

I hope that the U.S. Army will again be the good guys and cancel any plans for the Maalaea Harbor proposed south breakwater extension. If the plans have been on the table since 1968, it doesn't seem to be an urgent issue and perhaps is not necessary. The boat owners are complaining that occasional, large swells damage they're boats. So what. Let them pay for the repairs or move the boats to other harbors (if the harbor is really that bad, then owners would have already moved the boats). This seems a better alternative than destroying 12 acres of reef. Ultimately, every single reef is important to the ecosystems, which benefit all of mankind. If we need to destroy one, we should have a better reason than a few boat owners' pocketbooks. (Speaking of pocketbooks, I'm sure the U.S. Army has more important projects than this which may need additional funding.)

If there's a liability issue than perhaps some disclaimers can be wrote into the contracts. Even the current swell caused by Hurricane John is an Act of God. I imagine there is no government liability for the recent instances.

In conclusion, harbors and boats are merely man made things which can easily be remade, but the reef is a Creation of God which can be never be re-created.

Thank you very much, Sir.

Anthony J. Lannutti

T

RANDY AND ROSALIND MASON
626 KAUMAKA PLACE .
HONOLULU, HAWAII 96925
808-395-1250

U.S. Army Engineers, District, Honolulu
attn.: CEPOD-ED-PV (William Lennan)
Building T-1,
Fort Shafter, Hawaii 96825-5440

RE: Maalaea Harbor channel realignment

Dear Sir,

My wife and I adamantly oppose any realignment of the Maalaea channel or any other alteration of the harbor or or reef system which would adversely impact the unique nature of the surf at Maalaea Harbor.

As surfers we oppose the destruction of a wave which is recognized throughout the international surf community as being the worlds fastest breaking "right" (breaks to the surfer's right). As environmentalists we oppose the destruction of any part of the natural reef system which exists at Maalaea. As small business owners we oppose the destruction of any part of Hawaii's most precious natural resource, our beaches and aquatic attractions. We simply can't afford to destroy something this valuable.

We urge you to seek alternate solutions to the problems which may exist within the harbor even if they be more costly than the proposed breakwater extension. Please do not disappoint the thousands of surf enthusiasts around the world are watching. Please carefully consider the long term impact of the loss of this irreplaceable resource. Please do not allow the destruction this unique and beautiful wave.

Thank you,

Randy Mason
Rosalind Mason

cc:
John Waihee, Governor, State of Hawaii
Linda Lingle, Mayor, Maui County

RECEIVED
AUG 7 1994

U

Jack F. Mueller, P.E.
RR 1, Box 388 #301
Wailuku, HI 96793

September 27, 1994

Ray H. Jyo, P.E.
Director of Engineering
Department of the Army
U.S. Army Engineer District, Honolulu
Ft. Shafter, Hawaii 96858-5440

Dear Mr. Jyo:

In reference to your letter of August 15, 1994 and following its format, I have the following comments:

a. I repeat, the CZMA requires that a harbor cannot be built or improved without adequate land transportation. It is a matter of public safety! Again I remind you. Level of service F describes a condition in which traffic demands exceed capacity and this is the LOS of the Honoapiilani Highway. Therefore, until the Honoapiilani Highway capacity is enlarged and the LOS is reduced to an acceptable level, no additional traffic can be added to the highway.

(1), (2) and (3) See above. However, in reference to (3), bookings for the harbor boats come from agents all over the island and most passengers drive their own rental cars to the harbor.

b. See a. above. The Honoapiilani Highway is presently operating at Level of service F, according to the Department of Transportation. DOT's figures do not agree with the figures of the consultant you quote. Your conclusions in 1.13.2 and 1.13.3 are incorrect.

c. The sewerage problem is not a water quality problem it is a public health problem! If there are not adequate facilities in place to maintain public health standards, the new berths will sit empty. Maybe you can build the "harbor improvements" but you will not be able to use them if the sewerage facilities are not concurrently installed and ready to use. The DOH will enforce the existing public health regulations, or the courts will.

V

True?

d. I disagree entirely with your conclusions and suggest you carefully examine the detailed study of Ma'alaea Bay by B.K. Dynamics and Westinghouse Environmental Systems Department. The currents are not what you describe and certainly not what we have observed living right on the bay and frequently swimming and snorkeling in this area. In addition, to blame the beach erosion in the 1950's on "condominium sea walls", built in the 1970's is a stretch of imagination beyond my comprehension. We are continuing to monitor and record the condition of our sandy beach and when and if a new breakwater is installed our records will undoubtedly prove of substantial value to all of our property owners.

e. I also completely disagree with your projection of a rise in property values as a result of the harbor "improvements". What provision are you making to compensate the property owners when property values go down, or are you planning to wait long enough for inflation to effect the rise?

f. It was interesting reading Paragraph 3.5 of the SEIS and then reading Chapter 4 Harbor Oscillations. I wonder why "Harbor oscillations were not considered in the earlier study by Lillycrop et al." Also, from Chapter 5 Conclusions, "a. Plan 6 is satisfactory ---" and then b. and c. with conclusions based on different conditions. Was any baffling ever thought of or discussed? Too bad you can't be more objective in your evaluations of alternatives. Therefore, it appears that the Corps is about to build a project that will not product a safe harbor, that will be an environmental disaster and that is based on an highly imaginary economic analysis. Well, what's new about that.

Very truly yours,

Jack F. Mueller

Jack F. Mueller, P.E.

THE SURFER'S JOURNAL

September 15, 1994

To: Mr. William Lennan
From: Steve Pezman
Publisher, The Surfer's Journal
Re: Maalaea Harbor channel realignment

Dear Mr. Lennan,

I have served as the Publisher of Surfer Magazine from 1970-1991, and am currently Publisher of The Surfer's Journal. Both publications are distributed throughout the world. These publications serve as a voice for the over 5,000,000 million surfers worldwide.

To the intire gobal surfing community the surf break at Maalaea, Maui is considered completely unique for it's wave characteristics of speed (it is known as the world's fastest surfing wave), and shape (perfect, peeling, tapered walls) which result in a surfing experience unequaled anywhere else.

Surf breaks are a finite resource. There are only so many on each island. Over the years the use pressure at each has grown beyond their carrying capacity.

Surfing is important to the economy and culture on Maui. Wherever surfing thrives it provides an important economic stimulus to tourism and provides high quality, intensely valuable recreational experiences for both locals and visitors. For the high level of intensity and reward one experiences from going surfing, or merely watching it, the cost is extremely low and accessibility high. The presence of the sport also stimulates a vigorous light industry and retail support structure. The intire structure of the sport on each island is based on the number and quality of breaks there. To wit: The Big Island is much less a surfing destination than Oahu, Kauai, and Maui which are known for their superior waves.

There is no proven strategy for mitigating the loss of a break, especially a world class break like Maalaea. It would be a severe tragedy to Maui and the surfing world if one of the it's finest, most legendary, irreplaceable surf breaks was willfully destroyed or substantially reduced by the proposed breakwater extension.

The surfers of the world emplore you to not build it.

Thank you for your consideration.

Sincerely,

Steve Pezman

Steve Pezman
Publisher

PO Box 4006 San Clemente, CA 92671 714 361-0331 800 666-2122 FAX 714 361-2417

W

CHARTERS

145 North Kihei Road
Kihei Maui, Hawaii 96753
(808) 874-0332
(800) 544-MAUI

AUGUST 26, 1994

District Engineer
U.S. Army Engineer District, Honolulu
Bldg. 230
Fort Shafter, HI 96858-5440

Attn. CEPOD-ED-PV / Lennan

Thank you for sending me copies of the public notice and a copy of the:

FINAL
SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT
FOR
MAALAEA HARBOR

My only concern is that the length of the south breakwater extension will not be sufficient to block swells coming up the Alalakeiki Channel during 'kona' storms.

If your wave simulations show that this should not be a problem for the CENTER MOLE, than I would hope you would start the improvements as soon as possible.

The FSEIS has been very well done, (as were the ones before), and I hope the project can be carried out expeditiously.

Respectfully Submitted,

Tim Slack

Tim Slack

X

SIERRA CLUB LEGAL DEFENSE FUND, INC.

October 1, 1994

Commander
US Army Engineer District, Honolulu
Attn: CEPOD-ED-PV (Lennan)
Building T-1
Ft. Shafter, Hawaii 96858-5440

RE: Final Supplemental Environmental Impact Statement for Ma'alaea Harbor, Maui

Dear Commander:

We submit the following comments in response to the Final Supplemental Environmental Impact Statement ("FSEIS") prepared by the U.S. Army Engineer District, Honolulu, for planned expansion and modification of Ma'alaea Harbor for light-draft vessels, at Ma'alaea, Maui.

We provide these comments on behalf of the Protect Ma'alaea Coalition, Save Our Surf and Life of the Land. These comments are offered in addition to comments submitted by the Mid-Pacific office of the Sierra Club Legal Defense Fund (SCLDF) on September 16, 1994, regarding Public Notice CW94-0003. We incorporate those comments by reference here.

INTRODUCTION

Based on our analysis of the FSEIS, the mitigation measures proposed by the Army Corps of Engineers ("Corps"), and the Corps' Public Notice CW94-0003, issued August 15, 1994, regarding compliance with Section 404 of the Clean Water Act ("CWA")(33 U.S.C 1344), the proposed activity fails to satisfy the Corps' legal obligations under the National Environmental Policy Act ("NEPA"). (42 U.S.C 4371 *et seq.*). The FSEIS fails to adequately evaluate: (1) reasonable alternatives to the proposed harbor expansion; (2) direct and indirect impacts resulting from the proposed harbor expansion; (3) impacts to water quality, and resultant secondary impacts on marine resources; (4) impacts to surf sites, including Ma'alaea Pipeline; (5) impacts of utilizing

Y

potentially toxic fill material. In addition, the FSEIS fails to include a substantive response to all comments received, including comments from agencies, citizens' groups and individuals, despite an obligation to respond to all substantive comments and any opposing views on issues raised. 40 CFR § 1502.9(b) and 1503.4(a), (b).

The FSEIS clearly demonstrates the Corps' failure to evaluate both the impacts of and alternatives to the proposed project. In addition to being required as part of an EIS, the latter duty is mandated of all federal agencies when unresolved conflicts exist. Thus, the Corps has an additional obligation to conduct a full and complete analysis of alternatives to the proposed project. NEPA directs all federal agencies to "study, develop, and describe appropriate alternatives" to any project involving unresolved conflicts in "alternative uses of available resources." 42 U.S.C. § 4332(2)(E). This requirement exists *in addition to* the alternatives analysis required by NEPA in the context of an EIS, and has been found by the courts to be:

> supplemental to and more extensive in its commands than the requirement of 102(2)(C)(iii). It was intended to emphasize an important part of NEPA's theme that all change was not progress and to insist that no major federal project should be undertaken without intense consideration of other more ecologically sound courses of action, including shelving the entire project, or of accomplishing the same result by an entirely different means.

Environmental Defense Fund v. Corps of Engineers of the U.S. Army, 492 F.2d 1123, 1135 (5th Cir. 1974)(Emphasis added).

It is undisputed -- as the FSEIS itself reflects -- that unresolved conflicts over the use of resources at Ma'alaea remain, and that members of the public as well as cooperating agencies continue to question and challenge the need for and the execution of the harbor expansion project at Ma'alaea, and particularly the Corps' preferred alternative. The Corps has failed to comply with the alternatives analysis mandated by § 102(2)(E) of NEPA, as well as the EIS alternatives analysis requirement of § 102(2)(C)(iii).

We are particularly dismayed at the Corps' blatant dismissal of concerns raised by other federal agencies in fulfillment of their duty to protect wildlife resources. The is exemplified by the Corps' decision to issue the FSEIS prior to completion of a final Fish and Wildlife Coordination Act ("FWCA") report, pursuant to 16 U.S.C. § 662b, despite recommendations from the

U.S. Fish and Wildlife Service (USFWS), the Department of the Interior, and the Environmental Protection Agency ("EPA") that the final FWCA report be included in the FSEIS. In so doing, the Corps has violated § 662(b) of the FWCA, which states:

> the reports and recommendations of the Secretary of the Interior on the wildlife aspects of [affected] projects .... shall be made an integral part of any report prepared or submitted by any agency of the Federal Government responsible for engineering surveys and construction of such projects when such reports are presented to the Congress or to any agency or person having the authority or the power, by administrative action or otherwise, (1) to authorize the construction of water-resource development projects .... The reporting officers in project reports of Federal agencies shall give full consideration to the report and recommendations of the Secretary of the Interior ....

It is imperative that the Corps re-evaluate the impacts of the project and the adequacy of the proposed mitigation, and issue a revised supplemental EIS, pursuant to 40 CFR § 1502.9. In addition, as we stated in our comments of September 16, 1994, the Corps must revise the project so as to achieve compliance with the Sections 7 and 9 of the Endangered Species Act ("ESA") (16 U.S.C. § 1536 and § 1538), and Section 101 of the Marine Mammal Protection Act ("MMPA") (33 U.S.C. § 1371). and compliance with the requirements of Section 404 of the CWA.

Our specific comments follow.

A. <u>Failure to evaluate reasonable alternatives</u>

The rigorous evaluation of alternatives to proposed projects is fundamental to the reduction and elimination of adverse impacts on natural resources, and is required by numerous laws, including NEPA and the FWCA. Despite repeated requests from agencies and the public, the Corps has failed to fulfill their statutory obligation to evaluate alternatives to the proposed Ma'alaea Harbor expansion, with the result that the FSEIS cannot fulfill its purpose of informing "decisionmakers and the public of the reasonable alternatives which would avoid or minimize adverse impacts ...." 40 CFR § 1502.1.

The Corps has failed to respond to the requests presented by the USFWS in its draft FWCA report, which identified Alternative 6 as the least damaging to fish and wildlife resources, and

requested that the Corps (a) <u>refine</u> and analyze a workable project design based on an interior mole concept and (b) provide the USFWS with the results for evaluation <u>prior to preparation and submission of a final FWCA report for inclusion into the FSEIS</u>. The Corps instead responded by analyzing Alternative 6 as originally presented, and by incorporating the test results in the FSEIS. This action by the Corps made it impossible for the USFWS to complete the final FWCA report prior to issuance of the FSEIS. In addition to violating the provisions of the FWCA (16 U.S.C. § 662(b)), this action by the Corps has left unresolved the issue of avoidance of adverse project-related impacts to coral reef habitat at Ma'alaea.

The Corps' preferred alternative requires the destruction or alteration of at least 11.9 acres of coral reef, coral rubble, and sand bottom[1]. The USFWS has identified the coral reef fronting the harbor as the habitat of major concern at Ma'alaea because of its high value to threatened green sea turtles and to reef fish. Draft FWCA report at 22. The USFWS has also determined that reef habitats are relatively scarce on a national basis, and that the extent of healthy and productive coral reefs on a local basis may be declining. In addition, coral reefs are considered by the EPA's CWA guidelines to be "Special Aquatic Sites," and they must be given special consideration. 40 CFR § 230.1 (d) states:

> From a national perspective, the degradation of special aquatic sites . . . is considered to be among the <u>most severe environmental impacts</u> covered by these guidelines. The guiding principle should be that degradation or destruction of special sites may represent an <u>irreversible loss of valuable aquatic resources</u>. (Emphasis added).

It is as a result of the importance of the coral reefs and associated resources at Ma'alaea Bay, that the USFWS requested in its Draft FWCA report (at 23) that "the Corps refine a workable design based on the concept underlying alternative 6." Alternative 6 specifies an interior mole, would involve <u>no</u> dredging or filling outside of the existing Ma'alaea Harbor, and would minimize impacts to coral reef resources.

Far from giving the USFWS's request the "full consideration" required by the Corps' own regulation at 33 CFR § 320.4(c), the

---

[1] Due to inconsistencies between the DEIS and FSEIS regarding the areas to be dredged and filled, and the total quantity of dredged material, it is difficult to accurately assess the total area or volume that will be impacted.

Corps has ignored this request. The Corps' response to the draft FWCA report, contained in an August 1, 1994 letter to Brooks Harper of the USFWS, provides information on the Corps' reasons for rejecting Alternative 6 as it was modeled by the Corps' engineers, but fails to explain why the Corps could not "refine a workable design based on the concept underlying alternative 6", and fails to clearly demonstrate that such an alternative is not practicable. Such a demonstration is required as part of the Corps' responsibilities under the CWA (see 40 CFR § 230.10 (a)(3)), and is additionally mandated by NEPA, which states that EISs must "[r]igorously explore and objectively evaluate all reasonable alternatives." 40 CFR § 1502.14(a).

Furthermore, the Corps' rejection of Alternative 6 as it was modeled is not consistent with the standards established by the Corps in the FSEIS for evaluation of alternatives. The Corps states (FSEIS at 1-2) that "Alternative 6 would not meet the purposes of the proposed action," which include (a) reduction of surge within the harbor basin, (2) reduction of navigation hazards in the entrance channel, and (3) provision of the opportunity for addition of commercial and recreational berthing spaces and attendant harbor facilities. FSEIS at 2-1. According to the Corps' own study of wave response, however, Alternative 6 was found to satisfy the Corps' criteria for "providing the harbor with protection from the incident wind wave and swell climate." Wave Response of Proposed Improvement Plan 6 to the Small Boat harbor at Ma'alaea, Maui, Hawaii", (hereinafter "Plan 6 Wave Study") FSEIS Appendix G at 16. In addition, the conceptual harbor configuration shown in the FSEIS (at 3-18) indicates that, at a minimum, Alternative 6 would provide for a 30% increase in the number of existing berths; with further refinement, it is likely that an even greater increase in the number of berths could be realized. Consequently, the statement that Alternative 6 does not meet the purposes of the proposed action is incorrect.

The Corps further errs when it states in the FSEIS (at 1-2) that Alternative 6 "would actually worsen existing navigation and safety conditions." In fact, Alternative 6 recorded the lowest exceedence of the Corps' 1 ft. wave height criteria of any plan tested. Plan 6 exceeded this criterion only 1.9% of the time, while the 4 alternatives under consideration showed exceedences varying between 2 and 17.7%. The current configuration exceeded the 1ft. criteria 21.4% of the time. See Plan 6 Wave Study at 14. Alternative 6 also proved to be better than existing conditions with respect to wave heights in the entrance channel, with test results indicating that the Corps' 2 ft. criteria would be exceeded only 7.5% of the time; this compares with exceedence of the 2ft. criteria 9.6 % of the time with the current

configuration. In each case, the test results demonstrated that Alternative 6, as modeled by the Corps, met the Corps' own limiting criteria for wave heights, and would constitute an improvement, as opposed to a worsening, of current conditions.

The Plan 6 Wave Study also states that Alternative 6 "can potentially lead to a significant increase in the amplitude of harbor oscillation" (emphasis added), and notes that a number of assumptions and simplifications were made in the course of the study that may impact its accuracy. This information was used by the Corps to eliminate Alternative 6 from consideration, but no study of surge reduction was been undertaken by the Corps for any of the alternatives under active consideration. The Plan 6 Wave Study states (at 15)

> The HARBD numerical model was run for both Plan 6 and the existing plan to investigate the harbor response to wave periods characteristic of harbor oscillations. These tests were included because the "surge" problem reported in the existing harbor may arise in part from resonant response to long period wave energy impacting the harbor. Harbor oscillations were not considered in the earlier study [addressing wave response in other harbor alternative plans] by Lillycrop et al. (1993).

Clearly, the conclusions that (1) Alternative 6 would cause harbor oscillations that could damage berthed vessels and (2) the preferred alternative would not cause harbor oscillations that could damage berthed vessels are not supported by the Corps own testing data. With the refinement of a design based on the concept underlying Alternative 6, it may be possible to reduce the potential for the development of harbor oscillations.

In addition to failing to adequately respond to the USFWS' request for refinement of the concept underlying Alternative 6, and failing to uniformly apply its own evaluation criteria to all alternatives studied, the Corps has failed to consider other means of achieving the stated project goals. NEPA mandates agencies to consider a full range of alternatives, including those that may fall outside of their own jurisdiction. 40 CFR § 1502.14 (c). Such alternatives include development of multiple projects to satisfy the three project objectives.
Specifically, the Corps should evaluate the possibility of making internal harbor modifications to reduce the existing surge and navigation hazards, in conjunction with the development of an alternative project, possibly including dry storage of boats or landward expansion of harbor, to provide additional harbor capacity.

Finally, as we outlined above, under § 102(2)(E) of NEPA, the Corps has a supplemental duty to evaluate alternatives to the proposed project. This duty has been found by courts to be both supplemental to and more extensive than the alternative analysis requirement of an EIS. The Court of Appeals for the Eighth Circuit addressed the scope of § 102(2)(E) in Olmstead Citizens For a Better Community v. United States, 793 F.2d 201, 208 (8th Cir. 1986), observing that § 102(2)(E)

> imposes not a duty to publish an even more thorough explanation than in an impact statement but instead a duty to actively seek out and develop alternatives as opposed to merely writing out options that reasonable speculation suggest might exist.... The case proposes, for example, that an agency should consider "shelving the entire project" or "accomplishing the same result by entirely different means" ....
>
> (Emphasis added).

The USFWS, in its draft FWCA Report, was seeking precisely such a detailed consideration and development of alternatives. Section 102(2)(E) mandates that the Corps comply.

B. Failure to consider impacts of increased boating activity resulting from the Ma'alaea harbor expansion

The scope of the FSEIS is inadequate, as it fails to analyze the impacts of the increased boating activity that is expected to result from the expansion of the harbor. Scope includes the range of actions, alternatives and impacts to be considered in an environmental impact statement. 40 CFR § 1508.25 explicitly requires analysis of impacts, which may be direct, indirect or cumulative. Failure to consider indirect and cumulative impacts violates § 1502.16, which calls for the examination of both direct and indirect effects (or impacts) and their significance. Indirect effects are those which

> are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems....
>
> Effects includes ecological (such as effects on natural resources and on the components, structures, and functioning

> of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative.

40 CFR § 1508.8 (b) (emphasis added).

Concerns regarding the impacts of increased boating activity at Ma'alaea and the resultant effects on the surrounding environment have been raised repeatedly, both during scoping for the DEIS and in comments submitted on the DEIS. See scoping comments (FSEIS § 7.2); and comments on the FSEIS, including those submitted by the County of Maui Planning Department (FSEIS at C-32 through C-33) and Life of the Land (FSEIS at C-62). These comments stress the need to consider the following: the effect of designing the harbor to accommodate larger vessels, due to the increased environmental impacts associated with these vessels; the impacts of an increased number of vessels at Ma'alaea on the surrounding environment, including but not limited to fishery resources, listed threatened and endangered species such as humpback whales and green and hawksbill sea turtles, and coral reefs such as those at Molokini Atoll; impacts on existing recreational use of the marine environment; the need to consider both short-term and long-term impacts of increased harbor capacity; and impacts of increased activity and noise at Ma'alaea harbor on adjacent residents.

The FSEIS contains no analysis of impacts resulting from the increased use of the marine environment that will accompany harbor expansion, stating (in § 5.12.3, addressing fishing) that

> the increase in the number of fishing boats would likely lead to a small increase in fishing pressure on the commercially important species, including the bottom fishery. However, most of the fishing boats which would eventually be berthed in the harbor are either now trailered or moored elsewhere, so that they are already exploiting the fisheries resources. The exact incremental increase is unknown, but is expected to be small. (Emphasis added).

The FSEIS offers no data to support this conclusion. It fails to perform even a basic analysis of the fishing areas used by existing slip-holders at Ma'alaea, and their capacity to support additional use. The FSEIS offers no breakdown of the percentages of slips at the expanded harbor that will be allocated to commercial fishing or charter vessels, or how large such vessels will be; currently, 56% of the slips at Ma'alaea are occupied by commercial fishing, charter fishing, and commercial passenger vessels. Furthermore, the FSEIS fails completely to provide evidence that those vessels on the waiting list for new slips in the expanded harbor are in fact currently in regular use, and are exploiting the same resources now that they will be if berthed at Ma'alaea. If it is true that many of the vessels that seek berths at Ma'alaea are currently trailered and regularly used, there would appear to be no need for expansion of the number of slips at Ma'alaea, particularly an expansion with the severe impacts associated with Alternative 1.

The FSEIS dismisses impacts to Molokini Atoll Marine Life Conservation District with the statement that the State Department of Land and Natural Resources intends to limit the number of commercial permits at Ma'alaea, and will develop regulations for the use of Molokini. No evaluation is presented of the likelihood of such action being taken, however, nor of the effectiveness of such measures, despite the requirement that EISs indicate the likelihood that mitigation measures will be adopted or enforced. 40 CFR § 1502.16(h); § 1505.2. In addition, the Council on Environmental Quality has stressed the importance of adequately assessing the likelihood that proposed mitigation will be effective in a memorandum (46 Fed. Reg.18026 as amended, 51 Fed. Reg. 15618), which states (at 19.b):

> If there is a history of nonenforcement or opposition to such measures, the EIS and Record of Decision should acknowledge such opposition or nonenforcement. If the necessary mitigation measures will not be ready for a long period of time, this fact, of course, should also be recognized.

Finally, no consideration is given to the fact that marine resources in areas other than Molokini Atoll may be impacted as a result of increased boating activity at Ma'alaea.

The most glaring omission with respect to the impacts of increased boating activity resulting from the harbor expansion concerns species listed as threatened or endangered pursuant to the ESA, including the humpback whale and hawksbill sea turtle (both listed as endangered) and the green sea turtle (listed as threatened).

The FSEIS mischaracterizes conclusions presented in the National Marine Fisheries Service Biological Opinion (contained within FSEIS Appendix A) when it states (at § 5.10.3):

> According to the Biological Opinion from the National Marine Fisheries Service (NMFS) issued on 25 April 1990, the project is expected to have an adverse effect on the

> endangered humpback whale in Hawaii, but with mitigation will have less adverse effect than the present situation.

The Biological Opinion submitted by NMFS does <u>not</u> indicate that the harbor expansion will have a "less adverse effect" than the present situation. On the contrary, it states explicitly:

> [t]he increased vessel activity associated with the expansion and operation of the proposed small boat harbor at Ma'alaea, Maui, may adversely affect humpback whales in Hawaiian waters. This determination is based on the likelihood of displacing humpback whales from a portion of cow/calf habitat and subsequently impeding recovery of the North Pacific Population as a result of potentially lowered recruitment. While the exact proportion of impact attributable to the expansion cannot be estimated, it is additive to the increasing level of vessel traffic in west Maui waters.

NMFS Biological Opinion at 8. NMFS thus has taken the position that harbor expansion will <u>worsen</u> the present situation with respect to boat and whale interaction, and will consequently adversely effect the endangered humpback whale population. As a consequence, the FSEIS <u>must</u> further assess impacts on humpback whales resulting from expansion of the harbor (40 CFR 1508.27).

As a separate issue, the FSEIS must detail and evaluate the probable effectiveness of measures proposed to mitigate the impacts on humpbacks. Although NMFS suggests that the adverse effects of displacement of whales from the waters around Ma'alaea Harbor may be mitigated by consolidating vessel activity in existing facilities -- in reliance upon which mitigation NMFS issued its "no jeopardy" opinion -- NMFS clearly finds that, in the absence of such mitigating factors, the harbor expansion will have a negative impact on humpback whales. It also states that "future development of new harbors and boat ramps along the west Maui coast may likely exceed the jeopardy threshold." Biological Opinion at 8. The FSEIS repeats recommendations made by NMFS with regards to review and revision of the Statewide Boating Plan, removal of non-permitted mooring structures in Ma'alaea Harbor, and development of ingress/egress corridors and vessel speed limits in Ma'alaea Bay. It fails, however, to present any evaluation as to the likelihood of these actions being taken, or to the probable effectiveness of such measures, despite the requirement that EISs indicate the likelihood that mitigation measures will be adopted or enforced. 40 CFR § 1502.16(h); § 1505.2, see also 46 Fed. Reg.18026 as amended, 51 Fed. Reg. 15618.

The FSEIS states (at 5.10.3) that there may be some increase in boat/green turtle contact, and reduction of turtle foraging and nesting habitat, but that "this is not expected to cause any adverse impact to the turtle population of Ma'alaea Bay." Once again, this statement does not accurately reflect the NMFS Biological Opinion, which states that green turtles may be adversely affected by harassment and displacement as a result of added vessel traffic associated with the expansion. NMFS adds that "these adverse impacts are not likely to jeopardize the green turtle <u>in Hawaiian waters</u> as it is not dependent upon the project area for its continued existence." Biological opinion at 8. NMFS has clearly stated that an adverse impact to green turtles <u>in the project vicinity</u> may occur, and such impact must be fully analyzed in the EIS. In addition, the likelihood that the green turtle population of Ma'alaea Bay may be jeopardized should be fully analyzed.

The FSEIS states (at 5-7) that no effects are expected on endangered hawksbill turtles. That statement appears to be based on a February 25, 1993 letter from Gary Matlock of NMFS (contained within Appendix A of the FSEIS) which states that no effects on endangered hawksbill sea turtles are expected. More recent information is available, however, which the Corps is obligated to consider in the FSEIS (<u>see</u> 40 CFR 1502.22).

According to information obtained from NMFS (George Balazs, personal communication), two hawksbills were observed nesting at Ma'alaea in the summer of 1993, one of which was killed after being hit by a car. The total nesting population in Hawai'i in 1993 was 24 turtles, meaning that the two at Ma'alaea represented some 8% of that year's known nesting population. Observations during the 1994 nesting seasons have recorded only 3 nesting females statewide, confirming prior indications that hawksbill nesting in Hawaii may be cyclical, with turtles nesting once every two years. This information implies that the total female nesting population may consist of as few as 25 individuals.

Taken in this light, the record of two nesting attempts at Ma'alaea Bay in 1993 is extremely significant, and must be analyzed in a revised FSEIS, pursuant to § 1502.22. Courts have upheld this duty, stating that if the agency failed to make a reasonably adequate compilation of relevant information, the courts may properly find that "the EIS does not satisfy the requirements of NEPA, in that it cannot provide the basis for an informed evaluation or a reasoned decision." <u>Sierra Club v. United States Army Corps of Engineers</u>, 701 F.2d 1011, 1030 (2nd Cir. 1983).

This information additionally obligates the Corps to re-initiate consultation over impacts to hawksbill sea turtles: in the Biological Opinion for the Ma'alaea Harbor expansion, NMFS states that "[c]onsultation must be re-initiated if new information becomes available revealing the effects of the project on listed species that were not previously considered".

C. <u>Water Quality Impacts</u>

The deterioration of water quality associated with the proposed project has serious implications for marine life within Ma'alaea Bay. The USFWS has consistently expressed concerns over the impacts of increased turbidity associated with the harbor expansion. In a Biological Reconnaissance Report issued in 1979, the USFWS recommended that the Corps consider modifying the existing harbor channel entrance rather than cutting a new channel. The report also recommended that measures to reduce sedimentation of harbor waters from stormwater drainage be included in the proposed project design. The latter concern was reiterated in both a preliminary FWCA report issued in February 1980, and in a final FWCA report released in June 1980. Comments by the USFWS, transmitted to the Corps through the Department of Interior's Office of Environmental Affairs in June 1980, again reiterated these concerns:

> The Service recommended that the Corps incorporate sedimentation control measures into the project design to mitigate project-related adverse impacts on water quality. The Service expressed concern that greater boat usage in the harbor as a result of the proposed project will slow the settlement of newly-introduced sediments and increase the re-suspension of existing sediments in harbor waters. This increase in suspended sediments would add to the threat to nearby coral-reef habitats already posed by the existing heavy load of upland sediments entering the harbor with stormwater runoff.

July 1993 FWCA Report at 3.

In its most recent (draft) FWCA report (July 1993) the USFWS notes that:

> Ma'alaea Bay is a productive system that may be limited by the effects of siltation. The biota of Ma'alaea Bay has been described as being unusual in that the abundance and diversity of marine species, which are uncommon elsewhere in the Hawaiian Islands, are common

> in the bay. The reasons for the special character of the biological resources of the bay remain largely unknown and extreme caution in undertaking any action which would alter any aspect or condition of the bay has been urged (Kinzie, 1972). The maintenance of good water quality in Ma'alaea Harbor is of great importance since cumulative impacts to water quality could contribute to the degradation of the biological resources and ecological features of Ma'alaea Bay. Therefore, the Service recommends that the Corps develop measures to protect the quality of water in Ma'alaea Harbor from project related impacts and incorporate these measures as part of the proposed project.

July 1993 FWCA report at 21 (emphasis added).

Despite this explicit recommendation by the USFWS that the Corps develop measures to protect the quality of water within Ma'alaea Harbor from project-related impacts, and despite its obligation under 40 CFR § 230.10 (d) to minimize potential adverse impacts on the aquatic ecosystem, the Corps' Public Notice for Ma'alaea Harbor states explicitly (as quoted above) that "[t]urbidity within the harbor will not be controlled during construction." Furthermore, the Corps attempts to evade its responsibility to fully evaluate impacts to water quality by pointing to existing storm water drainage ditches (which empty into the harbor) as the "primary cause of sedimentation and high turbidity levels." FSEIS § 5.6. NEPA requires that EISs consider cumulative impacts, however, stating (at § 1508.7):

> "Cumulative impact" is the impact on the environment which results from the environmental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. (Emphasis added).

The consideration of cumulative impacts is particularly important here, as the increased boat traffic is acknowledged by the FSEIS to be a factor in projected future increases in turbidity levels, due to re-suspension of sediments within the harbor. Taken in combination with the Corps' failure to address exceedences of the state water quality standard for turbidity this constitutes a complete abdication of the Corps' statutory obligation to ensure that water quality is not degraded as a result of this project.

The impacts of anticipated increases in sediment loads coming into the harbor, in combination with the increase in boat traffic and potential changes in harbor flushing characteristics, must all be fully analyzed in a revised EIS.

D. Impacts to Surf Sites

As outlined in the Corps' Public Notice, the proposed action would result in the complete destruction of the Off-the-Wall surf site and would also result in the modification of Buzz's No. 1 and No. 2 sites. In addition, experienced surfers are concerned that the proposed action may impact the Ma'alaea Pipeline, rated as one of the top surf sites in the world. Surf sites support water-related recreation activities, and impacts to such activities are regulated under 40 CFR § 230.10 (c). Findings of significant degradation are to place special emphasis on the persistence and permanence of the effects of the dredge and fill activity. The guidelines for water-related state (§ 230.52) that "[o]ne of the more important direct impacts of dredged or fill disposal is to impair or destroy the resources which support recreation activities." The proposed alternative would permanently and irrevocably destroy or impair three unique surf sites, and thereby constitutes a significant degradation of the waters of the United States. This impact must be more fully considered than it has been in the current FSEIS.

E. Failure to Evaluate the Impacts of Utilizing Potentially Toxic Fill

40 CFR § 230.10(b)(2) prohibits discharge of dredged or fill material if it violates any applicable toxic effluent standard or prohibition under Section 307 of the Clean Water Act. The Section 404(B)(1) Practicable Alternatives Analysis and Evaluation (hereinafter "Section 404 Evaluation") (in FSEIS Appendix A) states (at 11) that the "disposal operation is not expected to violate the Toxic Effluent Standards of Section 307 of the Clean Water Act." However, no data on the toxicity of harbor sediments, which will be dredged and used as fill, are included in the FSEIS.

The U.S. Environmental Protection Agency raised this concern in their comments of January 15, 1993 (at 3), in which they called upon the Corps to "provide data to support the assumption that dredged and fill material is not contaminated as stated in Appendix A, 404(b)(1) Guideline Analysis." The Corps has provided no data in the FSEIS to support its assumption that harbor sediments will meet Section 307 Toxic Effluent Standards, and does not address this issue in its 15 August, 1994 response to the EPA (see FSEIS Appendix C). There is reason to believe that these sediments may be contaminated: other sites in the Hawaiian Islands have recorded very high levels of toxic pollutants in harbor sediments, and the stormwater that drains into Ma'alaea Harbor is known to carry both sediments and chemical pollutants, including agricultural fertilizers, pesticides and herbicides. See USFWS FWCA report at 15. In addition, the Corps itself has stated, in the course of its Section 404 Evaluation (at 10), that contaminants may pose a risk at the harbor:

> [t]he accumulation of contaminants in the harbor waters and bottom sediments presents the potential for bioaccumulation in the marine life inhabiting the site. In addition, the presence of contaminants in the bottom sediments raises problems for disposal of maintenance dredged material through the life of the project.

The Corps is required, in the course of its Section 404 Evaluation, to make a factual determination of the degree to which the material proposed for discharge will introduce, relocate, or increase contaminants (40 CFR § 230.11 (d)). In making this determination, the Corps must evaluate the possibility of chemical contamination of the material to be discharged, pursuant to 40 CFR § 230.60-61. The Corps is allowed to make use of prior evaluations, chemical and biological tests, scientific research, and experience in making its determination, but is required to document the information used in making such a determination (40 CFR § 230.60). In addition, the Corps is required (§ 230.60(b)) to consider the following factors in making its determination: (1) potential routes of contaminants or contaminated sediments to the extraction site; (2) pertinent results from tests previously carried out on the material at the extraction site, or carried out on similar material for other permitted projects in the vicinity; (3) any potential for significant introduction of persistent pesticides from land runoff; (4) any records of spills or disposal of petroleum products or substances designated as hazardous under section 311 of the Clean Water Act; (5) information in Federal, State and local records indicating significant introduction of pollutants from various sources along the potential routes of contaminants to the extraction site.

The FSEIS fails completely to document the information used by the Corps in reaching its conclusion that the sediments of Ma'alaea Harbor meet Section 307 Toxicity Standards, and fails to demonstrate that the Corps has considered the factors listed above in reaching its conclusion. The Corps must provide this information in a revised EIS before it can be considered in compliance with Section 404(b)(1) of the Clean Water Act.

Conclusion

In summary, the FSEIS for the proposed Ma'alaea Harbor expansion is woefully inadequate. It is imperative that the Corps re-evaluate the impacts of the project and the adequacy of the proposed mitigation, and issue a revised supplemental EIS, pursuant to 40 CFR § 1502.9. In addition, as we stated in our comments of September 16, 1994, the Corps must revise the project so as to achieve compliance with the ESA, MMPA, and compliance with the requirements of Section 404 of the CWA.

Please do hesitate to contact us with any questions.

Very truly yours,

Mark Smaalders

Mark Smaalders
Resource Analyst

cc: Eugene Nitta, NMFS
Robert Smith, USFWS
Deanna Wieman, EPA
John Nakagawa, OSP
Hawaii State Department of Health
Protect Ma'alaea Coalition
Save Our Surf
Life of the Land
Surfrider Foundation

SIERRA CLUB LEGAL
DEFENSE FUND, INC.

The Law Firm for the Environmental Movement

223 South King Street, ... Building, Suite 400, Honolulu, Hawaii 96813 (808) 599-2436 Fax (808) 521-6841

19 SEP 1994
HED
DHED
SECY
CLK-TYP

September 16, 1994

M. Bruce Elliot
Lieutenant Colonel, U.S. Army
District Engineer (CEPOD-ED-PV)
US Army Corps of Engineers
Building 230
Ft. Shafter, Hawaii 96858-5440

RE: Public Notice No. CW94-0003

Dear Colonel Elliot:

We submit the following comments in response to U.S. Army Corps of Engineers ("Corps") Public Notice CW94-0003, issued August 15, 1994, regarding compliance with Section 404 of the Clean Water Act("CWA")(33 U.S.C 1344), and intent to discharge dredged and fill material into Ma'alaea Harbor, Maui. Based on our analysis of the Final Supplemental Environmental Impact Statement ("FSEIS") prepared by the U.S. Army Engineer District, Honolulu, and the mitigation measures proposed by the Corps in the public notice for the project, we believe that the proposed activity fails to satisfy the Corps' legal obligations under Section 404 of the Clean Water Act. In addition, the proposed activity does not comply with the requirements of Sections 7 and 9 the Endangered Species Act ("ESA") (16 U.S.C § 1536 and § 1538) and Section 101 of the Marine Mammal Protection Act ("MMPA")(33 U.S.C. § 1371).

It is imperative that the Corps re-evaluate the impacts of the project, the adequacy of the proposed mitigation, compliance with the ESA and MMPA, and compliance with the requirements of Section 404 of the CWA. As part of this process, and pursuant to 33 CFR § 327 and § 336, we hereby request that the U.S. Army Corps of Engineers hold a public hearing to consider the effects of the proposed discharge of dredged and fill material. We make this request on behalf of the Protect Ma'alaea Coalition, Save Our Surf and Life of the Land, whom we represent on this issue.

Our specific comments follow.

Coral Reefs

Coral reefs are considered by Section 404 (b)(1) guidelines to be "Special Aquatic Sites," and are given special consideration in the guidelines. 40 CFR § 230.1 (d) states:

> From a national perspective, the degradation of special aquatic sites . . . is considered to be among the most severe environmental impacts covered by these guidelines. The guiding principle should be that degradation or destruction of special sites may represent an irreversible loss of valuable aquatic resources.

The Corps' preferred alternative involves the destruction or alteration of approximately 11.9 acres of coral reef, coral rubble, and sand bottom. The U.S. Fish and Wildlife Service ("USFWS") has identified the coral reef fronting the harbor as the habitat of major concern at Ma'alaea because of its high value to threatened green sea turtles and to reef fish. Draft Fish and Wildlife Coordination Act ("FWCA") report at 22. The USFWS has also determined that reef habitats are relatively scarce on a national basis, and that the extent of healthy and productive coral reefs on a local basis may be declining.

As a result of concerns over impacts to coral reefs and other resources at Ma'alaea Bay, the USFWS requested in its Draft FWCA report (at 23) that "the Corps refine a workable design based on the concept underlying alternative 6." Alternative 6 specifies an interior mole, would involve no dredging or filling outside of the existing Ma'alaea Harbor, and would minimize impacts to coral reef resources.

To date, the Corps has failed to comply with this request. The Corps' response to the draft FWCA report, contained in an August 1, 1994 letter to Brooks Harper of the USFWS, provides information on the Corps' reasons for rejecting alternative 6 as it was modeled by the Corps' engineers, but fails to explain why the Corps could not "refine a workable design based on the concept underlying alternative 6", and fails to clearly demonstrate that such an alternative is not practicable. Such a demonstration is required by 40 CFR § 230.10 (a)(3). Pursuant to that regulation, the Corps must demonstrate that no design based on an interior mole configuration, or other design that does not impact coral reef resources, is practicable.

Turbidity

The Corps has failed to meet its statutory obligations to ensure that water quality standards are not exceeded, and that water quality is not significantly degraded. Water quality at Ma'alaea Harbor is frequently below state standards at present: monitoring at Ma'alaea Harbor by the Hawai'i State Department of Health shows that, "[i]n three years of sampling, criteria have consistently been exceeded for turbidity in over one-third of all measurements." FSEIS at 4-6. This condition is expected to worsen as a result of the proposed harbor expansion. According to the FSEIS (at 5-2):

> [t]urbidity would be increased while dredging, blasting, filling, and dredge spoil dewatering activities are completed. Additional exceedances in water quality standards for turbidity would be expected, both during construction, and as a result of increased turbulence caused by the additional vessel traffic.

Remarkably, despite its acknowledgement that the proposed project will exacerbate ongoing violations of the water quality standard, the Corps has no plans to limit turbidity within the harbor. The Corps' Public Notice for Ma'alaea harbor states (at 6) that "[t]urbidity within the harbor will not be controlled during construction." As you know, the Corps has a legal obligation to ensure that water quality standards are not exceeded as a result of activities that are regulated by Section 404 of the CWA. 40 CFR § 230.10 (b) states:

> No discharge of dredged or fill material shall be permitted if it: (1) causes or contributes, after consideration of disposal site dilution and dispersion, to violations of any applicable State water quality standard.

As part of its compliance with Section 404 requirements, the Corps must address how it will ensure that its activities do not contribute to the further exceedence of state water quality standards for turbidity at Ma'alaea Harbor.

<u>Significant Degradation of the Waters of The United States</u>

40 CFR § 230.10 (c) states: "(e)xcept as provided under section 404(b)(2), no discharge of dredged or fill material shall be permitted which will cause or contribute to significant degradation of the waters of the United States." The proposed project will cause significant degradation of the waters of the United States at Ma'alaea Bay, as a result of (but not limited to) impacts on water quality, coral reefs (addressed above) and surf sites.

(A) Water Quality Impacts. The deterioration of water quality associated with the proposed project has serious implications for marine life within Ma'alaea Bay. The USFWS has consistently expressed concerns over the impacts of increased turbidity associated with the harbor expansion. In a Biological Reconnaissance Report issued in 1979, the USFWS recommended that the Corps consider modifying the existing harbor channel entrance rather than cutting a new channel. The report also recommended that measures to reduce sedimentation of harbor waters from stormwater drainage be included in the proposed project design. The latter concern was reiterated in both a preliminary FWCA report issued in February 1980, and in a final FWCA report released in June 1980. Comments by the USFWS, transmitted to the Corps through the Department of Interior's Office of Environmental Affairs in June 1980, again reiterated these concerns:

> The Service recommended that the Corps incorporate sedimentation control measures into the project design to mitigate project-related adverse impacts on water quality. The Service expressed concern that greater boat usage in the harbor as a result of the proposed project will slow the settlement of newly-introduced sediments and increase the re-suspension of existing sediments in harbor waters. This increase in suspended sediments would add to the threat to nearby coral-reef habitats already posed by the existing heavy load of upland sediments entering the harbor with stormwater runoff.

> July 1993 FWCA Report at 3.

In its most recent (draft) FWCA report (July 1993) the USFWS notes that:

> Ma'alaea Bay is a productive system that may be limited by the effects of siltation. The biota of Ma'alaea Bay has been described as being unusual in that the abundance and diversity of marine species, which are uncommon elsewhere in the Hawaiian islands, are common in the bay. The reasons for the special character of the biological resources of the bay remain largely unknown and <u>extreme caution in undertaking any action which would alter any aspect or condition of the bay</u> has been urged (Kinzie, 1972). The maintenance of good water quality in Ma'alaea Harbor is of great importance since cumulative impacts to water quality could contribute to the degradation of the biological resources and ecological features of Ma'alaea Bay.

> Therefore, the Service recommends that the Corps develop measures to protect the quality of water in Ma'alaea Harbor from project related impacts and incorporate these measures as part of the proposed project.

July 1993 FWCA report at 21 (emphasis added).

Despite this explicit recommendation by the USFWS that the Corps develop measures to protect the quality of water within Ma'alaea Harbor from project-related impacts, and despite its obligation under 40 CFR § 230.10 (d) to minimize potential adverse impacts on the aquatic ecosystem, the Corps' Public Notice for Ma'alaea Harbor states explicitly (as quoted above) that "(t)urbidity within the harbor will not be controlled during construction." Taken in combination with the Corps' failure to address exceedences of the state water quality standard for turbidity this constitutes a complete abdication of the Corps' statutory obligation to ensure that water quality is not degraded as a result of this project.

(B) Surf Sites. As outlined in the Corps' Public Notice, the proposed action would result in the complete destruction of the Off-the-Wall surf site and would also result in the modification of Buzz's No. 1 and No. 2 sites. Surf sites support water-related recreation activities, and impacts to such activities are regulated under 40 CFR § 230.10 (c). Findings of significant degradation are to place special emphasis on the persistence and permanence of the effects of the dredge and fill activity. The guidelines for water-related state (§ 230.52) that "(o)ne of the more important direct impacts of dredged or fill disposal is to impair or destroy the resources which support recreation activities." The proposed alternative would permanently and irrevocably destroy or impair three unique surf sites, and thereby constitutes a significant degradation of the waters of the United States.

Compliance with the Toxic Effluent Standards of Section 307 of the Clean Water Act.

40 CFR § 230.10(b)(2) prohibits discharge of dredged or fill material if it violates any applicable toxic effluent standard or prohibition under Section 307 of the Clean Water Act. The Section 404(B)(1) Practicable Alternatives Analysis and Evaluation (hereinafter "Section 404 Evaluation") (in FSEIS Appendix A) states (at 11) that the "disposal operation is not expected to violate the Toxic Effluent Standards of Section 307 of the Clean Water Act." However, no data on the toxicity of

harbor sediments, which will be dredged and used as fill, are included in the FSEIS.

The U.S. Environmental Protection Agency raised this concern in their comments of January 15, 1993 (at 3), in which they called upon the Corps to "provide data to support the assumption that dredged and fill material is not contaminated as stated in Appendix A, 404(b)(1) Guideline Analysis." The Corps has provided no data in the FSEIS to support its assumption that harbor sediments will meet Section 307 Toxic Effluent Standards, and does not address this issue in its 15 August, 1994 response to the EPA (see FSEIS Appendix C). There is reason to believe that these sediments may be contaminated: other sites in the Hawaiian Islands have recorded very high levels of toxic pollutants in harbor sediments, and the stormwater that drains into Ma'alaea Harbor is known to carry both sediments and chemical pollutants, including agricultural fertilizers, pesticides and herbicides. See USFWS FWCA report at 15. In addition, the Corps itself has stated, in the course of its Section 404 Evaluation (at 10), that contaminants may pose a risk at the harbor:

> (t)he accumulation of contaminants in the harbor waters and bottom sediments presents the potential for bioaccumulation in the marine life inhabiting the site. In addition, the presence of contaminants in the bottom sediments raises problems for disposal of maintenance dredged material through the life of the project.

The Corps is required, in the course of its Section 404 Evaluation, to make a factual determination of the degree to which the material proposed for discharge will introduce, relocate, or increase contaminants (40 CFR § 230.11 (d)). In making this determination, the Corps must evaluate the possibility of chemical contamination of the material to be discharged, pursuant to 40 CFR § 230.60-61. The Corps is allowed to make use of prior evaluations, chemical and biological tests, scientific research, and experience in making its determination, but is required to document the information used in making such a determination (40 CFR § 230.60). In addition, the Corps is required (§ 230.60(b)) to consider the following factors in making its determination: (1) potential routes of contaminants or contaminated sediments to the extraction site; (2) pertinent results from tests previously carried out on the material at the extraction site, or carried out on similar material for other permitted projects in the vicinity; (3) any potential for significant introduction of persistent pesticides from land runoff; (4) any records of spills or disposal of petroleum products or substances designated as hazardous under section 311 of the Clean water Act; (5) information in Federal, State and local records indicating significant introduction of pollutants from various sources along the potential routes of contaminants to the extraction site.

The FSEIS fails completely to document the information used by the Corps in reaching its conclusion that the sediments of Ma'alaea Harbor meet Section 307 Toxicity Standards, and fails to demonstrate that the Corps has considered the factors listed above in reaching its conclusion. The Corps must provide this information before it can be considered in compliance with Section 404(b)(1) of the Clean Water Act.

Mitigation

The Corps' Public Notice fails to commit to or accurately describe significant mitigation either recommended or required by the USFWS and the NMFS. The Public Notice (at 6-7) lists but fails to commit to several mitigation measures recommended by the USFWS. In addition, the Corps' Public Notice completely omits a recommendation on the development of measures to protect the quality of water in Ma'alaea Bay from project-related impacts.

The public notice mischaracterizes conclusions presented in the NMFS Biological Opinion when it states (at 9):

> According to the Biological Opinion from the National Marine Fisheries Service (NMFS) issued on 25 April 1990, the project is expected to have an adverse effect on the endangered humpback whale in Hawaii, but with mitigation will have less adverse effect than the present situation.

The Biological Opinion submitted by NMFS does not indicate that the harbor expansion will have a less adverse effect than the present situation. It explicitly states: "[t]he increased vessel activity associated with the expansion and operation of the proposed small boat harbor at Ma'alaea, Maui, may adversely affect humpback whales in Hawaiian waters." NMFS Biological Opinion at 8. NMFS thus has taken the position that harbor expansion will worsen the present situation. NMFS states that the adverse effects of displacement of whales from the waters around Ma'alaea Harbor are outweighed by the benefits of consolidating vessel activity in existing facilities. It also states, however, that "future development of new harbors and boat ramps along the west Maui coast may likely exceed the jeopardy threshold." Biological Opinion at 8. Expansion of the harbor is thus one more instance of development in west Maui that the Biological Opinion states may lead to exceedence of the jeopardy threshold. The Corps' refusal to commit to the limitations

required by the Biological Opinion is another reason why the proposed project is not acceptable.

Threatened and Endangered Species

(A) Humpback Whales. The Corps has committed to implementing all of the recommendations provided in NMFS' Biological Opinion. Section 404(b)(1) Evaluation at 8. It has not, however, committed to abiding by the terms outlined in the Statement Regarding Incidental Taking Pursuant to Section 7(b)(4) of the Endangered Species Act of 1973 ("Section 7 Statement")(see FSEIS Appendix A). The Section 7 Statement outlines (at 1) "terms and conditions that must be complied with"; these include a requirement that blasting be restricted to the months of June through November inclusive. In its Public Notice, the Corps has stated that "[i]n general, blasting will be avoided during December through May if possible. If blasting must occur, charges will be kept small. . . ." (Emphasis added). As you must be aware, the Corps is obligated by the Endangered Species Act ("ESA") and the Marine Mammal Protection Act ("MMPA") to abide by the terms of the NMFS Section 7 Statement; should the Corps proceed with blasting in the months of December through May, as it has indicated it may do, it will be in violation of the ESA and MMPA.

Furthermore, careful evaluation of the Corps' obligations under the ESA and MMPA indicate that dredging and filling must also be restricted to June through November. The Biological Opinion prepared by the NMFS states that disturbance and injury to humpback whales may result from harbor construction activities such as "blasting, dredging and filling" that occur during the winter humpback breeding and calving season. As you know, disturbance and injury to humpback whales falls within the definition of harassment, and is prohibited by the ESA and MMPA in the absence of an incidental take authorization. The NMFS Section 7 Statement issued for this project expressly states (at 2) that it applies only to the endangered green sea turtle, and that no marine mammal take (pursuant to § 101(a)(5) of the MMPA) is authorized until appropriate small take regulations are in place and related "Letters of Authorization" are issued. Although we do not support any dredging and filling activities associated with this project as it is currently proposed, if the project were to move forward, the lack of an incidental take authorization means that the Corps must restrict all dredging and filling activities to the months of June through November, or be in violation of the ESA and MMPA.

(B) Hawksbill Sea Turtles. The Public Notice for Ma'alaea Harbor makes reference to a February 25, 1993 letter from the

NMFS that states that no effects on endangered hawksbill sea turtles are expected. In that letter (contained within Appendix A of the FSEIS), NMFS states that "[c]onsultation must be re-initiated if new information becomes available revealing the effects of the project on listed species that were not previously considered". According to information obtained from NMFS, (George Balazs, personal communication) two hawksbill were observed nesting at Ma'alaea in the summer of 1993, one of which was killed after being hit by a car. The total nesting population in Hawaii in 1993 was 24 turtles, meaning that the two at Ma'alaea represented some 8% of that year's known nesting population. Observations during the 1994 nesting seasons have recorded only 3 nesting females statewide, confirming prior indications that hawksbill nesting in Hawaii may be cyclic, with turtles nesting once every two years. This information implies that the total female nesting population may consist of as few as 25 individuals.

Taken in this light, the record of two nesting attempts at Ma'alaea Bay in 1993 is extremely significant, and obligates the Corps to re-initiate consultation with NMFS pursuant to Section 7 of the ESA regarding impacts of the proposed project on hawksbill sea turtles.

Failure to Ensure that Project Goals are Met

Analysis performed by the Corps has failed to ensure that the selected alternative meets the specific goals of the project. The Public Notice lists (at 2) the reduction of surge within the harbor as a specific goal of the harbor expansion project. Remarkably, no study of surge reduction has been undertaken by the Corps for any of the alternatives under active consideration; the only surge analysis performed by the Corps compared surge within the present harbor with that predicted for Alternative 6, which has been rejected by the Corps (see Wave Response of Proposed Improvement Plan 6 to the Small Boat harbor at Ma'alaea, Maui, Hawaii (hereinafter "Plan 6 Wave Study") within Appendix 6 of the SFEIS.) This study states (at 15)

> The HARBD numerical model was run for both Plan 6 and the existing plan to investigate the harbor response to wave periods characteristic of harbor oscillations. These tests were included because the "surge" problem reported in the existing harbor may arise in part from resonant response to long period wave energy impacting the harbor. Harbor oscillations were not considered in the earlier study (addressing wave response in other harbor alternative plans) by Lillycrop et al. (1993).

The failure to address harbor oscillations for the selected alternative is particularly troubling due to the fact that Plan 6 -- which shows "unacceptable" surge conditions -- recorded the lowest exceedence of the Corps' 1 ft. wave height exceedence criteria of any plan tested. Plan 6 exceeded this criterion only 1.9% of the time, while the 4 alternatives under consideration showed exceedences varying between 2 and 17.7%, with the Selected Alternative achieving a 6.1% exceedence. See Plan 6 Wave Study at 14. In failing to evaluate the harbor oscillations, other than to state in the SFEIS (at 5-8) that surge in the harbor will be "reduced substantially" with any of the four alternate plans, the Corps has not demonstrated that the selected alternative will meet one of its three primary goals.

Conclusion

In summary, the project as presented in the Public Notice fails to comply with numerous legal requirements, including but not limited to the Marine Mammal Protection Act, the Endangered Species Act, and the Clean Water Act. It is undisputed that the project will have a significant adverse impact on endangered species, coral reefs, water quality, and recreation resources; it is not clear that, as designed, the project will even satisfy its stated goals. For these reasons, we are strongly opposed to its implementation.

We look forward to your response to our request for a public hearing. Please do hesitate to contact us with any questions.

Very truly yours,

Mark Smaalders

Mark Smaalders
Resource Analyst

cc: Eugene Nitta, NMFS
Robert Smith, USFWS
Deanna Wieman, EPA
John Nakagawa, OSP
Hawaii State Department of Health
Protect Ma'alaea Coalition
Save Our Surf
Life of the Land
Surfrider Foundation

STEVEN TAUSSIG
P. O. BOX 1381
HAIKU, MAUI, HI 96708

U.S. ARMY ENGINEERS DIST. HONOLULU
ATTEN. CEPOD-ED-PV (LENNAN)
BUILDING T-1
FORT SHAFTER, HI.
TE835-5440

DEAR SIRS, 8/25/94

IN RESPONSE TO MAALAEA BOAT HARBOR ARTICLE, I HOPE YOU WILL NOT THINK OF EXPANSION OF HARBOR. LET THIS NOT BE ANOTHER ISSUE WHERE THE RICH PAVE OVER ANOTHER WATER RECREATIONAL SURF SPOT. AS FOR ME I'VE ONLY BEEN LIVING ON MAUI FOR THREE YEARS. HOWEVER I WOULD SINCERLY CONTEMPLATE MOVING TO KAUAI, IF EXPANSION IS EMINENT. LET THE MAJORITY OF WATER LOVING PEOPLE ENJOY WHAT THEY ALREADY HAVE. Sincerely, Steven Taussig

Z

APPENDIX H

CLEAN WATER ACT

DRAFT SECTION 404(b)(1) EVALUATION

I. PROJECT DESCRIPTION

a. Location. Ma'alaea Harbor for Light-Draft Vessels, Ma'alaea, Maui, Hawaii. The harbor is located on the south-central coast of Maui.

b. General Description. The Corps of Engineers, Honolulu District (HED) and the Hawaii Department of Land and Natural Resources (DLNR) propose to build improvements to the Ma'alaea Harbor for Light-draft Vessels at Ma'alaea, Maui. Users and potential users have identified a shortage of berths, surge problems and resultant vessel damage in within the harbor, navigation hazards in the existing entrance channel, inadequate harbor facilities, and concerns about impacts on navigation at Ma'alaea Harbor.

The Federal portion of the proposed action consists of realigning the entrance channel and modifying the existing breakwater to protect the new entrance channel. The purpose of these improvements are to reduce the surge within the harbor basin, reduce navigation hazards in the entrance channel, and provide opportunity for addition of commercial and recreational berthing spaces and associated harbor facilities. The local sponsor, the Hawaii DLNR, would provide expanded berthing facilities and improved infrastructure, including fuel station, sewage treatment and pumpout facilities.

The proposed plan consists of: extending the south breakwater 620 feet; dredging an entrance channel 610 feet long, 150-180 feet wide, and 12-15 feet deep; dredging a 1.2-acre turning basin, 12 feet deep; dredging a 720-foot-long, 30-foot-wide, and 8-foot deep main access channel; adding a 400-foot-long revetted mole on the seaward side of the existing south breakwater, for bus turn-around; adding a center revetted mole, where the DLNR will later develop a fuel dock; and adding an east revetted mole, where the DLNR will later build berths.

Construction of the breakwater, moles and dredging portion of the project is expected to take approximately 26 months.

The work staging and storage area would be located on the paved portion of the harbor parking areas.

c. Authority and Purpose. Section 404 and Section 401 of the Clean Water Act (33 U.S.C. 1341; 33 U.S.C. 1344); Sections 324D-4 and 342D-53, Hawaii Revised Statutes (HRS).

d. General Description of Dredged or Fill Material. About 80 feet of the existing east breakwater head would be removed in order to realign the entrance channel, and about 41,260 cubic yards of material would be dredged from the existing harbor basin, to enlarge the turning basin and access channel, and for construction of the new entrance channel. About 5,000 cubic yards of that amount would be used for construction of the breakwater extension and south revetted mole, which would require a total of about 40,700 cubic yards of fill. About 34,800 cubic yards of fill material will be needed for the center mole and east revetted mole. An additional 53,000 tons of stone and 15,600 cubic yards of concrete armor units would be placed in the construction of the breakwater and the three revetted moles. All suitable dredged material will be used in construction of the breakwater and mole structures. Any remaining material will be disposed in an upland site.

Dredged material will consist of unconsolidated clastic marine sediments with coral sands, gravels, cobbles and boulders which currently lie beneath a lightly cemented coral limestone breccia crust, as well as clay, silt, and sand from terrigenous sources. Conventional dredging equipment such as heavy-duty backhoes, clamshells, and hydraulic cutter heads would be used.

Construction materials would consist primarily of dredged material, basalt stone, and concrete. Material dredged from the entrance channel and harbor would be used in the construction of the breakwater extension and revetted moles. The stone material can be obtained from three commercial quarries on Maui and the concrete required for construction of armor units for the main breakwater extension can be obtained from a commercial source.

Rock will consist of boulders measuring ½ cubic yard or more. Granular material shall consist of well-graded sand, gravel or crushed stone composed of hard, tough and durable particles.

e. Description of the Proposed Discharge Site(s). Figure 1 in the Draft Supplemental EIS II shows the project location. Figure 2 shows existing habor structures, and Figure 7 shows the proposed action.

The proposed project site is located on the southern shore of Maui in the northwestern corner of Ma'alaea Bay. The Ma'alaea Harbor was constructed on a large fringing reef flat at the western end of the Bay. The harbor is used for commercial and recreational boating. Existing features at the Harbor include a south revetted mole approximately 1,100 feet long and 90 feet wide; an east breakwater approximately 850 feet long and 26 feet wide; an entrance channel approximately 90 feet wide and 13 feet deep; and an interior basin approximately 11.3 acres in size. Additional facilities include a one-lane concrete launch ramp, parking spaces, a haul-out facility, a small restroom, two small storage buildings, and space for boat repair and maintenance. The south revetted mole provides parking for autos and buses. The total berthing capacity is 96 (but because of size, only 89 vessels are currently harbored here). About half of these vessels are recreational.

Three upland stormwater drainage channels flow into the northern side of the basin. These drainages and runoff from erosion-prone uplands in other parts of the Bay increase the sediment load in nearshore waters significantly. The harbor basin acts as a sediment trap.

Northeast tradewinds generally prevail. Ocean current near the harbor is predominantly a tradewind-generated surface movement toward the southwest. Although tidal currents are fairly weak, tidal fluctuations coupled with prevailing wind-driven currents are believed to result in continuous flushing of the harbor.

The disposal sites are the locations of the proposed protective structures and moles. The structures and related fill areas have been designed to minimize the amount of material to be discharged into the water.

The harbor bottom consists primarily of soft sediments with remnants of the former reef flat still present within the central and eastern portion of the basin. Live corals have developed along the east and west slopes of the dredged channel and turning basin. Inside the harbor, the greatest concentration of coral occurs along the dredged channel entrance near the southern tip of the east mole. Coral cover near the entrance is about 30 to 40 percent. The eastern edge of a triangular reef remnant in the center of the harbor also contains high coral coverage. Outside the harbor, high coral coverage exists on either side of the channel entrance and extends eastward.

Marine resources in the project area include a variety of corals, fish, algae, and macroinvertebrates, The coral reef fronting the harbor supports the green and hawksbill sea turtles, which are Federally listed species. Ma'alaea Bay is one of four major breeding, calving, and nursing areas for endangered humpback whales in Hawaii. These whales are known to occur within several hundred feet of the harbor entrance.

Three surf sites are located adjacent to the harbor. One of these, the "Ma'alaea Pipeline" is known internationally as one of the best waves in the world and is considered to be unique. "Off-the-Wall" is also considered to be unique. Buzz's consists of three separate breaks, and is located along the south breakwater.

f. Description of Disposal Method. Conventional dredging equipment such as heavy-duty backhoes, clamshells, and hydraulic cutter heads would be used. In areas where these methods are not effective, blasting may be used.

Blasting will not be permitted from December 1 through May 31. It shall be controlled to result in a minimum overbreak or shattering of material beyond excavation lines and grades.

Stones will be placed by suitable equipment or placed by hand on the prepared base.

II. FACTUAL DETERMINATIONS.

a. Physical Substrate Determinations.

(1) Substrate Elevation and Slope. The shallowest areas in the harbor are along the east breakwater and over the remnant triangular reef shoal in the center of the harbor. The deepest areas are in the entrance channel and follow a broad swath north from the entrance channel to the northern boundary of the harbor. Harbor slope is generally towards this deep area. Outside the harbor shallow areas front the south breakwater and very shallow areas are to the east of the east

breakwater. Deeper areas extend from the entrance to the east, southeast, and south. There would be some changes in bottom elevations and slope with the proposed action. The entrance channel would be realigned; however, the corridor planned for the entrance channel is already one of the deepest areas, so depths will not change substantially. The south breakwater extension would be placed upon one of the most shallow areas just outside the harbor entrance. The center mole would be constructed upon a remnant shoal in the center of the harbor in one of the shallowest areas; fills associated with the east mole would also be placed in one of the more shallow areas. Dredging would occur in the areas already containing the deepest portions of the harbor. No major changes in substrate elevation and slope are expected.

(2) Sediment Type. The harbor bottom consists primarily of soft sediments with remnants of the former reef flat still present within the central and eastern portion of the basin. Live corals have developed along the east and west slopes of the dredged channel and turning basin. Inside the harbor, the greatest concentration of coral occurs along the dredged channel entrance near the southern tip of the east mole. Coral cover near the entrance is about 30 to 40 percent. The eastern edge of a triangular reef remnant in the center of the harbor also contains high coral coverage. Outside the harbor, high coral coverage exists on either side of the channel entrance and extends eastward.

Altering a high energy area to a low energy one subsequent to the placement of structures, will change the composition of the substrate, since silty fine sediments typify low energy areas and coarser sediments exemplify high energy bottom habitat. The changes in circulation and sedimentation will alter existing habitat.

Dredging activities would result in loss of some coral substrate, with replacement by soft sediments, and unconsolidated clastic marine sediments with coral sands, gravels, as well as clay, silt, and sand from terrigenous sources. A new channel would be dredged, and dredging will also occur within the harbor basin, resulting in deepening of the basin. Corals are expected to develop along the slopes of the dredged entrance channel and also within freshly dredged areas within the harbor.

(3) Dredged/Fill Material Movement. All suitable dredged material will be utilized as fill in the construction of the south breakwater extension, the east mole, and the center mole. Fill material will be covered as soon as possible with rock revetment to prevent erosion and subsequent sediment movement effects. Blasting would be required where traditional dredging equipment cannot remove difficult material. The dredging, filling, and blasting would be accomplished using silt curtains or other sediment-containment devices to ensure that dredged sediments would be confined to the most localized area possible.

The breakwater structure will extend into deeper water and will tend to intercept littoral drift. The resulting shoaling is expected to occur primarily in the entrance channel in the lee of the breakwater extension. In the short-term, shoaling within the harbor basin is expected to continue at about its present rate due to continuing deposition of terrigenous sediments. With the conversion of agricultural lands to commercial and residential development adjacent to the harbor, and with the drainage improvements planned for several future development actions, long-term sediment loading in the harbor from upland sources is expected to decrease, as will shoaling.

(4) Physical Effects on Benthos. Sessile or sedentary species are most vulnerable to adverse impacts, including burial and smothering, because they cannot move from the area of disturbance. Sedimentation, particularly for disposal operations, has the potential for burial of benthic communities. Sedentary organisms, such as coral reefs, are particularly vulnerable to burial. Films of silt or suspended sediment plumes may temporarily affect feeding, respiration, or photosynthetic activity.

Placement of fill for the east revetted mole would affect an area nearly completely covered by sediments. Placement of fill for the center mole would cover a shoal area with live coral, and some areas of soft substrate. This would result in a loss of benthic residents and algae growing in and over the substrate. These resources provide food and shelter for some species of juvenile foodfishes. The new structures would provide habitat for a different biological community. Benthic forms present prior to the placement of fill are not likely to recolonize on the fill since its surface would consist of materials that are substantially different from that currently present. The armor units and rocks would provide new habitat for some algae and benthic invertebrates. It is estimated that about 1.4 acres of new habitat would be provided by the structures. A rapid recolonization of algae and benthic organisms is expected to occur, although the community is likely to differ.

Corals can be harmed by increases in turbidity and suspended solids. High turbidity and sedimentation may decrease coral abundance, alter growth forms, and decrease coral species diversity. Coral feeding activity can be reduced and decreased light penetration affects photosynthetic corraline algae. This is particularly true in low water motion environments, as within the harbor. However, no coral reef would remain within the harbor to be affected by the turbidity, and in the high water motion environment outside of the harbor, sediments are transported away to deeper depths. Any corals colonizing dredged slopes would be those with tolerance for the conditions.

Indirect impacts on corals and other filter-feeders and algae could occur as a result of temporary degradation of nearshore water quality. Effects may include smothering caused by excessive sedimentation, abrasion of corals by current-driven suspended sediments, and reduced primary productivity from decreased light levels. Silt containment measures will be utilized during construction activities to restrict these effects to the smallest area possible. Adverse sediment damage to adjacent reefs is not expected with the employment of best management practices. Bottom flows, where heaviest sediment is entrained, are into the harbor, whereas surface flows, with very light, fine suspended materials, are driven out of the harbor. Sediments carried out of the harbor would be diluted and kept in suspension by wave action and would be transported offshore. The surface layer of water flow carrying the resuspended sediments would move with the prevailing southwestward surface flow.

Dredging can increase circulation. The habitat loss from construction is also lessened by the colonization of new surface areas provided by marine structures particularly riprap. Reef surfaces exposed by dredging often become recolonized by reef-building species. Algae and benthic invertebrates that live on these surface areas may serve as fish forage. Resuspension of nutrients during dredging can be useful in providing needed nutrients to phytoplankton and other vegetation. Dredging may provide a temporary food source for turbidity-tolerant fishes, crabs, and shrimp that forage on the benthic animals discharged with dredged material. Dredging would attract fish to feed on exposed benthic organisms.

Because of the highly variable nature of marine benthic assemblages, disturbances by dredging/disposal activities usually represent relatively minor and short-lived impacts, similar to those induced by storm events.

(5) Other Effects. Pollutants trapped in sediments can be resuspended during dredging. However, harbor sediments were tested for 32 contaminants, which were either not detected or were found at very low levels. Ingestion of resuspended pollutants by marine organisms is not expected.

(6) Actions Taken to Minimize Impacts (Subpart H). Breakwaters and revetments would be constructed of large boulders and/or core-locs to dissipate wave energy and resist erosion and its subsequent turbidity effects. Fills would be protected from erosion with armor stone as soon as practicable after placement to avoid additional effects of suspended sediments in the water column. Fill materials will be free of pollutants. All spoil temporarily stored at the project site would be placed behind watertight berms above the tidal influence. No dredged spoil would be stockpiled in the marine environment. The DLNR, Division of Aquatic Resources, will design, fund, and supervise field work and development of a predictive geographic model to forecast potential changes in sediment transport in response to changes in coastal topography.

Transplantation of corals was determined to be not feasible for several reasons. Coral colonies inside the harbor are adapted to low water motion environments and have growth forms that could not survive relocation to higher water motion regimes outside of the harbor. Coral colonies on the outside of the harbor are either too large or encrusting to be easily transplanted and cannot be readily fragmented into smaller movable pieces. To mitigate for a net loss of 3.3 acres of reef habitat, construction of artificial reefs would be accomplished, in the amount of 3.3 acres. This would be accomplished by additions to the State's existing artificial reef.

If blasting is required, the construction contractor would be required to prepare a blasting plan to identify the measures to be implemented to protect aquatic life.

b. Water Circulation, Fluctuation and Salinity Determinations.

(1) Water.

(a) Salinity. Salinity gradients will not be affected.

(b) Water Chemistry (pH, etc.). The effects on the harbor water quality of other potential components of the increased stormwater input, such as pesticides and herbicides for landscaping purposes, and petroleum products from upland parking lots would likely be adverse. However, the reduction in agricultural chemical inputs resulting from the conversion of nearby adjacent uplands from agricultural to commercial and residential uses may offset those adverse effects. Additional chemical input due to the proposed project could include fuel and oil residues in the long-term.

(c) Clarity. During construction, dredging, filling, and blasting activities would result in a temporary effect on water clarity. Bottom sediments will be resuspended, but when dredging ceases, water clarity will quickly return to normal.

Turbulence caused by increased boat traffic within the harbor will resuspend fine sediments, but the projected future reduced sediment input would result in an overall increase in water quality within the harbor.

(d) Color. No effect is expected.

(e) Odor. No effect is expected.

(f) Taste. No effect is expected.

(g) Dissolved gas levels. Dissolved oxygen concentrations near dredging sites have been reported to be lower than concentrations measured away from dredging operations. Dredging activities may suspend nutrients or organic material into the water column, possibly resulting in a higher biological oxygen demand, and leading to reduced dissolved oxygen levels. These effects would be localized and temporary, and since there is no existing problem with low dissolved oxygen levels in the harbor and flushing would quickly dilute these effects, they would not persist.

(h) Nutrients. The major cause of algae blooms and chlorophyll A exceedences in the harbor is unknown. The DBOR and DAR will accomplish a shoreline cleanup of nuisance algae in and adjacent to the harbor.

Resuspension of nutrients during dredging may provide needed nutrients to phytoplankton and other vegetation. Resuspended detritus may also provide nutrient material and protection from predation for transient biota. Turbidity created by dredging can benefit sponges, echinoderms, etc. because of increased availability of food in the dredge effluent. The resuspension of nutrients, such as nitrogen in the form of ammonia, from sediments may enhance primary productivity.

(i) Eutrophication. No effects are expected.

(j) Others as Appropriate. Current exceedences of enterococci in the harbor may be caused by stormwater runoff or by the lack of adequate wastewater facilities. The construction of a sewage treatment facility and pumpout facilities in conjunction with the harbor improvements may reduce the number of exceedences of this parameter. Activities associated with or resulting from the proposed action are not likely to introduce new sources of this bacteria.

(2) Current Patterns and Circulation.

(a) Current Patterns and Flow. Circulation within Maalaea Harbor is primarily wind-driven, since the tidal range is generally less than about 2-1/2 feet. The flow is two-layered, with the surface water flowing out of the harbor, and the bottom layer flowing into the harbor. The circulation inside the harbor is a clockwise circulation set up due to the north wind pushing water against the south breakwater. A smaller counterclockwise flow exists in the west end of the harbor. Outside the harbor a small portion of the flow outside the east breakwater reverses due to the interaction between westward flow and the breakwater. Approaching the west coastline, velocity is diminished and the current direction turns southward.

The new breakwater extension would deflect incoming flow from its original southwestward direction into a straight southward direction with accelerating flow speed. The original southwestward flow then would turn northward. An eddy would be expected to develop around the tip of the breakwater extension, exerting a circular effect on the flow around the harbor mouth.

With the proposed project, the circulation pattern would be similar to existing conditions, but the exchange rate between the harbor and bay water would be reduced due to the decrease of the available area for free exchange. The rate of harbor flushing would be reduced with the addition of the south breakwater extension, as well as the addition of the center mole. However, with design modifications to the center mole which allows relatively free water circulation around the structure, the reduction in flushing rate is minor.

(b) Velocity. Current velocity outside the harbor is about 10 to 15 cm/sec. The velocity inside the harbor is between 2 to 5 cm/sec; it would decrease by 10 to 15 percent after the proposed project is constructed.

(c) Stratification. Not applicable.

(d) Hydrologic regime. See paragraphs (a) and (b) above.

(3) Normal Water Level Fluctuations (tides, etc.) Normal water level fluctuations would not be affected. Wave heights would be reduced in the new entrance channel and within the berthing areas.

(4) Salinity Gradients. Salinity gradients will not be affected.

(5) Actions That Will be Taken to Minimize Impacts (refer to Subpart H). Silt curtains and other means will be directed by the HED for the contractor to confine suspended sediments during dredging of the entrance channel and construction of project features. Construction practices will be employed to prevent persistent turbidity and excessive sediment transport into

areas of living corals. All temporarily constructed facilities or structures, including silt containment, will be removed immediately after completion of work in the water.

Fill materials will be free of pollutants, and no contamination should result from construction activities. A contingency plan for containing and controlling accidental spills of petroleum products at the construction site, including storing absorbent pads and containment booms on site would be developed.

Lumber and other construction materials treated with preservative substances will not be permitted to contact the water until after at least 1 week of drying. Construction and fabrication of dock assemblies will be take place insofar as possible on fast land. Construction materials, petroleum products, human wastes, debris, and landscaping substances will not be permitted to fall, flow or leach into the ocean or drainage ditches which enter the harbor.

All spoil temporarily stored at the project site would be placed behind watertight berms above the influence of the tides. No dredged spoil will be stockpiled in the marine environment. All construction related materials would be placed or stored in ways to avoid or minimize disturbance to the reef, with the exception of the construction footprint.

Fills would be protected from erosion with armor stone as soon as practicable after placement to avoid additional effects of suspended sediments in the water column.

With the except of design modifications made to avoid and minimize environmental impacts, breakwaters and revetments would be constructed of large boulders and/or core-locs to dissipate wave energy and resist erosion.

The State of Hawaii DLNR, Division of Boating and Ocean Recreation and Division of Aquatic Resources will implement a shoreline cleanup of *Hypnea musciformis* in and adjacent to the harbor.

Work would discontinue during flood conditions.

Water quality will be monitored during and after construction.

c. Suspended Particulate/Turbidity Determinations. During construction, turbidity would be increased while dredging, blasting, fill and dredge spoil dewatering activities are completed. Exceedences in water quality standards for turbidity may be expected for the duration of construction.

Indirect impacts on corals and other filter-feeders and algae would be expected as a result of temporary degradation of nearshore water quality. These effects may include smothering caused by excessive sedimentation, abrasion of corals by current-driven suspended sediments, and reduced primary productivity from decreased light levels.

Corals can be harmed by increases in turbidity and suspended solids. Coral feeding activity is reduced and decreased light penetration affects photosynthetic coraline algae. High turbidity and sedimentation may decrease coral abundance, alter growth forms, and decrease coral species diversity. Because surface flows differ in direction from the bottom flows within the harbor, resuspended sediments within the harbor would not be expected to have a significant effect on the coral areas outside the new harbor entrance. Bottom flows which entrain the heaviest sediments, flow into the harbor. The surface layer of water carrying the lightest and finest sediment flows out of the harbor, become entrained, and move with the dominant southwestward surface flow.

Dredging activities may result in potentially adverse ecological effects in terms of habitat loss, fishery potential reduction, and circulation disruption, positive effects can also result. Dredging can increase circulation. The habitat loss from construction is also lessened by the colonization of new surface areas provided by marine structures particularly riprap. Algae and benthic invertebrates that live on these surface areas may serve as fish forage. Resuspension of nutrients during dredging can be useful in providing needed nutrients to phytoplankton and other vegetation. Dredging may provide a temporary food source for turbidity-tolerant fishes, crabs, and shrimp that forage on the benthic animals discharged with dredged material. Resuspended detritus may also provide nutrient material and protection from predation for transient biota. Turbidity created by dredging can benefit sponges, echinoderms, etc. because of increased availability of food in the dredge effluent.

Fish egg development can be delayed for several hours by suspended solids; mollusk eggs and larvae development are similarly affected. The only effect that would be expected on fish eggs is a slight delay in time to hatching. Lethal concentrations are far in excess of levels characteristic of dredging operations. Juvenile forms of fish are not likely to be permanently or lethally affected.

Adult fish are more sensitive to suspended solids than most invertebrates, but can escape turbidity plumes. Some bottom-dwelling species could be susceptible to dredging activities.

All life stages of pelagic fish appear to be fairly tolerant of elevated suspended sediment concentrations. Fish species depositing demersal eggs can be negatively impacted. Sediment layers over 0.5 mm can cause significant mortality. Juveniles and adults of practically all fishes are sufficiently mobile to avoid burial due to increased sedimentation rates or prolonged exposures to suspended sediments at a dredging site. Fishes generally return shortly after the disturbance ceases. The major impact on these stages is the potential loss of benthic food sources.

Both demersal and pelagic fish eggs and larvae are susceptible to entrainment by suction dredges due to their inability to escape. Mortality of entrained fry approaches 100 percent since the majority is buried by sediment, while the remainder suffer abrasion of external surfaces.

Suspended sediment apparently has little effect on feeding or movement of shellfish larvae through the water column. Shellfish species inhabiting turbid coastal waters can be expected to be adapted to and highly tolerant of suspended sediment concentrations for reasonable durations of time.

Dredging, filling, and blasting activities are not likely to release hazardous or toxic contaminants into the aquatic environment. Bottom sediments were sampled and tested. None of the substances tested were above action limits, and most were below the limits of detection. Ingestion of resuspended pollutants by marine organisms is not expected.

Turbulence caused by increased boat traffic within the harbor will resuspend fine sediments, but the reduced future sediment load would result in an increase in water quality within the harbor because there would be less sediment for boating traffic to resuspend.

Silt curtains will be used to confine the dredging and filling activities to a very localized area, to ensure high suspended sediment concentrations are kept to the smallest possible area.

Because of the highly variable nature of marine benthic assemblages, disturbances by dredging/disposal activities usually represent relatively minor and short-lived impacts, similar to those induced by storm events, or other disturbances.

(2) Effects (degree and duration) on chemical and physical properties of the water column.

(a) Light Penetration. Light penetration will be affected temporarily. During construction, turbidity and suspended sediment would be increased. Dredging within the harbor and entrance channel will deepen some areas, decreasing light penetration.

(b) Dissolved Oxygen. Dredging activities may suspend nutrients or organic material into the water column, possibly resulting in a higher biological oxygen demand, and leading to reduced dissolved oxygen levels. These effects would be localized and temporary, and since there is no problem with low dissolved oxygen levels in the harbor, the effects would not persist.

(c) Toxic Metals and Organics. Dredging, filling, and blasting activities are not likely to release hazardous or toxic contaminants into the aquatic environment. Bottom sediments were sampled and tested. None of the substances tested were above action limits, and most were below the limits of detection.

(d) Pathogens. The introduction of pathogens may be decreased with the construction of the new sewage treatment facilities. There may be a decrease in the concentrations of enterococci found in water samples.

(e) Aesthetics. The aesthetics of the water would be affected during construction. No long-term effects on the aesthetics of the water are expected.

(f) Others as appropriate. None.

(3) Effects on Biota

(a) Primary Production and Photosynthesis. Reduced light penetration levels during construction may temporarily result in reduced primary productivity. The resuspension of nutrients, such as nitrogen in the form of ammonia, from sediments may enhance primary productivity.

Indirect impacts on corals and other filter-feeders and algae would be expected as a result of temporary degradation of nearshore water quality. These effects may include smothering caused by excessive sedimentation, abrasion of corals by current-driven suspended sediments, and reduced primary productivity from decreased light levels. However, silt containment will be used to ensure that dredging, filling, and blasting effects are kept to the absolute minimum area.

Positive effects can also result from dredging and filling activities.. Dredging can increase circulation. The habitat loss from construction is also lessened by the colonization of new surface areas provided by marine structures particularly riprap. Algae and benthic invertebrates that live on these surface areas may serve as fish forage. Resuspension of nutrients during dredging can be useful in providing needed nutrients to phytoplankton and other vegetation. Dredging may provide a temporary food source for turbidity-tolerant fishes, crabs, and shrimp that forage on the benthic animals discharged with dredged material.

(b) Suspension/Filter Feeders. Filter feeding invertebrates can be affected by turbidity. With increased level of suspended solids, the energy expended in food gathering may exceed energy obtained from the food. The effects of turbidity are usually not permanent.

(c) Sight Feeders. Mobile sight feeders will move away from the sediment plume for feeding purposes. Sedentary sight feeders may be unable to obtain food. Effects would dissipate after construction.

(4) Actions Taken to Minimize Impacts (subpart H). Silt containment measures will be taken to ensure that sediment effects are kept to the minimum area possible. Fills will be anchored with armor stone as soon as possible after placement to prevent erosion. Water quality will be monitored during and after construction.

d. Contaminant Determinations. Contaminants are not expected to occur as a result of the proposed dredging and filling activities. Bottom sediments were sampled and analyzed for 32 hazardous compounds and 8 metals. Most contaminants were not detectable, and others were at very low levels. No effects due to contamination are expected.

e. Aquatic Ecosystem and Organism Determinations

(1)-(3) Effects on Plankton, Benthos, Nekton. Based on on the analysis in paragraphs a through d above, the overall effects on the aquatic ecosystem will not be significant. Because of the highly variable nature of marine benthic assemblages, disturbances by dredging/disposal activities usually represent relatively minor and short-lived impacts, similar to those induced by storm events, or other disturbances.

(4) Effects on Aquatic Food Web. Fish egg development can be delayed for several hours by suspended solids; mollusk eggs and larvae development can also be affected. The only effect that would be expected on fish eggs is a slight delay in time to hatching. Lethal concentrations are far in excess of levels characteristic of dredging operations. Juvenile forms of fish are not likely to be permanently or lethally affected.

Both demersal and pelagic fish eggs and larvae are susceptible to entrainment by suction dredges due to their inability to escape. Mortality of entrained fry approaches 100 percent since the majority is buried by sediment, while the remainder suffer abrasion of external surfaces.

All life stages of pelagic fish appear to be fairly tolerant of elevated suspended sediment concentrations. Fish species depositing demersal eggs can be negatively impacted. Sediment layers over 0.5 mm can cause substantial mortality. Juveniles and adults of practically all fishes are sufficiently mobile to avoid burial due to increased sedimentation rates or prolonged exposures to suspended sediments at a dredging site. Fishes generally return shortly after the disturbance ceases. The major impact on these stages is the potential loss of benthic food sources.

Adult fish are more sensitive to suspended solids than most invertebrates, but can escape turbidity plumes. Some bottom-dwelling species could be susceptible to dredging activities.

A benthic community different from that inhabiting the existing dredge and fill sites is expected to colonize the new structures. Generalized feeders would not be adversely affected; any specialized species requiring food provided by the habitat to be lost would be displaced to other suitable habitats, with a corresponding increase in competition for that resource.

Resuspended detritus may provide nutrient material and protection from predation for transient biota. Turbidity created by dredging can benefit sponges, echinoderms, etc. because of increased availability of food in the dredge effluent.

Suspended sediment apparently has little effect on feeding or movement of shellfish larvae through the water column. Shellfish species inhabiting turbid coastal waters can be expected to be adapted to and highly tolerant of suspended sediment concentrations for reasonable durations of time.

Ingestion of resuspended pollutants by marine organisms is not expected. Recent sediment sampling did not find contaminants near allowable limits.

Silt curtains will be used to confine the dredging and filling activities to a very localized area, to ensure high suspended sediment concentrations are kept to the smallest possible area.

Because of the highly variable nature of marine benthic assemblages, disturbances by dredging/disposal activities usually represent relatively minor and short-lived impacts, similar to those induced by storm events, or other disturbances.

(5) Effects on Special Aquatic Sites

(a) Sanctuaries and Refuges. The nearshore waters outside the harbor are within the boundaries of the Hawaiian Islands Humpback Whale National Marine Sanctuary. Adverse effects are expected on the endangered humpback whale, including displacement of the whales from a portion of their cow/calf habitat. The National Marine Fisheries Services has determined that the proposed action is not likely to jeopardize the continued existence of the humpback whale.. As long as construction activities are conducted with the required State and Federal permits, the proposed action complies with the Sanctuary implementing regulations. Although the proposed project would result in increased vessel traffic and its associated adverse impacts on whales and sea turtles, the overall effects to the species and to the Sanctuary are expected to be beneficial compared to future conditions without the proposed project. It would help consolidate vessel traffic so that other important whale and sea turtle habitats are not affected.

Measures to protect whales from disturbance and injury would be taken during construction activities, including surveying and monitoring the presence of the animals, limiting blasting to specific seasons to avoid critical reproductive stages and activities, limiting the size of blasting materials, shifting mooring areas to avoid whale and sea turtles, and development and implementation of ingress and egress corridors, as well as vessel speed limits.

(b) Coral Reefs. Approximately 4.8 acres of coral reef will be directly impacted by dredging and filling activities. Inside the harbor, this includes the dredging and filling of about 13,040 square feet of the triangular reef flat in the center of the harbor and the dredging of 32,650 square feet along the eastern breakwater. Outside the harbor about 23,025 square feet to be filled by the construction of the south breakwater extension, and 134,900 square feet to be filled with the construction of the south breakwater extension and the dredging of the new entrance channel.

The new breakwater, channel slope and interior harbor slope would provide about 1.5 acres of useable substrate for colonization by other benthic communities. Only the protected areas inside the breakwater could support coral cover greater than 5 percent. In order to replace the net loss of 3.3 acres of coral reef habitat, additions totaling 3.3 acres would be made to the State's artificial reef.

(c) Wetlands. No wetlands, mud flats, vegetated shallows, or riffle and pool complexes would be affected.

(6) Threatened and Endangered Species. The National Marine Fisheries Service prepared a Biological Opinion dated July 23, 1990, which concluded that the proposed activities are not likely to jeopardize the continued existence of humpback whales or green-sea turtles. The increased vessel activity associated with the expansion and operation of the harbor may adversely

affect humpback whales, based on the likelihood of displacing whales from a portion of the cow/calf habitat. NMFS stated, however, that despite the potential for adding vessel traffic, the benefits of consolidating vessel activity in existing facilities and preserving nearshore cow/calf habitat in other areas of west Maui outweigh the possible adverse effects of displacement of humpback whales. NMFS believes that adverse impacts to whales from vessel traffic will be reduced compared to impacts from expected increases in vessel traffic without the proposed project.

NMFS also determined that the proposed activity may result in the injury or mortality of green turtles and established an incidental take by injury or mortality of one turtle during the course of construction. Five turtles per day may be disturbed or temporarily displaced. Because NMFS stated that if dredging, filling, and construction of revetments are conducted with reasonable care, these activities could result in some adverse effects, but are not likely significant enough to result in a take. No incidental take provisions were provided for the humpback whale.

The HED concluded that the proposed project is not likely to affect the hawksbill turtle and Hawaiian monk seal, and NMFS concurred with this determination.

(7) Other Wildlife. No terrestrial wildlife species would be affected by the proposed action.

(8) Actions to Minimize Impacts (Subpart H). Measures that will be implemented to protect the whale and turtle during construction include: a restriction that blasting be conducted only during the months of June through November, except that if blasting is determined necessary during restricted months, consultation with NMFS will occur prior to blasting; NMFS will be notified 10 days before blasting in order to monitor blasting activities; blast sites will be monitored by boats and diverse to ensure the area of clear of marine mammals and turtles before blasting occurs; consultation regarding charge size must occur with NMFS and HED; any disturbance or injury to listed species must be reported to NMFS within 24 hours; and a report summarizing monitoring information will be submitted to NMFS.

f. Proposed Disposal Site Determinations.

(1) Mixing Zone Determinations. The mixing zone will be confined to the smallest practicable zone within each specified disposal site. The use of silt curtains or other silt containment devices will ensure effects of sediment dispersal are kept to the smallest area possible.

(2) Determination of Compliance with Applicable Water Quality Standards. Routine water quality sampling in Ma'alaea Harbor in the last several years showed that between 1991 through 1994, criteria for turbidity was exceeded between one to four times year. There were no exceedences in 1995 and 1996. Exceedences of chlorophyll A occurred between one and three times per year, and enterococci standards were exceeded from one to six times from 1991 through 1996. Exceedences of ammonia occurred from two to 11 times between 1993 and 1996.

During construction, turbidity would be increased while dredging, blasting, fill, and dredge spoil dewatering activities are completed. Short-term exceedences in water quality standards for turbidity may be expected due to the construction activities. Effects will be kept to the minimum possible area. Regardless of whether any new harbor improvement is constructed, runoff into the harbor will continue to periodically degrade harbor water quality. However, with the near-term future conversion of adjacent uplands from agricultural to commercial/residential purposes, as well as drainage improvements planned in conjunction with several of those new developments, sediment input into the harbor would be expected to increase, although stormwater discharge would increase.

Enterococci exceedences would not be expected to increase with the proposed construction activities. In addition, with the construction of the new sewage treatment and pumpout facilities by the State, exceedences of the enterococci standard would be expected to decrease.

Exceedences of the ammonia standard are likely caused by input from the upland sources. The resuspension of nutrients, such as nitrogen in the form of ammonia, from sediments may enhance primary productivity. The proposed construction would not provide any new sources of this substance.

The Hawaii Department of Health is reviewing the proposed action pursuant to Section 401 of the Clean Water Act.

(3) Potential Effects on Human Use Characteristics.

(a) Municipal and Private Water Supply. No municipal or private water supplies would be affected by the proposed construction. The proposed harbor expansion would require an additional 875,000 gallons of water per month. The Maui Board of Water Supply has indicated that new sources may need to be developed to meet such a demand.

(b) Recreational/Commercial Fisheries. During construction, recreational and commercial fishing operations may experience congestion and delays within the harbor due to the presence of construction equipment and activities.

With the proposed expansion, an additional 10 commercial fishermen would conduct operations out of Ma'alaea Harbor. This would be an increase of 2 percent in the Statewide total average number of occupational fishermen and an increase of 6 percent in the number from Maui County. Total average annual catch for the State would increase by about 35,300 pounds (2 percent increase), and by 21,230 pounds (6 percent increase) for Maui County. Because the Penguin Bank, Maui, Molokai and Lanai fishing areas appear to have experienced a decline in the fish populations over the last 40 to 50 years, additional fishing pressure could result in a further decline.

The Hawaii Division of Aquatic Resources is developing plans for bottomfish management. When adopted, these rules will specific catch limits, gear restrictions, and will establish prohibited fishing areas to protect spawning and nursery areas. With the implementation of the bottomfish management, recreational and commercial fisheries would improve, and the effects of the additional fishing pressure resulting from the Ma'alaea Harbor expansion would not be significant.

(c) Water Related Recreation. Navigation conditions for recreational boaters will be improved by the proposed breakwater and entrance channel realignment.

One surf site will be lost due to the proposed action. Design modifications to the proposed alternative will avoid impacts to two other surf sites which would have been modified by the original plan. The U.S. Army Waterways Experiment Station recommended that the surf site not be replaced, since it would require modification of the sea bottom and result in additional adverse impacts to the marine ecosystem. The mitigation plan for the proposed action provides for development of amenities for surfers, including easier access to the water via the east mole, as well as showers at the east and south moles. Increased and diverse recreational opportunities for sport fishing, whale watching, diving, and snorkeling will also be provided.

(d) Aesthetics. The presence of equipment and unfinished structures during construction would be a negative effect on the aesthetics of the area. This effect would be short term.

(e) Parks, National/Historical Monuments, National Seashores, Wilderness Areas, Research Sites, Similar Preserves. The nearshore and offshore waters outside Ma'alaea Harbor are contained in the Hawaiian Islands Humpback Whale National Marine Sanctuary. The proposed action is consistent with the policies, goals, and objectives of the sanctuary.

The Molokini Shoal Marine Life Conservation District would not be expected to be negatively impacted by the increased vessel traffic. The rules for the conservation district specify that no new commercial operations may utilize this fisheries in the district. Mooring restrictions are in effect; no new permits are anticipated to be issued for use of this area.

g. Determination of Cumulative Effects on the Aquatic Ecosystem. Cumulative effects on water quality would be both beneficial and adverse. The input of stormwater drainage to the harbor from upland areas is expected to increase in the future as more impervious surfaces are developed. However, the sediment load of that drainage is expected to decrease significantly, as more agricultural land is converted to developed, landscaped, and paved areas. Turbidity effects are likely to be improved in the harbor, even with the additional vessel traffic. The effects of other potential components of the increased stormwater input, such as pesticides and herbicides for landscaping purposes and other urban constituents would likely be adverse. However, the reduction in agricultural chemical inputs may offset those adverse effects.

The incremental impact of increased fishing activity is estimated to be an increase of 2 percent in the statewide catch and an increase of 6 percent in the annual catch for Maui County fishermen. Bottomfish management rules being established by the Division of Aquatic Resources provide for a catch limit on the number of ehu and onaga for recreational fishers, restrict fishing gears, define restricted fishing areas and control dates, and develop an identification system for vessels that fish for bottomfish. The goal is to increase spawning stocks of these fish and protect bottomfish resources while continuing to allow most existing uses. The additional commercial fishing operations that could be accommodated at Ma'alaea Harbor would slightly reduce any gains in spawning stocks.

Cumulative effects to threatened and endangered aquatic life would be primarily related to increased vessel traffic. Despite the potential for adding vessel traffic, NMFS believes that the benefits of consolidating vessel activity in existing facilities and preserving nearshore humpback whale cow/calf habitat in other areas of west Maui outweigh the possible adverse effects of displacement of humpback whales. NMFS stated that adverse impacts to whales from vessel traffic will be reduced compared to impacts from expected increases in vessel traffic without the proposed action. Since ingress/egress corridors for the expanded harbor and vessel speed limits within the cow/calf area of the Bay would be developed and implemented, effects of the existing and added vessel traffic on humpback whales should be reduced.

The proposed action contains a conservation measure for threatened and endangered species which calls for the State Boating Plan to be reviewed. Current and future harbor and boat ramp needs, as well as the locations and capacities of designated mooring areas, would be revised to avoid adverse impacts to listed species. NMFS stated that no new moorings outside of State designated mooring areas should be authorized, and no new harbors, marinas, or boat ramps should be built in west Maui. The reason is that future development of new harbors and boat ramps may likely exceed the jeopardy threshold for the humpback whale. It is unlikely that any additional facilities of this type will be developed, unless it is demonstrated that threatened and endangered species would not be jeopardized.

h. Determination of Secondary Effects on Aquatic Ecosystem. Based on the analyses in paragraphs a through g above, secondary effects on the aquatic ecosystem would not be significant.

DRAFT -- AUGUST 14, 1997

Lt. Colonel Ralph H. Graves
District Engineer
Department of the Army
U.S. Army Engineer District, Honolulu
Building 230
Fort Shafter, Hawaii 96858-5440

Dear Lt. Colonel Graves:

Subject: **Section 401 Water Quality Certification for the Maalaea Boat Harbor Expansion Improvements Project, Maalaea, Maui**
WQC No. 0000231 / Army Authorization No. CW 94-003

In accordance with the provisions of the Clean Water Act, as amended (33 U.S.C. 1251 et seq.; the "Act"), Chapters 91, 92 and 342D, Hawaii Revised Statutes, Part 121 of Title 40, Code of Federal Regulations, and Chapter 11-54 of the Hawaii Administrative Rules, the Department of Health (Department) has reviewed your Section 401 Water Quality Certification application and appurtenant data relevant to water quality considerations for the discharge activities. The subject activity is authorized under the U.S. Department of the Army, Honolulu Engineer District, Civil Works authorization No. CW 94-003. The processing of this application and the issuance of this Water Quality Certification is based on the January 7, 1997 Memorandum of Agreement between the U.S. Army Corps of Engineers, Honolulu Engineer District and the Department's Clean Water Branch.

The Director of Health (Director) attests to the following statements based on information contained in the Section 401 Water Quality Certification application package.

1. The Director has either:

    a. Examined the application submitted by the U.S. Army Corps of Engineers, Honolulu Engineer District, and bases its certification upon an evaluation of the information contained in such application which is relevant to water quality considerations; or

b. Examined other information furnished by the U.S. Army Corps of Engineers, Honolulu Engineer District, sufficient to permit the statement described in Item No. 2. below.

2. When all conditions contained in item 3., below, are fully complied with, there is a reasonable assurance that the activity will be conducted in a manner which will not violate the Basic Water Quality Criteria applicable to all waters and the Specific Water Quality Criteria applicable to the class of State waters where the proposed discharge(s) would take place.

3. The following conditions are deemed necessary to be imposed with respect to the project activity authorized under the U.S. Army Corps of Engineers, Honolulu Engineer District, Civil Works authorization No. CW 94-003:

a. The discharges evaluated under this application are limited to those resulting from the following construction activities within the Maalaea Boat Harbor:

(1) Construction of an extension to existing south breakwater 620 feet long;

(2) Construction of an entrance channel 610 feet long, varying in width from 150 feet to 180 feet;

(3) Construction of a 1.7-acre turning basin, 12 feet deep;

(4) Construction of a 720-foot-long, 80-foot-wide and 8-foot-deep main access channel;

(5) Addition of a revetted mole 400 feet long on the seaward side of the existing south breakwater for a bus turn-around;

(6) Removal of about 80 feet of the existing east breakwater head;

(7) Construction of a harbor center mole of

approximately 1.8 acres with three (3) associated circulation culverts at 36-inch diameter each;

(8) Construction of an east mole with a 18-inch diameter culvert which permits water collected in a swale between the Maalaea Yacht-Marina and Maalaea Milawai to enter the harbor; and

(9) Dredging the berthing area.

b. Materials to be placed directly into the Maalaea Boat Harbor or discharges resulting from the proposed construction activities evaluated under this Section 401 WQC application include the following:

(1) Incidental discharges from the dredging of about 38,000 cubic yards of material from the harbor basin (including the turning basin, access channel, and berth area) and the new entrance channel;

(2) Incidental discharges from the removal of 80 feet of the existing east breakwater;

(3) Placement of about 36,500 cubic yards of the dredged material (from 3.b.(1) above) into the harbor for the construction of south mole extension, the east mole and the center mole;

(4) Placement of 53,000 tons of the basalt stone to be used for the construction of the moles; and

(5) Placement of 5,300 cubic yards of concrete to be used for the construction of armor units and rib cap.

c. This Section 401 Water Quality Certification shall become valid only when the following conditions have been satisfied:

(1) A complete Environmental Protection Plan, as required in Section 01430 of the "Specifications (dated January 1997)" has been submitted to the Clean Water Branch for review and comment and all related concern(s) and comment(s) are properly addressed to the Director's satisfaction. A copy of the final Environmental Protection Plan shall be submitted to the Clean Water Branch.

The Clean Water Branch shall have at least 30 days to review and comment after receiving a copy of the complete Environmental Protection Plan.

A complete Environmental Protection Plan shall, at a minimum, include the following information:

(a) A project-related site-specific, and construction method-specific Best Management Practices Plan which shall, at a minimum, include the following descriptions:

(i) Site characterization;

(ii) Construction sequence;

(iii) Construction method;

(iv) Characteristics of the discharge and potential pollutants associated with the proposed construction activity; and

(v) Proposed control measures or treatment;

(b) An applicable monitoring plan;

(c) A detailed dredging plan (including the use of explosives);

(d) A dewatering, treatment and effluent monitoring plan, if applicable; and

(e) Additional mitigative/compensatory measures, controls or treatment measures, or contingency plan needed because of the construction method used or other unforeseen circumstances;

(2) A copy of the Coral Transplantation Plan shall be submitted to the Clean Water Branch; and

(3) <u>(any additional conditions).</u>

d. This Section 401 Water Quality Certification:

(1) Shall become invalid if the U.S. Army Corps of Engineers, Honolulu Engineer District, fails to commence the proposed Maalaea Boat Harbor Expansion Construction work within two (2) years from the date of this letter;

(2) Shall remain valid until five (5) years from the date of this letter or until the applicable water quality standard(s) is revised or modified, whichever is earlier, provided that the U.S. Army Corps of Engineers, Honolulu Engineer District, starts its proposed construction work within two (2) years from the date of this letter;

(3) May be revoked at the Director's discretion or when any of the following is identified:

(a) The U.S. Army Corps of Engineers, Honolulu Engineer District, shall comply with all new water quality standards as adopted by the Department. In any case where:

(i) Water quality standards applicable to the waters into which the activity may discharge are subsequently established before the activity is completed; or

(ii) The Director determines that the activity is violating water quality standards;

The Clean Water Branch shall notify the U.S. Army Corps of Engineers, Honolulu Engineer District, of the violation or noncompliance with the new water quality standards. The U.S. Army Corps of Engineers, Honolulu Engineer District, shall cease the violation or noncompliance within one hundred eighty days of the date of the notice. If the U.S. Army Corps of Engineers, Honolulu Engineer District, fails within one hundred eighty days of the date of the notice to cease the violation or noncompliance, the Director may revoke this certification, at the Director's discretion;

(b) The discharge(s)from the activity is in violation or noncompliance with any existing water quality standards or condition of this Section 401 Water Quality Certification. The Clean Water Branch shall notify the U.S. Army Corps of Engineers, Honolulu Engineer District, of the violation or noncompliance. The U.S. Army Corps of Engineers, Honolulu Engineer District, shall cease the violation or the noncompliance within seven (7) days of the date of the notice. If the U.S. Army Corps of Engineers, Honolulu Engineer District, fails within seven (7) days of the date of the notice to cease the violation or noncompliance, the Director may revoke this certification, at the Director's discretion;

(c) The Section 401 Water Quality Certification was obtained by misrepresentation, or there was a failure to disclose fully all relevant facts;

(d) There is a change in any condition that requires either a temporary or permanent reduction or elimination of the permitted discharge; or

(e) It is in the public interest.

e. The U.S. Army Corps of Engineers, Honolulu Engineer District, shall:

(1) Invite the Department's representative(s) to attend the partnering, pre-construction or any other similar type of meeting that is established for the proposed construction activities;

(2) Notify the Clean Water Branch (via telephone no. (808) 586-4309) and the Maui District Health Office (via telephone no. (808) 984-8234) at least three (3) working days before any construction work is to begin;

(3) Comply and shall also require the contractor(s) to comply with applicable specifications, schedules, procedures, Mitigation Plan dated June 5, 1996, approved Environmental Protection Plan, Best Management Practices Plan, and any other project construction related requirements, or information contained in the Section 401 Water Quality Certification application dated February 28, 1997;

(4) Conduct or contract with a qualified laboratory/environmental consultant to conduct applicable monitoring in accordance with its monitoring plan contained in the February 28, 1997 Section 401 Water Quality Certification application (or its modified monitoring plan, **dated XXXXX XX, 1997(to be submitted later));**

(5) Ensure that silt curtain(s) or other appropriate and effective silt containment device(s) be properly deployed prior to the commencement of any section of the in-water construction work; be properly maintained throughout the entire period of the section of the in-water construction work; and not be removed until the section of the in-

water work is completed and the water quality in the affected area has returned to its pre-construction condition;

(6) Not commence any dredging activity unless:

(a) A coral transplant and monitoring program has been submitted to the Clean Water Branch and the actual live coral transplantation has been properly and successfully completed. A copy of the program progress report as well as the long term monitoring report shall also be submitted to the Clean Water Branch when they become available;

(b) Silt curtain(s) or other appropriate and effective silt containment device(s) has been properly deployed;

(c) A detailed dredging plan has been submitted to the Clean Water Branch for review and comment and all dredging related concern(s) and comment(s) are properly addressed to the Director's satisfaction.

A detailed dredging plan shall, at a minimum, include the following information:

(i) Method and equipment to be used for the proposed dredging;

(ii) Method and sequence to be used for dredged spoils transportation and handling;

(iii) Method and location for the dredged spoils dewatering process; and

(iv) Identification of the exact location and design of the pollution control measures to be used and location(s) of the explosives to be used on a 8" X 11-½" map . The use of explosives shall be based on a plan approved by the U.S. Army Corps of Engineers, Honolulu Engineer District;

(7) Invite the Department's representative(s) from Maui District Health Office (via telephone No.: (808) 984-8234) to the project site when the use of explosives for dredging is scheduled;

(8) Ensure that all "discharges" associated with the proposed Maalaea Boat Harbor Improvements construction activities be conducted in a manner that will comply with the "Basic Water Quality Criteria Applicable to All Waters" as specified in Section 11-54-04(a), Hawaii Administrative Rules;

(9) Ensure that all material(s) placed or to be placed in State waters be free of waste metal products, organic materials, debris and any pollutants at toxic or potentially hazardous concentrations to aquatic life as identified in Section 11-54-04(b), Hawaii Administrative Rules;

(10) Ensure that construction debris be contained and prevented from entering or re-entering State waters;

(11) Cease immediately the portion of the construction work or discharge that is causing:

(a) Noncompliance with Section 11-54-04(a) or Section 11-54-04(b) of the Hawaii Administrative Rules; or

(b) Damage or will cause damage to the live coral;

The U.S. Army Corps of Engineers, Honolulu Engineer, shall not resume the portion of the construction work or discharge until adequate mitigative measures are implemented and appropriate corrective actions are taken and concurred by the Department;

(12) Report immediately any spill(s) or other contamination(s) that occurs at the project site to the Clean Water Branch;

(13) Notify the Clean Water Branch within 14 days after the completion of the proposed construction activities;

(14) Ensure that all temporarily constructed facilities or structures, including the silt containment device(s), be removed immediately after the completion of the in-water construction and when the water quality in the affected area has returned to its pre-construction condition; and

(15) Ensure that all mitigative measures contained in the draft Mitigation Plan, dated June 1996, be properly and timely completed.

f. Work shall be discontinued during flood conditions.

g. Clearing and grubbing shall be held to the minimum.

h. The effectiveness and adequacy of the implemented best management practices and/or environmental protection measures shall be reviewed and updated as often as needed. Any change(s) to the draft Mitigation Plan (dated June 1996), approved Environmental Protection Plan, Best Management Practices Plan or Applicable Monitoring Plan or correction(s) or modification(s) to information already on file with the Department shall be submitted to the Clean Water Branch, for review and comment, as such change(s), correction(s) or modification(s) arise. The U.S. Army Corps of Engineers, Honolulu Engineer District, shall properly address the Clean Water Branch's comment(s) and/or concern(s) to the Director's satisfaction before such change(s), correction(s) or modification(s) become effective.

i. By applying for and accepting the Section 401 Water Quality Certification, the U.S. Army Corps of Engineers, Honolulu Engineer District, agrees that the

Department may conduct routine inspection of the construction site in accordance with Section 342D-8 of the Hawaii Revised Statutes.

j. Demolition debris and/or dredged spoils shall be removed from the aquatic environment and be disposed of at the upland State or County approved sites. A Solid Waste Disclosure Form for Construction Sites shall be completed and returned to the Department's Office of Solid Waste Management. No construction material or construction-related materials shall be stockpiled, stored or placed in the aquatic environment or stored or placed in ways that will disturb the aquatic environment.

k. Return flow or runoff from the dredged spoil dewatering process or from the stockpiling site shall be contained on land and not be allowed to enter State waters. Should the discharge of the return flow or runoff from the dredged spoil dewatering site be unavoidable, it shall be properly handled in such a manner that the effluent discharges will comply with the applicable State Water Quality Standards. A detailed dewatering design and discharge plan, including applicable effluent monitoring program, shall be submitted to the Clean Water Branch for review and comment. This dewatering plan may be incorporated into the contractor's dredging plan as part of the Environmental Protection Plan.

l. The U.S. Army Corps of Engineers, Honolulu Engineer District, shall obtain a National Pollutant Discharge Elimination System permit for any discharge(s) that is regulated pursuant to Section 402 of the "Act" , Chapter 342D of the Hawaii Revised Statutes, Tile 40 Code of Federal Regulations, and Chapter 11-55 of the Hawaii Administrative Rules.

m. Bench marks shall be established prior to the commencement of any breakwater extension or mole construction work. Pictures shall be taken before and after the completion of the construction work. Bench marks shall be established to allow the comparison of the harbor conditions before and after the construction.

n. There shall be no washing of any stones, either from on-site or off-site, in State waters. No concrete shall be poured into State water. Storm water runoff or effluent from the stone washing or concrete armor units casting process related activity(ies) shall be properly contained and treated on land and not be discharged, either directly or indirectly, into State waters unless a National Pollutant Discharge Elimination System permit issued under the authorization of Section 402 of the Clean water Act (CWA) is obtained.

o. **(Any additional conditions to be added in order to resolve comments and concerns received during the public hearing)**

Should you have any questions, please contact Mr. Edward Chen, Engineering Section of the Clean Water Branch, at (808)586-4309.

Sincerely,

BRUCE S. ANDERSON, Ph.D.
Deputy Director for
Environmental Health

EC:auc

Enclosures: 1. Solid Waste Disclosure Form for Construction Sites
2. Monitoring Plan (dated ________________)

c: State DBEDT, CZM Program (w/o encls.)
State DLNR, Small Boat Harbor Div. (w/o encls.)
State DLNR, DAR (w/o encls.)
State DOH, SHWB (w/o encls.)
DHSA, Maui (w/o encls.)
Chief Sanitarian, Maui (w/encls.)

(Commenters)

C0806ECb

APPENDIX I

CDUA PERMIT

JOHN WAIHEE
GOVERNOR OF HAWAII

KEITH W. AHUE, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

DEPUTIES

JOHN P. KEPPELER, II
DONA L. HANAIKE

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF BOATING AND OCEAN RECREATION
333 QUEEN STREET, SUITE 300
HONOLULU, HAWAII 96813

November 25, 1994 BOR 0260.95

Mr. Stan Boc
Engineering Division
U. S. Army Engineer District, Honolulu
Building 230
Fort Shafter, Hawaii 96858-5440

Dear ~~Mr. Boc~~ Stan:

Subject: CDUA For Maalaea Harbor Improvements

Enclosed for your information and files is a copy of the approved Conservation District Use Application for the Subdivision of Submerged Lands and for Harbor Improvements at Maalaea Small Boat Harbor (MA 2681).

As a related issue, I have also enclosed a copy of the Protect Maalaea Coalition's latest law suit against the State for inadequacy of the FSEIS, Civil No. 94-0831 (3). There is a possibility that we may require assistance from the Corps to respond to some of the allegations listed in the complaint.

As of this date, no conference with the Office of State Planning has been scheduled for discussion of their CZM consistency determination.

Please call me at 587-1975 if you have any questions.

Very truly yours,

David E. Parsons

David E. Parsons
State Boating Administrator

Enc.

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
Office of Conservation and Environmental Affairs
Honolulu, Hawaii

FILE NO.: MA-11/8/93-2681
180-Day Exp. Date: 11/3/94
DOC. ID.: 5074

NOV 14 1994

MEMORANDUM

TO: David E. Parsons, Administrator
Division of Boating and Ocean Recreation

FROM: Keith W. Ahue, Chairperson
Board of Land and Natural Resources

SUBJECT: Conservation District Use Application for the Subdivision of Submerged Lands and for Harbor Improvements at Maalaea Small Boat Harbor, Maalaea, Wailuku, Maui (Seaward of TMK: 3-6-01)

We are pleased to inform you that your Conservation District Use Application was approved by the Board on October 28, 1994, subject to Part A, B, and C:

Part A:

That the Board denied the 9/22/94 Contested Case Petition request on CDUA MA-2681 on the basis of timeliness.

Part B:

That the Board denied the 10/28/94 verbal Contested Case request because: 1) they found that the same CDUA (MA-2681), which included public comments at the public hearing, and agency review comments, on the entire project, before the Board for action was the same as that processed with no material change and 2) the case for good cause was not demonstrated.

Part C:

That the Board approved this request for the subdivision of submerged lands and the master plan for the harbor improvements for Maalaea small boat harbor, Maalaea, Maui subject to the following conditions:

1. The applicant shall comply with all applicable statutes, ordinances, rules and regulations of the Federal, State and County governments, and applicable parts of Section 13-2-21, Administrative Rules, as amended;

2. The applicant, its successors and assigns, shall indemnify and hold the State of Hawaii harmless from and against any loss, liability, claim or demand for property damage, personal injury and death arising out of any act or omission of the applicant, its successors, assigns, officers, employees, contractors and agents under this permit or relating to or connected with the granting of this permit;

3. The applicant shall comply with all applicable Department of Health Administrative Rules;

4. The applicant shall submit a petition for a new Executive Order setting aside the reconfigured submerged land for Harbor purposes, to be filed with our Division of Land Management;

5. Before proceeding with any work authorized by the Board, the applicant shall submit four (4) copies of the construction plans and specifications to the Chairperson or his authorized representative for approval for consistency with the Harbor Master Plan and conditions of the permit and the declarations set forth in the permit application. Three (3) of the copies will be returned to the applicant. Plan approval by the Chairperson does not infer approval required of other agencies. Compliance with Condition 1 remains the responsibility of the applicant;

6. Any work or construction to be done on the land shall be initiated within one (1) year of the approval of such use, and all work and construction must be completed within ten (10) years of the approval of such use;

7. That the applicant notify the Department in writing when construction activity is initiated and when it is completed;

8. That in issuing this permit, the Department has relied on the information and data which the permittee has provided in connection with his permit application. If, subsequent to the issuance of this permit, such information and data prove to be false, incomplete or inaccurate, this permit may be modified, suspended or revoked, in whole or in part, and/or the Department may, in addition, institute appropriate legal proceedings;

9. That all representations relative to mitigation set forth in the accepted application and the Final Supplemental Environmental Impact Statement, for this proposed use are hereby incorporated as conditions of this approval;

10. That failure to comply with any of these conditions shall render this Conservation District Land Use application null and void; and

11. Other terms and conditions as prescribed by the Chairperson.

Please acknowledge receipt of this permit with the above noted conditions, within thirty (30) days, in the space provided below. Please sign two copies. Retain one and return the other within thirty (30) days.

Should you have questions on any of these conditions, please feel free to contact our Office of Conservation and Environmental Affairs staff at 587-0377.

Very truly yours,

Keith W. Ahue

KEITH W. AHUE

Receipt acknowledged

David Parsons

Applicant's Signature

Date 11/14/'94

cc: Maui Board Member
Maui Land Agent
Maui Planning Dept.
Maui DP&R, DWS
DOH/OHA/OSP/DOT

APPENDIX J

HISTORIC PRESERVATION

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
711 KAPI'OLANI BOULEVARD, SUITE 500
HONOLULU, HAWAI'I 96813-5249
PHONE (808) 594-1888
FAX (808) 594-1865

PPA hup

November 06, 1997

Mr. Ray H. Jyo, Director
Engineering and Technical Services
Department of the Army
Pacific Ocean Division, Corps of Engineers
Fort Shafter, HI 96858-5440

Subject: Section 404, and Section 401 Clean Water Act Requirements for the Discharge of Dredged and Fill Material into Ma'alaea Harbor for Light-Draft Vessels, Ma'alaea, Island of Maui.

Dear Mr. Jyo:

Thank you for the opportunity to review Section 404, and Section 401 Clean Water Act Requirements for the Discharge of Dredged and Fill Material into Ma'alaea Harbor for Light-Draft Vessels, Ma'alaea, Island of Maui. The U.S. Army Corps of Engineers and DLNR propose to build improvements to the Ma'alaea Harbor.

The Office of Hawaiian Affairs (OHA) has the following comments on the proposed development. Based on information provided by your institution, the improvements will not significantly impact flora and fauna resources nor recreational or cultural and/or archaeological resources. However, blasting and dredging activities will likely produce some unavoidable adverse impacts. These include killing of marine mammals if present, loss of reef habitat and reef species, destruction of a nearby small sandy beach, and loss of water quality.

Your institution has proposed mitigation measures intended to minimize adverse impacts on whales, turtles, monk seals, and other mammals, and to limit turbidity and siltation. OHA urges you to include in this package of mitigation measures mechanisms for safe transit and haven of vessels during blasting and dredging activities.

Letter to Jyo
Page two

Please contact Colin Kippen (594-1938), Officer of the Land and Natural Resources Division, or Luis A. Manrique (594-1758), should you have any questions on this matter.

Sincerely yours,

Randall Ogata
Administrator

Colin Kippen
Officer, Land and
Natural Resources
Division

LM:lm

DEPARTMENT OF THE ARMY
U S ARMY ENGINEER DISTRICT, HONOLULU
FT SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF

October 21, 1997

Planning and Operations Division

Ms. A. Frenchy DeSoto, Chair
Board of Trustees
Office of Hawaiian Affairs
711 Kapiolani Boulevard, Suite 1250
Honolulu, Hawaii 96813

Dear Ms. DeSoto:

The U.S. Army Corps of Engineers, Honolulu District has been planning improvements to Ma'alaea Harbor on Maui for some time. As part of our latest planning efforts we have sent the enclosed letter to 72 Hawaiian organizations on Maui, including your Maui office, requesting information about historic properties or cultural resources which have the potential to be affected by the harbor improvement project. The enclosed mailing list was developed from information received from your Land and Natural Resources Division and the Maui office.

We would appreciate receiving any information you or your staff may have concerning this matter, and we would also appreciate being advised of any Hawaiian organizations we may have inadvertently left off of our mailing list.

Please send your comments to:

District Engineer
Honolulu Engineer District
Building 230/CEPOD-ET-PP/Lennan
Fort Shafter, Hawaii 96858-5440

If you have any questions concerning this request, please contact Mr. Bill Lennan of my Planning and Operations Division staff at 438-2264.

Sincerely,

Raleigh Tabata

for Ray H. Jyo, P.E.
Director of Engineering
and Technical Services

Enclosures

DEPARTMENT OF THE ARMY
U S ARMY ENGINEER DISTRICT HONOLULU
FT SHAFTER HAWAII 96858-5440

REPLY TO
ATTENTION OF

October 17, 1997

Planning and Operations Division

SEE MAILING LIST

The U.S. Army Corps of Engineers, Honolulu Engineer District has assessed the potential effects of proposed construction improvements to Ma'alaea Harbor for Light-draft Vessels. A final environmental impact statement (EIS) was circulated in 1980, and a supplemental EIS was circulated in 1994. The enclosed public notice and enclosed figures provide details concerning the proposed project.

During the investigations leading to the 1980 and 1994 documents, it was determined that there were no historic properties as defined in the National Historic Preservation Act within the area of potential effect of the harbor improvements. The only physical items in very close proximity are the *piko* stone and the sharpening stone (King's Table) on the lawn fronting Buzz's Wharf Restaurant, and these two artifacts will not be affected by the project.

Before the harbor was constructed by the Territory of Hawaii in 1952, various cultural sites were known in the general area of the harbor, but only *ka poli* spring has been identified as being in the harbor itself. As part of our efforts to ensure that all the effects of the proposed project are considered in the decision-making process, we are seeking information about other cultural resources or historic properties that have the potential to be affected by the proposed harbor improvements.

We would appreciate receiving any information your organization or individual members may have concerning cultural resources in the harbor area which may be affected by the harbor improvement project.

Please send your comments to:

District Engineer
Honolulu Engineer District
Building 230/CEPOD-ET-PP/Lennan
Fort Shafter, Hawaii 96858-5440

If you have any questions concerning this request, please contact Mr. Bill Lennan of my Planning Division staff at 438-2264

Sincerely,

James A Dickason

Ray H. Jyo, P.E.
Director of Engineering
and Technical Services

Enclosures

JOINT PUBLIC NOTICE
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
AND
THE STATE OF HAWAII DEPARTMENT OF HEALTH, CLEAN WATER BRANCH

OF PUBLIC HEARING CONCERNING

SECTION 404, AND SECTION 401 CLEAN WATER ACT REQUIREMENTS
FOR THE
DISCHARGE OF DREDGED AND FILL MATERIAL INTO MA'ALAEA HARBOR FOR LIGHT-DRAFT VESSELS, MA'ALAEA, MAUI, HAWAII

The Public Hearing will be held at Kihei Elementary School, Kihei, Maui on September 24, 1997 from 7:00 to 9:00 pm in the Cafeteria. The public and interested agencies are invited to attend.

1. APPLICANT: U.S. Army Corps of Engineers, Honolulu Engineer District (Corps), Building 230, Fort Shafter, Hawaii 96858-5440 (Contact Person: William B. Lennan, Telephone No. (808) 438-2264) and the State of Hawaii Department of Land and Natural Resources, Division of Boating and Ocean Recreation (DLNR), 333 Queen Street, Room 300, Honolulu, Hawaii 96813

2. APPLICABLE STATUTORY AUTHORITIES: Section 404 and Section 401 of the Clean Water Act (33 U.S.C. 1341; 33 U.S.C.1344), Sections 324D-4 and 342D-53, Hawaii Revised Statutes (HRS).

3. LOCATION OF PROPOSED ACTIVITY: Ma'alaea Harbor for Light-draft Vessels, Ma'alaea, Maui, Hawaii.

Ma'alaea Harbor is Class A Marine Waters under Hawaii Administrative Rules (HAR), chapter 11-54, Water Quality Standards, section 11-54-06.

4. DESCRIPTION OF PROPOSED ACTIVITY: The Corps and the DLNR propose to build improvements to the Ma'alaea Harbor for Light-draft Vessels at Ma'alaea, Maui. Users and potential users have identified a shortage of berths, surge and resultant vessel damage within the harbor, navigation hazards in the existing entrance channel, inadequate harbor facilities, and concerns about impacts on navigation at Ma'alaea Harbor.

The proposal's general goal is to improve commercial and recreational navigation in the harbor. Specific goals include:

a. reduce surge within the harbor basin;

b. reduce navigation hazards in the entrance channel; and

c. allow for more commercial and recreational berthing spaces and attendant harbor facilities.

The plan is to:

a. extend the south breakwater 620 feet;

b. dredge an entrance channel 610 feet long, 150 - 180 feet wide, and 12 - 15 feet deep;

c. dredge a 1.2-acre turning basin, 12 feet deep;

d. dredge a 720-foot-long, 30-foot-wide, and 8-foot-deep main access channel;

e. add a 400-foot-long revetted mole on the seaward side of the existing south breakwater, for bus turn around;

f. add a center revetted mole, where the DLNR will later develop a fuel dock; and

g. add an east revetted mole, where the DLNR will later build berths.

The plan resembles a plan in the 1980 General Design Memorandum/Final Environmental Impact Statement, except that the footprint of the south breakwater revetted mole and extension have been reduced in area more than 60,000 square feet.

About 80 feet of the existing east breakwater head would be removed in order to realign the entrance channel, and about 34,000 cubic yards of material would be dredged from the existing harbor basin, from enlarging the turning basin and access channel, and the new entrance channel. About 5,000 cubic yards of that amount would be used for construction of the breakwater extension and south revetted mole. About 26,000 cubic yards of fill material will be needed for the center mole and east revetted mole. An additional 53,000 tons of stone and 13,000 cubic yards of concrete armor units would be placed in the construction of the breakwater and the three revetted moles. Modification of the aids to navigation would also be included in the federal project. Construction of the breakwater, moles and dredging portion of the project is expected to take approximately 26 months.

Primary construction materials would consist of dredged material, basalt stone, and concrete. Material dredged from the entrance channel and harbor would be used in the construction of the breakwater extension and revetted moles. The stone material can be obtained from three commercial quarries on Maui and the 13,000 cubic yards of concrete required for construction of armor units for the main breakwater extension can be obtained from a commercial source.

The work staging and storage area would be located on the paved portion of the harbor parking areas.

5. IMPACTS OF THE PROPOSED ACTION ON THE ENVIRONMENT:

Air. Construction activities would increase dust and vehicle exhaust emissions in the project area; however, these effects will be temporary, affecting only the near vicinity of the project site. After construction there would be some increase in exhaust emissions from vehicles and power boats, but these emissions are not expected to have a significant effect on air quality because of the low ambient concentrations and the strong offshore winds typical of the area that would blow them out to sea.

Noise levels will be increased during construction of both the Federal and State portions of the project by the operation of heavy construction equipment. There will also be a slight increase in noise after project completion because of the greater number of power boats and increased vehicle traffic; however, the prevailing wind would continue to be the dominant noise much of the time, and aircraft flying overhead would still be the loudest intermittent source of noise. Noise levels would be compatible with surrounding land uses.

Traffic. Boat traffic and fishing pressures in the area may be expected to increase. Vehicular traffic would also be expected to increase in the harbor area. Levels of service at the intersections of all three roads leading to and exiting the harbor area would be reduced one level, resulting in long delays or severe congestion during peak hours. The State has plans to improve the highway before completion of its infrastructure improvements.

Water quality. Increased harbor usage and ongoing deposition of sediments into the harbor would tend to further degrade the water quality within the basin. Future development planned for the surrounding Ma'alaea area may increase storm water input to the harbor, possibly necessitating maintenance dredging with its associated effects, and result in cumulative effects on water quality and marine life. Turbulence caused by increased boat traffic within the harbor will resuspend fine sediments, further reducing water quality. The project may improve the efficiency of the harbor to act as a sediment trap and may lessen siltation impacts on the marine environment outside the harbor.

Suspended fine coralline material resulting from dredging activities would temporarily increase water turbidity. A turbid plume would be expected to be carried offshore in a southwesterly direction by the prevailing wind-driven surface currents. The stresses associated with the turbidity would be temporary and would not last appreciably longer than the dredging activity, and will be mitigated by the use of silt containment devices.

Disposal. All of the dredged material would be utilized as fill material in the construction of project features. It is anticipated that there will be no excess material for upland disposal.

Water bottom. Approximately 12.9 acres of coral reef, coral rubble, and sand bottom and associated benthic organisms would be destroyed or altered by placement of the structures and dredging. About 5.7 acres would be covered and 7.2 acres would be dredged. About 7.6 acres of the total are within the existing harbor footprint.

Habitat and marine life. The new breakwater extension would provide habitat for many reef dwelling species, but will result in a net loss of reef habitat and have an adverse impact on displaced highly specialized reef species. An increase in the populations of generalized, reef dwelling species would be expected in the harbor vicinity after completion of construction. Increased fishing activity would be expected near the new structures.

Dredging during harbor construction would temporarily stimulate predator feeding as prey organisms are exposed or attracted to the dredging activities. Dredging noise would attract some species while it may disturb others such as the endangered humpback whale. Blasting during dredging, if required, would kill and injure some marine organisms and is likely to disturb the humpback whale if that species were present.

Beach. The proposed action would result in the destruction of a small sandy beach at the east end of the harbor if the proposed State improvements are made to the east mole.

Surfing. The proposed action would result in the complete destruction of the Off-the-Wall surf site and would also result in the slight modification of Buzz's No 1 and No. 2 sites. There would be no impact to the Ma'alaea Pipeline or Buzz's No. 3.

Economics. Real property in the harbor area would probably increase in value after completion of the harbor project. Associated tax revenues would also increase.

Safety. Social well-being would be enhanced because of the safer berthing and navigation conditions resulting from harbor improvements.

5a. MITIGATION MEASURES: The unavoidable impacts identified above can be mitigated as follows:

a. During all construction the contractor will be required by standard contract specifications to follow applicable Federal, State, and Maui County environmental laws. For the Federal part of the project, the contractor will be required to develop for Corps approval an environmental protection plan which will detail the measures to be used, based on the construction methods to be used, to comply with applicable environmental laws before being permitted to proceed with the work.

b. Construction of the new portions of the breakwaters and revetted moles will provide mitigation for the relatively depauperate reef flat habitat destroyed, by providing increased vertical habitat. Other mitigation has been planned with the assistance of the National Marine Fisheries Service, and the DLNR Division of Aquatic Resources.

c. The applicants shall insure that the applicable State Water Quality Standards shall not be violated.

1. The Corps will monitor applicable water chemistry, during construction and after construction in accordance with the applicants' monitoring plan dated February 28, 1997.

2. In particular, turbidity caused by dredging and construction of the harbor improvements will be minimized to the maximum extent practicable with existing known methods to control turbidity. The following are some of the measures which will be implemented to protect water quality.

(a) Turbidity and siltation will be minimized and kept from spreading by effectively using silt containment devices (such as silt curtains, etc.) and stopping construction during bad sea conditions. Construction will be conducted, especially during dredging, to prevent persistent turbidity and excessive sediment in areas of significant living corals.

(b) All spoil temporarily stored at the project site will be placed behind watertight berms above the influence of the tides.

(c) No dredged spoil will be stockpiled in the marine environment.

(d) Fills will be protected from erosion with armor stone as soon after completion as practicable.

(e) Breakwaters and revetments will be constructed of large boulders and/or concrete armor units to dissipate wave energy and resist erosion.

(f) All construction-related materials will be placed or stored in ways to avoid or minimize disturbance to the reef.

(g) All construction-related materials will be free of pollutants.

(h) Lumber or other construction materials treated with creosote or other preservatives substances will not be permitted to contact the water until after at least one week of drying.

(i) Construction materials, petroleum products, human wastes, debris and landscaping substances (herbicides, fertilizers, pesticides) will not be permitted to fall, flow or leach into the ocean or the drainage ditches which enter the harbor.

6. IMPACTS ON CULTURAL RESOURCES: A cultural history overview conducted by Hawaii Marine Research, Inc. in 1979 concluded that "(I)t does not appear from our investigations that Ma'alaea Small Boat Harbor is eligible for inclusion on the National Register of Historic Places". Subsequently, a literature review and further coordination with the SHPO's office revealed the presence of two artifacts, a *piko* stone and a grinding stone (King's table) identified as site 50-50-09-1440 (-1286). These items were moved from their original unknown location sometime in the past and are now located in the grassed area in front of Buzz's Restaurant. The State Historic Preservation Officer (SHPO) concurred with the Corps' determination in 1980 and again by letter dated November 17, 1989 that the project would have "no effect" on historic properties.

7. IMPACTS ON ENDANGERED SPECIES: Threatened and endangered species

that may occur in the project area are primarily the endangered humpback whale *(Megaptera novaeangliae)* and the threatened green turtle (*Chelonia mydas).*

a. Ma'alaea Bay is an important calving, breeding and nursing area for the endangered humpback whale (*Megaptera novaengliae*). The number of humpback whales visiting the area each year can vary widely. For example, during small boat surveys by the Pacific Whale Foundation in 1989 a total of 399 whales were observed, while in 1991 a total of 949 were seen. The reason for such fluctuation is not known. Ma'alaea Bay is included in the Hawaiian Islands Humpback Whale Sanctuary designated by Congress in the Oceans Act of 1992. A comprehensive management plan and implementing regulations have been developed by the Department of Commerce, National Oceanic and Atmospheric Administration, and approved by the Governor.

These endangered animals are resident in Hawaiian waters only during the period between December and May each year.

The results of the aerial and small boat surveys of humpback whales in the general vicinity of Ma'alaea Bay indicate that presently pods of whales without calves tend to avoid areas of heavy boat traffic, but that pods with calves do not. It is not known why this occurs, but it is speculated that the calf pods' need for shallow water overshadows the avoidance reaction. According to the Biological Opinion issued by the National Marine Fisheries Service (NMFS) on July 23, 1990, the project may have an adverse effect on the endangered humpback whale, but with mitigation will have less adverse effect than the without project condition. NMFS concluded that implementation of the project is not likely to jeopardize the continued existence of humpback whales in Hawaiian waters.

b. The threatened green sea turtle (*Chelonia mydas*) is also known to frequent Ma'alaea Bay throughout the year but green turtles are not known to regularly nest or breed in Ma'alaea Bay. The distribution and quantity of algal food resources and availability of resting habitat for green turtles within and around the project site has not been determined

(National Marine Fisheries Service 1990); however, a large male was observed resting in the coral reef fronting the south breakwater by the U.S. Fish and Wildlife Service during their survey in May 1993.

There may be some increase in contact between boats and turtles, and the portion of the reef flat covered by the new protective structures will no longer be available for turtle foraging or resting. This is not expected to cause any adverse impact to the turtle population of Ma'alaea Bay because of the very small number of boat/turtle interactions expected and the availability of other foraging/resting areas in the near vicinity of the harbor. In their Biological Opinion dated July 23 1990, NMFS determined that the project may result in the injury or mortality of green turtles, and established a low level of incidental take, but also concluded that the project is not likely to jeopardize the continued existence of green turtles in Hawaiian waters.

c. There have been several reports of endangered hawksbill turtles (*Eretmochelys imbricata*) nesting in the bay, but these turtles do not generally frequent Ma'alaea Bay. Endangered Hawaiian monk seals (*Monachus schauinslandi*) are observed along the coast of Maui on rare occasions. In February 1993 one was observed basking on a beach at Ma'alaea, east of the harbor.

NMFS by letters dated February 25, 1993 and October 30, 1995 and USFWS by letter dated December 5, 1994, concurred with the Corps' determination that no effects are expected on endangered hawksbill turtles or Hawaiian monk seals, which occur in Ma'alaea Bay only very rarely.

To mitigate potential adverse effects to the humpback whale and green turtle, NMFS made the following conservation recommendations in their Biological Opinion, which will be implemented by DLNR and the Corps within their respective jurisdictions. These recommendations are:

• The Corps, Hawaii State Department of Land and Natural Resources (DLNR) and NMFS should review the Statewide Boating Plan and revise as necessary, current and future harbor and ramp siting needs and the locations and capacities of designated mooring areas with respect to listed species.

• All non-permitted mooring structures in Ma'alaea Bay should either be removed or relocated within a state designated mooring area or into Ma'alaea Harbor, whichever would be appropriate. Future requests for mooring structures outside of state designated zones within Ma'alaea Bay should be denied.

• The DLNR, U.S. Coast Guard, and NMFS, in cooperation with the Corps should develop and implement, as appropriate, ingress/egress corridors for the expanded small boat harbor at Ma'alaea, and vessel speed limits within Ma'alaea Bay as defined in 50 CFR 22.31 (Approaching Humpback Whales in Hawaii) for the period December 15 to May 15 annually.

In addition the Corps uses the following standard mitigation measures to protect humpback whales and turtles which are usually incorporated into the Plans and Specifications for any project constructed in the ocean. These measures would also protect a Hawaiian monk seal or hawksbill turtle if one were present in the bay during construction.

• If blasting is required, the Contractor will be required to prepare a blasting plan. The blasting plan will be developed in coordination with and approved by NMFS and the Corps' Contracting Officer. In general, blasting will be avoided during December through May if possible. If blasting must occur, charges will be kept small, sound suppression measures (such as a bubble curtain or heavy tamping) and other methods will be used to reduce the effect on marine mammals or turtles to the minimum practicable.

• If blasting is required, the Contractor will be required to conduct a survey for turtles and marine mammals in the vicinity prior to each detonation. The survey methodology will be included in the blasting plan to be approved by NMFS and the Corps' Contracting Officer.

8. COASTAL ZONE MANAGEMENT AND WATER QUALITY CERTIFICATIONS:

a. **Federal Coastal Zone Consistency Determination.** The State of Hawaii, Department of Economic Development, Business and Tourism, Office Planning, Coastal Zone Management (CZM) Office issued a Consistency Determination by letter dated 12 September, 1996.

b. **Water Quality Certification (WQC).** On the basis of preliminary review, the State of Hawaii, Department of Health tentatively proposes to issue a WQC subject to the conditions and seeks the public's comments. See section 11 for instructions.

9. OTHER GOVERNMENT AUTHORIZATIONS: The authorization to discharge fill does not obviate the need to obtain other federal, state or local authorizations required by federal, state or local laws.

10. EVALUATION FACTORS: The Corps decision whether or not to discharge fill will be based on an evaluation of the probable impact including cumulative impacts of the proposed activity on the public interest. That decision will reflect the national concern for both protection and utilization of important resources. The benefit which reasonably may be expected to accrue from the proposal must be balanced against its reasonably foreseeable detriments. All factors which may be relevant to the proposal will be considered, including the cumulative effects thereof: among those are conservation, economics, aesthetics, general environmental concerns, wetlands, historic properties, fish and wildlife values, flood hazards, flood plain values, land use, navigation, shoreline erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, food and fiber production, mineral needs, considerations of property ownership and, in general, the needs and welfare of the people. The evaluation will apply the guidelines promulgated by the Administrator, U.S. Environmental Protection Agency, under authority of Section 404 (b)(1) of the Clean Water Act. (40 CFR Part 230)

The DOH decision on the WQC will follow section 401 of the Clean Water Act and implementing federal regulations, and HAR chapter 11-54.

11. COMMENTS AND INQUIRIES: The Corps and the DOH are soliciting comments from the public; Federal, State, and local agencies and officials; and other interested parties to consider and evaluate the impacts of the proposed activity on water quality and the public interest.

The Corps will consider comments received to determine whether to discharge, or to modify or condition the discharge for the proposed project. To make this decision, comments are used to assess impacts on endangered species, historic properties, water quality, general environmental effects and the other public interest factors listed above.

The DOH also seeks comments on the proposed WQC. The WQC application and other information on file are available for public inspection and copying at the following locations:

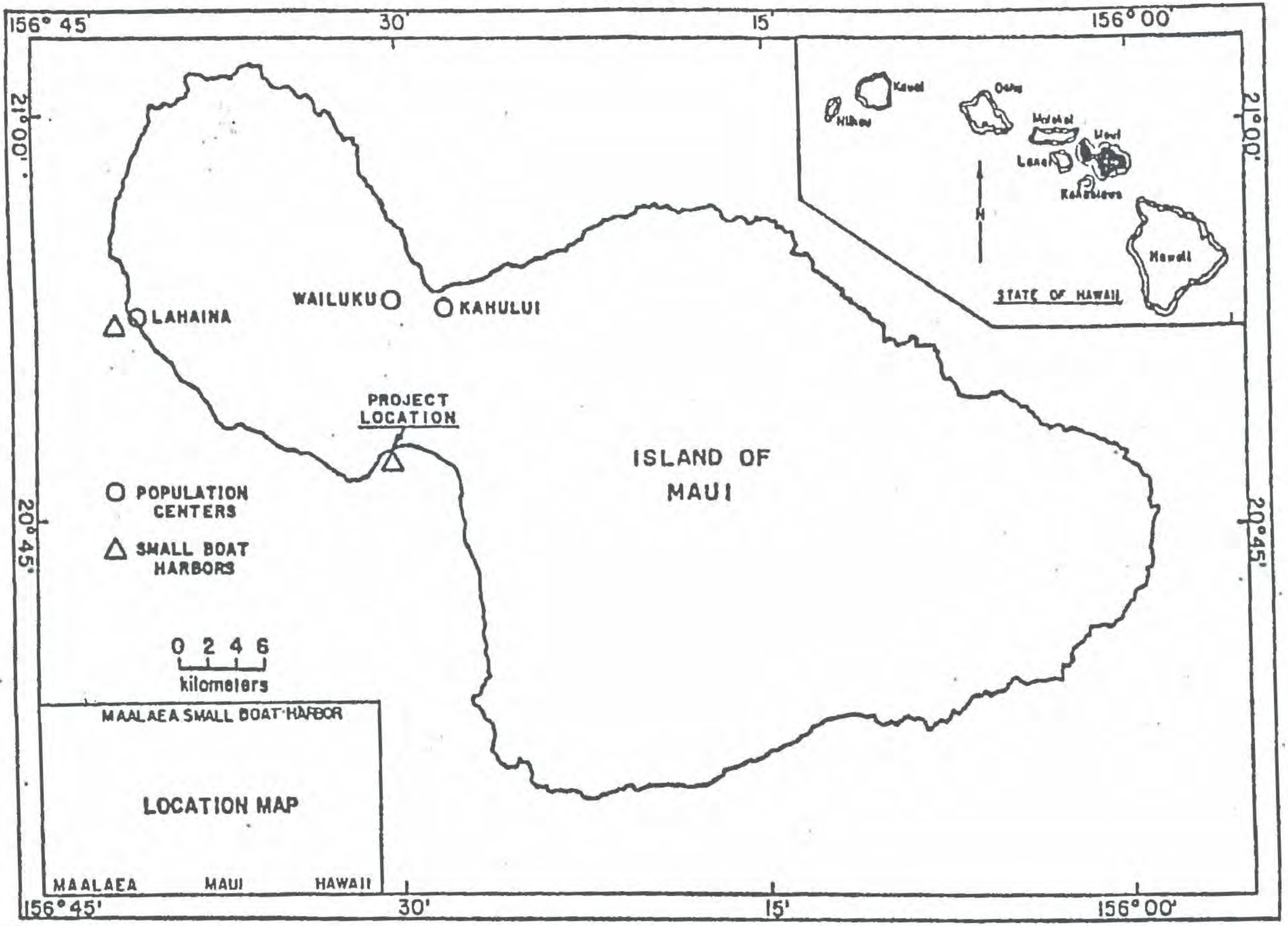
Oahu	Clean Water Branch, 919 Ala Moana Boulevard, Room 301, Honolulu, HI 96814
Maui	District Health Office, 54 High Street, Wailuku, HI 96793

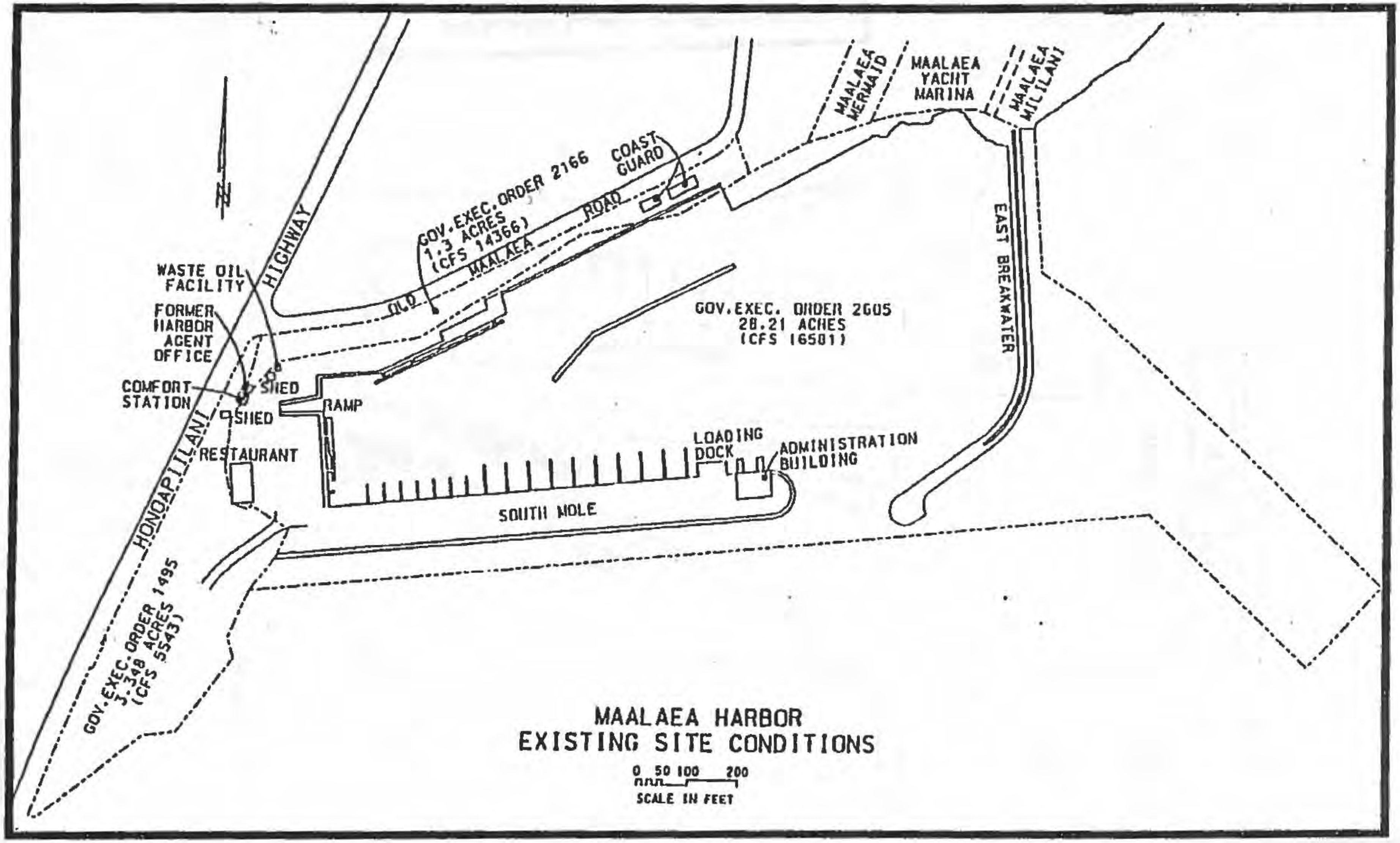
The proposed WQC is available for free from the DOH Clean Water Branch.

Interested parties may testify orally at the hearing, may submit any written comments, or both, on the proposed activity. Written comments should be submitted no later than 30 days from the date of this notice, or at the hearing. Written comments should be mailed to the Corps Honolulu District or the DOH Clean Water Branch at the addresses indicated below.

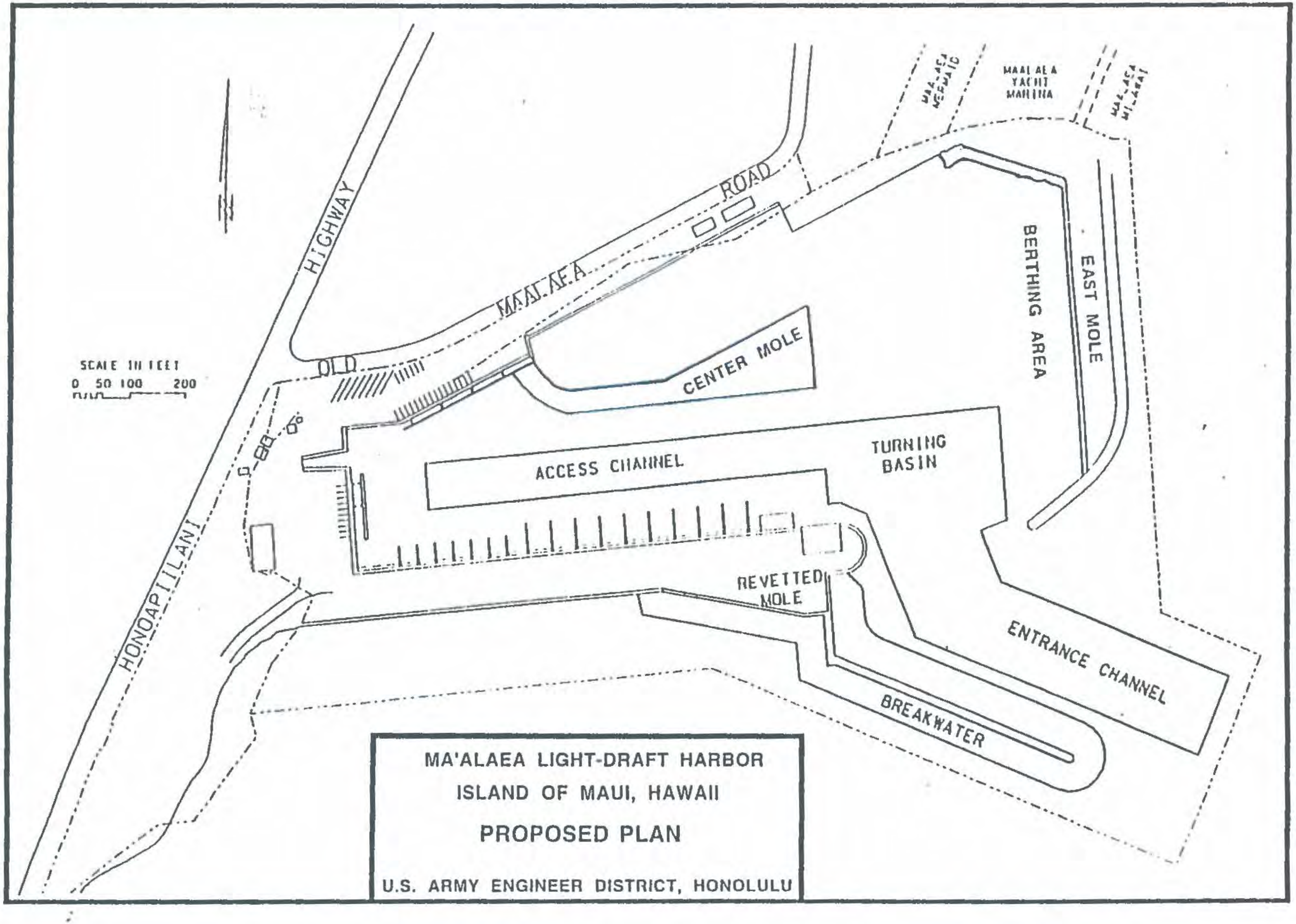
District Engineer
U.S. Army Engineer District, Honolulu
Building 230/CEPOD-ET-PP/Lennan
Fort Shafter, Hawaii 96858-5440

Hawaii State Department of Health
Environmental Management Division
Clean Water Branch
919 Ala Moana Boulevard, Room 301
Honolulu, Hawaii 96814-4920


156° 45'
30'
15'
156° 00'
21° 00'
20° 45'
WAILUKU
KAHULUI
LAHAINA
PROJECT
LOCATION
ISLAND OF
MAUI
POPULATION
CENTERS
SMALL BOAT
HARBORS
0 2 4 6
kilometers
Lanai
N
Hawaii
STATE OF HAWAII
MAALAEA SMALL BOAT HARBOR
LOCATION MAP
MAALAEA
MAUI
HAWAII
156° 45'
30'
15'
156° 00'



MAALAEA HARBOR
EXISTING SITE CONDITIONS



MA'ALAEA LIGHT-DRAFT HARBOR
ISLAND OF MAUI, HAWAII

PROPOSED PLAN

U.S. ARMY ENGINEER DISTRICT, HONOLULU

Native Hawaiian letter Mailing list
( ) = returned

Charles Maxwell
157 Alea Place
Pukalani Hawaii 96768

Ahahui Ka'ahumano
2078 Kahelili Highway
Wailuku HI 96793

Ahupua'a Maui Island
773 Kawananakoa Street
Wailuku HI 96793

Alu Like, Inc.
1977 Kaohu Street
Wailuku HI 96793

Friends of Moku'ula
2525 Ka'anapali Parkway
Lahina HI 96761

Hale O Na Ali'i
P.O. Box 415
Makawao HI 96768

Hana Canoe Club
Hana HI 96713

Hana Cultural Center
P.O. Box 27
Hana HI 96713

Hana District Pohaku
P.O. Box 322
Hana HI 96713

Hawaii Patriotic Action Association
2780Keha'a Drive
Lahaina HI 96761

Hawaiian Canoe Club
380 Konahea Street
Wailuku HI 96793

Hawaiian Homes Commission
51 Ku'ulaStreet
Kahului HI 96732

Honokohau Valley Association
P.O. Box 10575
Lahaina HI 96761

Hui Aina 'O Hana
1 Habeo'o Road
Hana HI 96713

Hui Alanui 'O Makena
2087 Wells Street
Wailuku HI 96793

Hui Kalai Aina
P.O. Box 385
Paia HI 96779

Hui Kalai Aina
RR3 Box 779C
Kula HI 96790

Hui No Ke Ola Pono
P.O. Box 492
Kahului HI 96732

Hui O Wa'a Kaulua
519B Front Street
Lahaina HI 96761

Hui of Hawaiians
P.O. Box 492
Kahului HI 96732

Imi I Luko I Kou Piko Partnership
200 S. High Street, 4th Floor
Wailuku HI 96793

Ka Imi Na'auao O Hawaii Nei
216 Liholiho Street
Wailuku HI 96793

Ka Lahui Hawai'i Maui Island
P.O. Box 492
Kahului HI 96732

Ms. Lori Seblas
Ka'anapali Beach Hotel
2525 Ka'anapali Parkway
Lahaina HI 96761

Kahana Canoe Club
888 Kanakea Street
Lahaina HI 96761

Kahuna La'au Lapa'au O Maui
P.O. Box 814
Wailuku HI 96793

Kaman A'o
715 Kilohou Street
Wailuku HI 96793

Kamehameha Schools/Bishop Estate
811 Kolu Street, Suite 103
Wailuku HI 96793

Ke Ola Pono No No Kupuna
896 Kuhio Place
Wailuku HI 96793

Keawala'i Church
1002 S. Kihei Road, #213
Kihei HI 96753

Keoken Hawaiian Homes Farmers
715 Kilohou Street
Wailuku HI 96793

Kihei Canoe Club
62 Elua Place
Kihei HI 96753

Kula Kaiapuni
218 Molokai Hema
Kahului HI 96732

La'au Lapa'au
606 Pohala Street
Wailuku HI 96793

Lahaina Canoe Club
Honokohau HI 96761

Lai Ula 'O Kai
216 Liholiho Street
Wailuku HI 96793

Lokahi Pacific
840 Alua Street, #203
Wailuku HI 96793

Maluhia Church
RR2, Box 806
Olowalu HI 96761

Klope Raymond
Maui Community College
310 Ka'ahumanu Avenue
Kahului HI 96732

Po'okela Program
Maui Community College
310 Ka'ahumanu Avenue
Kahului HI 96732

Maui Historical Society
Iao Valley Road
Wailuku HI 96793

Maui/Lana'i Islands Burial Council
2087 Wells Street
Wailuku HI 96893

Moolele
1087 A Pookeka
Makawao HI 96768

Na Hoaloha 'O Laie
1342 Kahoma Road
Lahaina HI 96761

Na Hoaloha O Lele
911 Ka'ili Place
Lahaina HI 96761

Na Kai 'Ewalu
795 Analio Drive
Wailuku HI 96793

Na Keiki O Ke Kai, Inc
P.O. Box 1744
Kihei HI 96753

Na Kupuna O Maui
1087A Po'okela
Makawao HI 96768

Na Leo Kako'o
P.O. Box 1913
Wailuku HI 96793

Na Leo O Na Kupuna
92 A Maluhia Drive
Wailuku HI 96793

Na Mele O Maui
Kaanapali Beach Hotel
Lahaina HI 96761

Na Moka Aupuni O Ko'ohau Hui
2965 Haiku Road
Haiku HI 96708

Na Po'e Kokua
P.O. Box 3006
Wailuku HI 96793

Na Po'o Kohau
P.O. Box 3006
Wailuku HI 96793

Na Pua No'eau
310 Ka'ahumanu Avenue
Kahului HI 96732

Napili Canoe Club
P.O. Box 913
Lahaina HI 96761

Nation of Hawaii
P.O. Box 2963
Wailuku HI 96793

Native Sons and Daughters of Hawaii
528 Onehee Street
Kahului HI 96732

Office of Hawaiian Affairs
140 Ho'ohana Street, Suite 206
Kahului HI 96732

Office of Hawaiian Affairs
140 Ho'ohana Street, #200
Kahului HI 96732

Ohana Council
270 Alamaha Street
Kahului HI 96732

Paukukalo Community Association
773 Kawananakoa Street
Wailuku HI 96793

Paukukalo Hawaiian Homes
511 Kikamia Street
Wailuku HI 96793

Pohaku Association
P.O. Box 72
Hana HI 96713

Protect Kahoolawe 'Ohana
469 Ma'aio Street
Kahului HI 96732

Proud Hawaiian Society
P.O. Box12017
Lahaina HI 96761

Punana Leo O Maui
P.O. Box 337
Wailuku HI 96732

Queen Lili'uokalani Children Center
1791 Wili Pa Loop
Wailuku HI 96732

Mr. Jimmy Cockett
Sheraton Maui Hotes
P.O. Box 870
Kula HI 96790

Waiehu Kou Hawaiian Homesteads
Community Association
3146 Mapu Place
Kihei HI 96753

Waiohuli-Keokea Homesteaders
P.O. Box 331028
Kahului HI 96732

Waiola Congregational Church
P.O. Box 455
Lahaina HI 96761

West Maui Taro Growers Association
P.O. Box 10575
Lahaina HI 96761

APPENDIX K

FLUSHING AND WAVE STUDY

CEWES-CE-TE (1110-2-1403b 20 January 1998

MEMORANDUM FOR RECORD

SUBJECT: Flushing Percentage in Maalaea Harbor, Maui, Hawaii

1. In a telephone conversation on 15 December 1997 Mr. Lennan of the U.S. Army Engineer District, Honolulu (CEPOH) requested a flushing percentage table for the previous study in Maalaea Harbor (Wang and Cialone, 1995). Specifically, he requested we use the percentage method illustrated in "Guidance Specifying Management Measure for Source of Nonpoint Pollution in Coastal Waters" published by EPA (1993).

2. The flushing percentage method defined by EPA (1993, page 5-12) as "...the amount of a conservative substance that is flushed from the basin over a 24 hour period....."

3. Based on above definition, we reexamined the concentration generated by the CH3D hydrodynamic numerical model. The simulations include the initial introduction of a 100 ppt conservative concentration in the system and run for existing as well as three design conditions, AP2, AP6 and MAP2, for seven days. The time history of the concentration at the three stations in the Maalaea harbor were used to analyze the flushing percentage during the first 24 hour period. Based on the flushing percentage of the individual stations, the averaged flushing percentages and the smallest flushing percentage (worst scenario) for the harbor are also presented in the attached table.

4. The flushing calculations conducted in Wang and Cialone (1995) are based on the flushing time formulation recommended by Coastal Marinas Assessment Handbook formulation (EPA, 1985, p4-3 thru p4-7) and criteria by Coastal Ecosystem Management (Clark, 1977, p407-408).

Harry Wang, Ph.D.
Research Physical Scientist
Tidal Hydraulic Branch,
Estuaries and Hydroscience Division

Encl.

REFERENCES:

Clark, John. R. (1977): Coastal Ecosystem Management. John Wiley & Sons, pp928.

USEPA (1985): Coastal Marinas Assessment Handbook; An Environmental Approach. EPA Region IV - Atlanta.

USEPA (1993): Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters. EPA, Office of Water, Washington, DC.

Wang H., A. Cialone (1995): Numerical Hydrodynamic Modeling and Flushing Study at Maalaea Harbor, Maui, Hawaii. Miscellaneous Paper CERC-95-8, US Army Engineers Waterways Experiment Station, Vicksburg, MS.

Table: Flushing Percentage Under Different Conditions in the Maalaea Harbor				
Station	Existing Condition	AP2	AP6	MAP2
Station 1	42%	41%	20%	29%
Station 2	49%	48%	28%	42%
Station 3	60%	54%	29%	44%
Average flushing percentage in the Harbor	50.3%	47.7%	25.7%	38.3%
Smallest flushing percentage in the Harbor	42%	41%	20%	29%

Draft Miscellaneous Paper CERC-97-xx
December 1997

Updated Wave Response of Proposed Improvements to the Small Boat Harbor at Maalaea, Maui, Hawaii

by Lori L. Hadley, Edward F. Thompson, Donald C. Wilson
Coastal and Hydraulics Laboratory

U.S. Army Corps of Engineers
Waterways Experiment Station
3909 Halls Ferry Road
Vicksburg, MS 39180-6199

Prepared for U.S. Army Engineer Division, Pacific Ocean

Contents

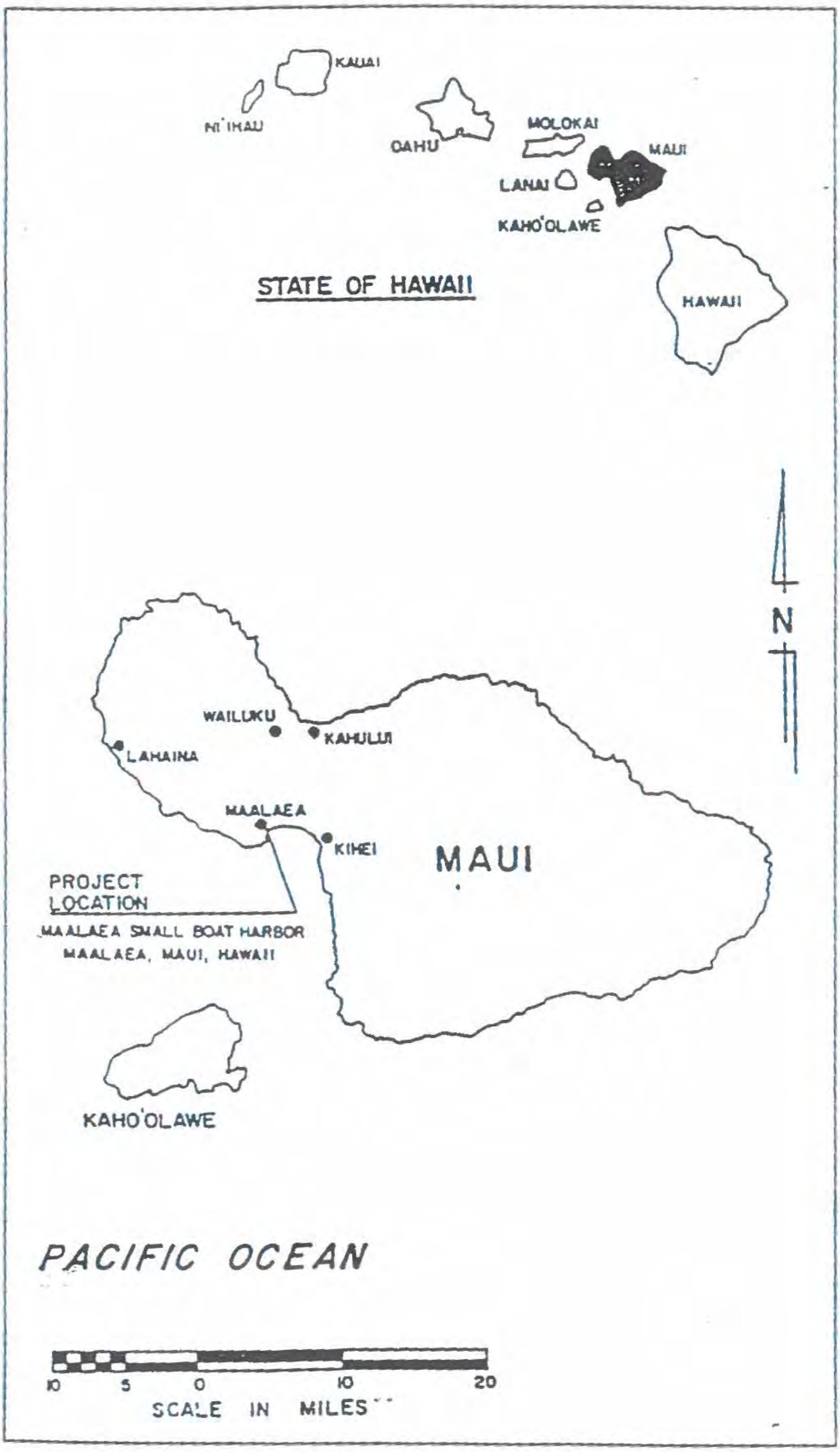


Figure 1. Study location

harbor is approximately 7 miles south of the County seat in Wailuku and approximately 8 miles south of the commercial and business center of Kahului.

Harbor space on Maui is much in demand. Maalaea small boat harbor contains 93 berths. Wave energy penetrates inside the harbor sufficiently often and with enough energy that the harbor is regarded as having a "surge" problem. A larger, more protected small boat harbor at Maalaea would help satisfy the demand for tranquil berthing space. The existing harbor layout is shown in Figure 2.

The shoreline of Maalaea Bay is part of an isthmus connecting two inactive volcanos which form west and east Maui. The shoreline is characterized by a long narrow coral-sand beach. The area is also known among surfers as the Maalaea Pipeline because of an infrequent, but world class breaking wave condition. Maalaea Harbor is located at the extreme west end of this beach. Several lesser surfing spots are also located near the harbor. There is concern that changes at Maalaea small boat harbor may impact nearby surfing areas.

Proposed improvements to Maalaea harbor are limited by several factors. The most significant is that the harbor site is fixed and can not be moved to a more ideal location. Additional considerations arise from recommendations provided by harbor users and local surfers. These recommendations include keeping the existing breakwater structures intact with any changes being additive, constructing modifications without serious interruption to harbor navigation, and limiting additional structures to the present eastern boundary of the harbor in order to avoid impacts on the surfing area outside the harbor. The General Design Memorandum (GDM) for Maalaea Harbor for Light-Draft Vessels (US Army Engineer District, Honolulu 1980) contains a record of the research and planning which led to proposed design improvements, Plan 1 (Figure 3). Plan 1 was subsequently followed by the development of additional modification plans. Plans selected for evaluation in this study are described below.

Plan 1 will provide berthing facilities for approximately 310 small craft, and includes the following improvements:

a. A 620 ft long extension to the existing south breakwater.

b. An additional 400 ft long revetment on the seaward side of the existing south breakwater.

c. A 610 ft long entrance channel, varying in width from 150 to 180 ft, and varying in depth from 12 to 15 ft.

d. A 1.7 acre, 12 ft deep turning basin.

e. Removal of 80 ft from the existing east breakwater head.

f. A 50 ft wide, 720 ft long interior revetment adjacent to the existing east breakwater.

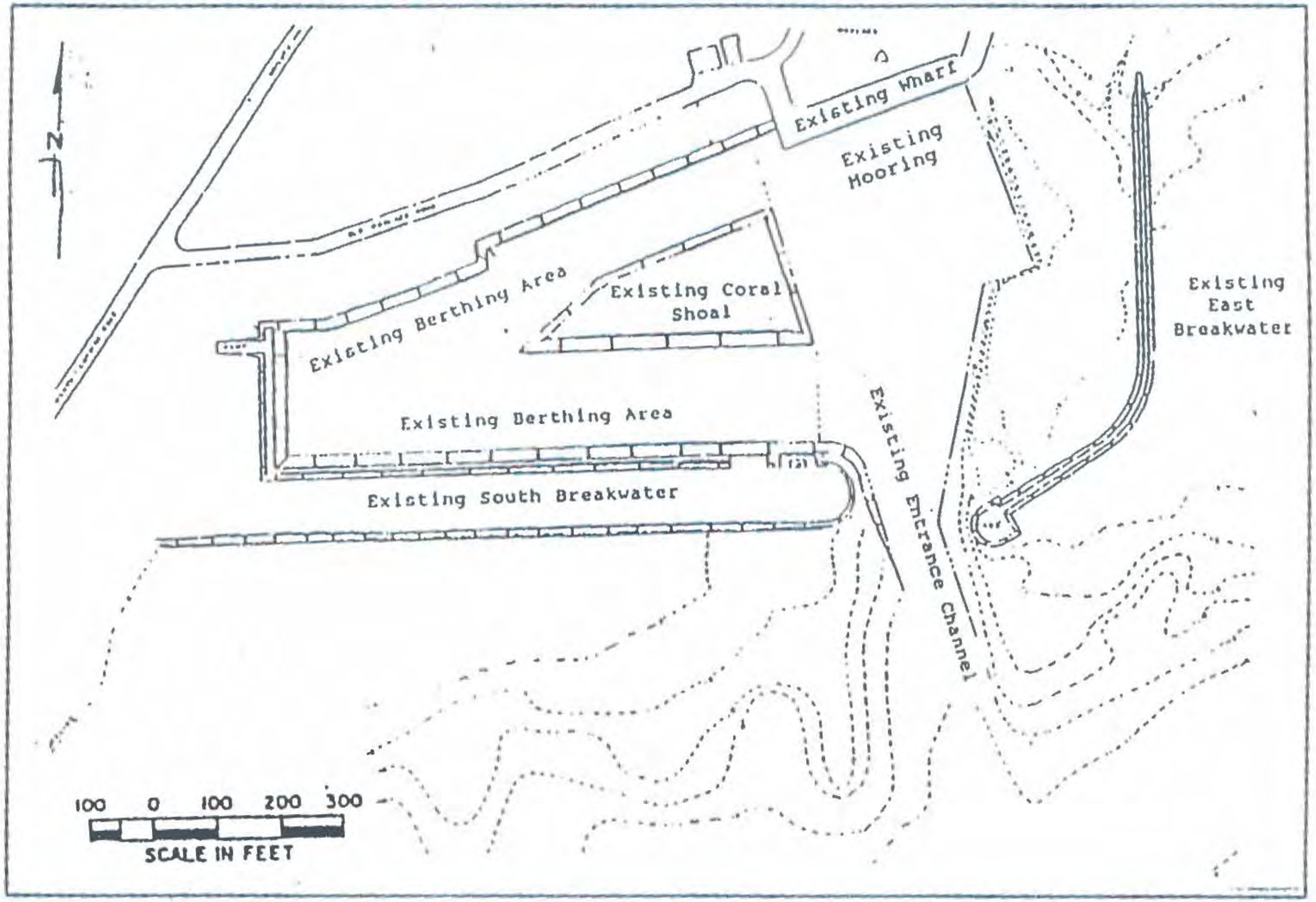


Figure 2. Existing plan

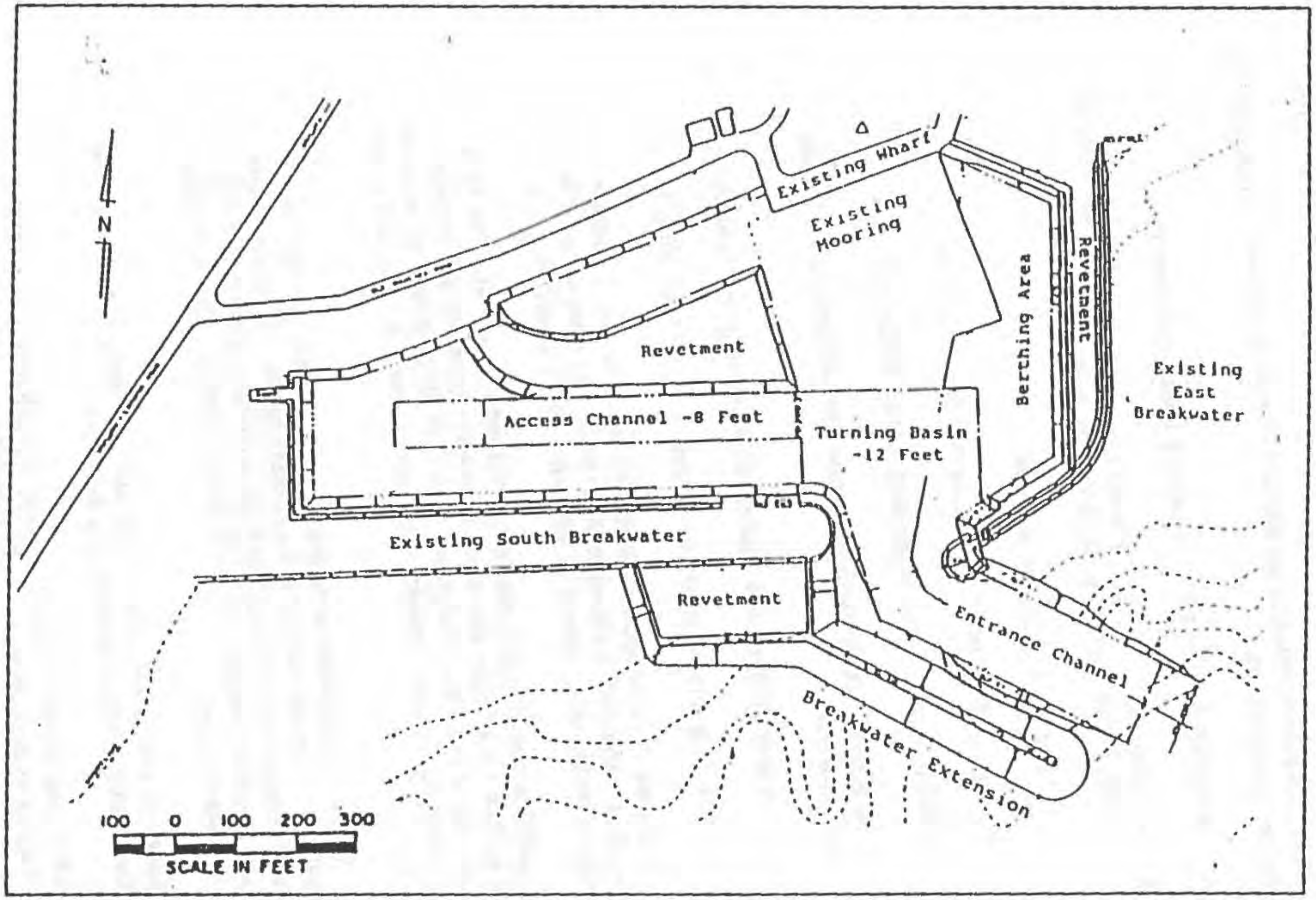


Figure 3. Proposed Plan 1

g. An 8 ft deep berthing area adjacent to the existing east breakwater.

h. A 570 ft long interior revetment varying in width from 50 to 170 ft.

Plan 2 (Figure 4) redirects the entrance channel to the west and includes the following improvements:

a. Removal of 300 ft from the existing south breakwater tip.

b. A 610 ft long 15 ft deep entrance channel, varying in width from 150 to 200 ft, and varying in depth from 12 to 15 ft.

c. A 1.7 acre, 12 ft deep turning basin.

d. Removal of 80 ft from the existing east breakwater head.

e. A 600 ft long extension to the existing east breakwater.

f. A 50 ft wide, 600 ft long interior revetment adjacent to the existing east breakwater.

g. An 8 ft deep berthing area adjacent to the existing east breakwater.

h. A 570 ft long interior revetment varying in width from 50 to 170 ft.

Plan 3 (Figure 5) includes the same improvements as Plan 2 with the exception of an additional extension to the existing east breakwater. The 600 ft long extension will continue an additional 250 ft toward the west.

Two modifications of Plan 1 were also considered (Figure 6). Plan 1a is the same as Plan 1 except the new south breakwater extension and entrance channel are rotated clockwise 7 degrees. Plan 1b is identical to Plan 1a except a vertical sheet pile bulkhead replaces the revetment along the east side of the center mole.

Plan 6 (Figure 7), was added as an alternative for a more protected harbor area without new structures *exterior* to the existing harbor. Its disadvantages include lack of needed new mooring space and a possibly difficult entrance channel section confined between two rock-faced structures. Plan 6 includes the following improvements:

a. Addition of a 95 ft wide, 500 ft long mole extending from the east end of the existing south breakwater into the harbor.

b. A 610 ft long entrance channel, varying in width from 150 to 200 ft, and varying in depth from 12 to 15 ft (not shown in Figure 7).

c. A 570 ft long interior revetment varying in width from 50 to 170 ft.

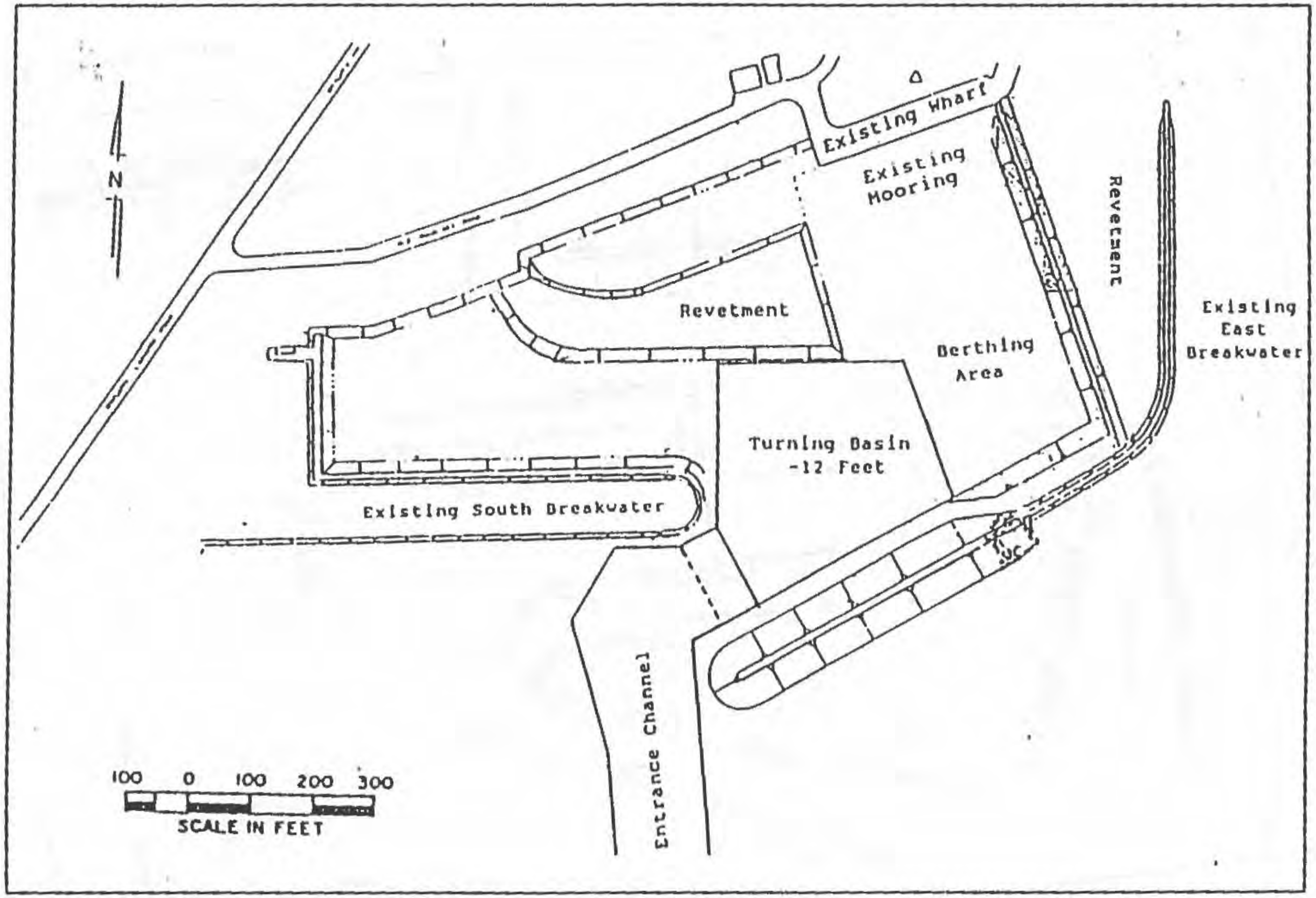


Figure 4. Proposed Plan 2

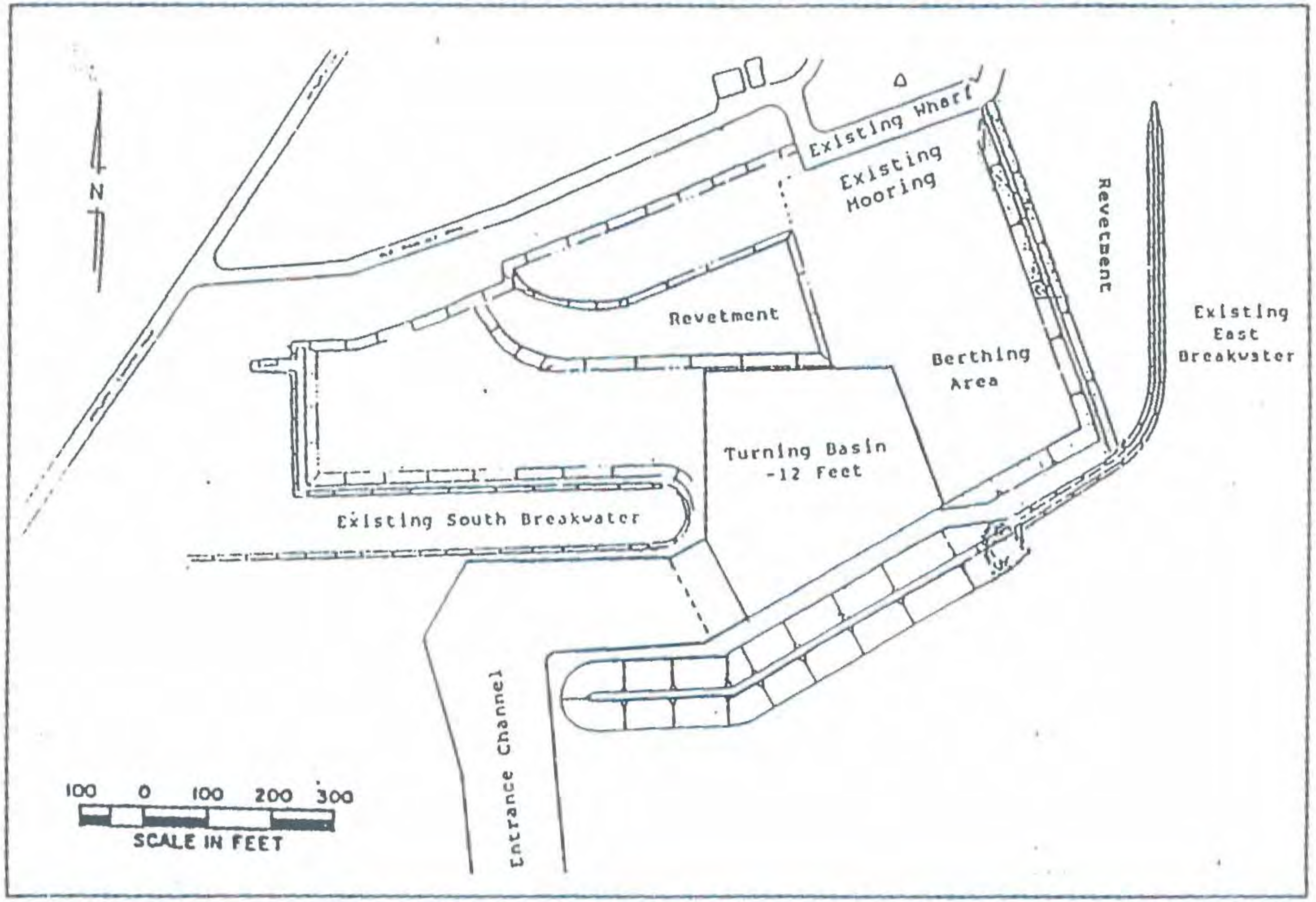


Figure 5. Proposed Plan 3

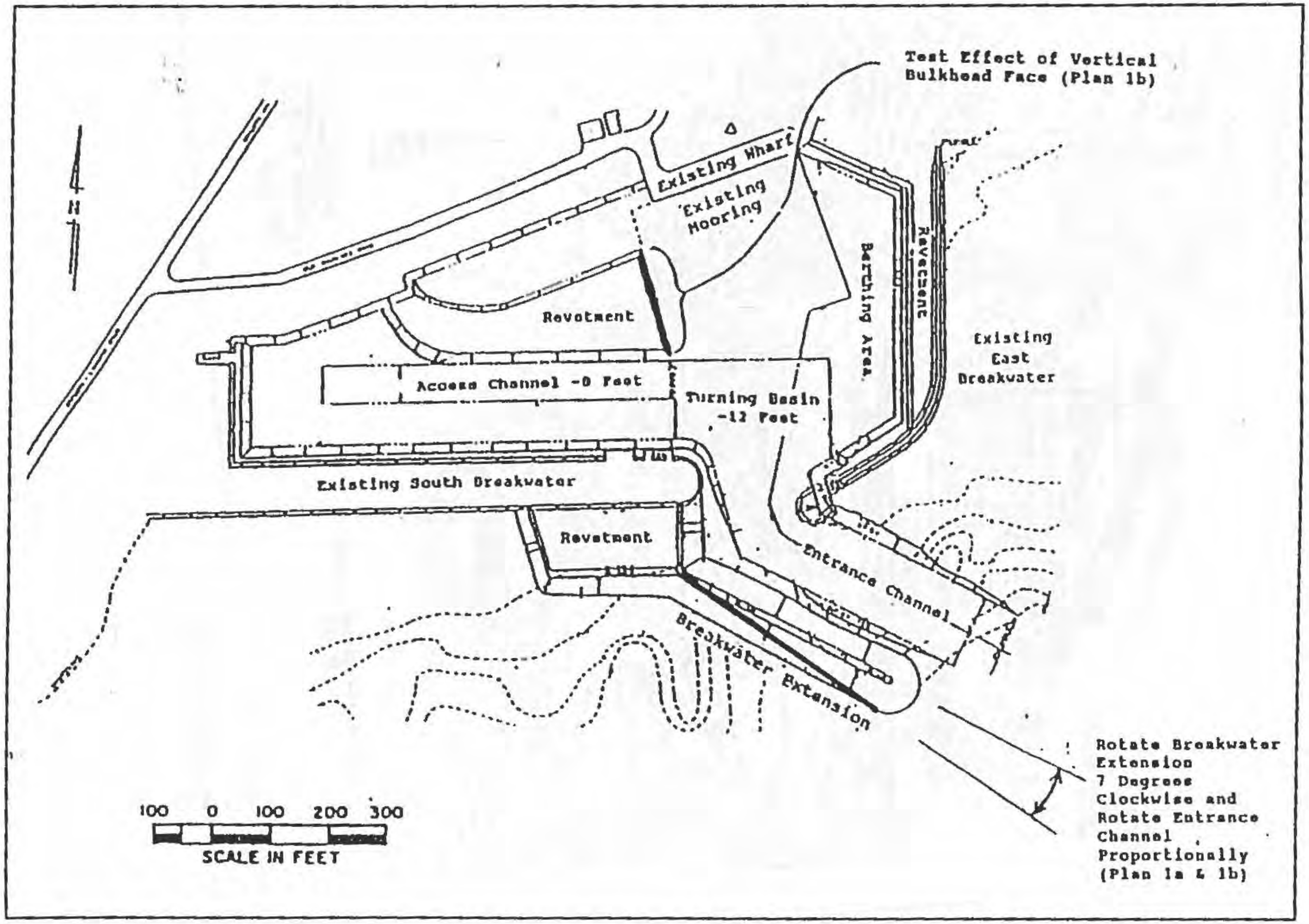


Figure 6. Proposed Plans 1a and 1b

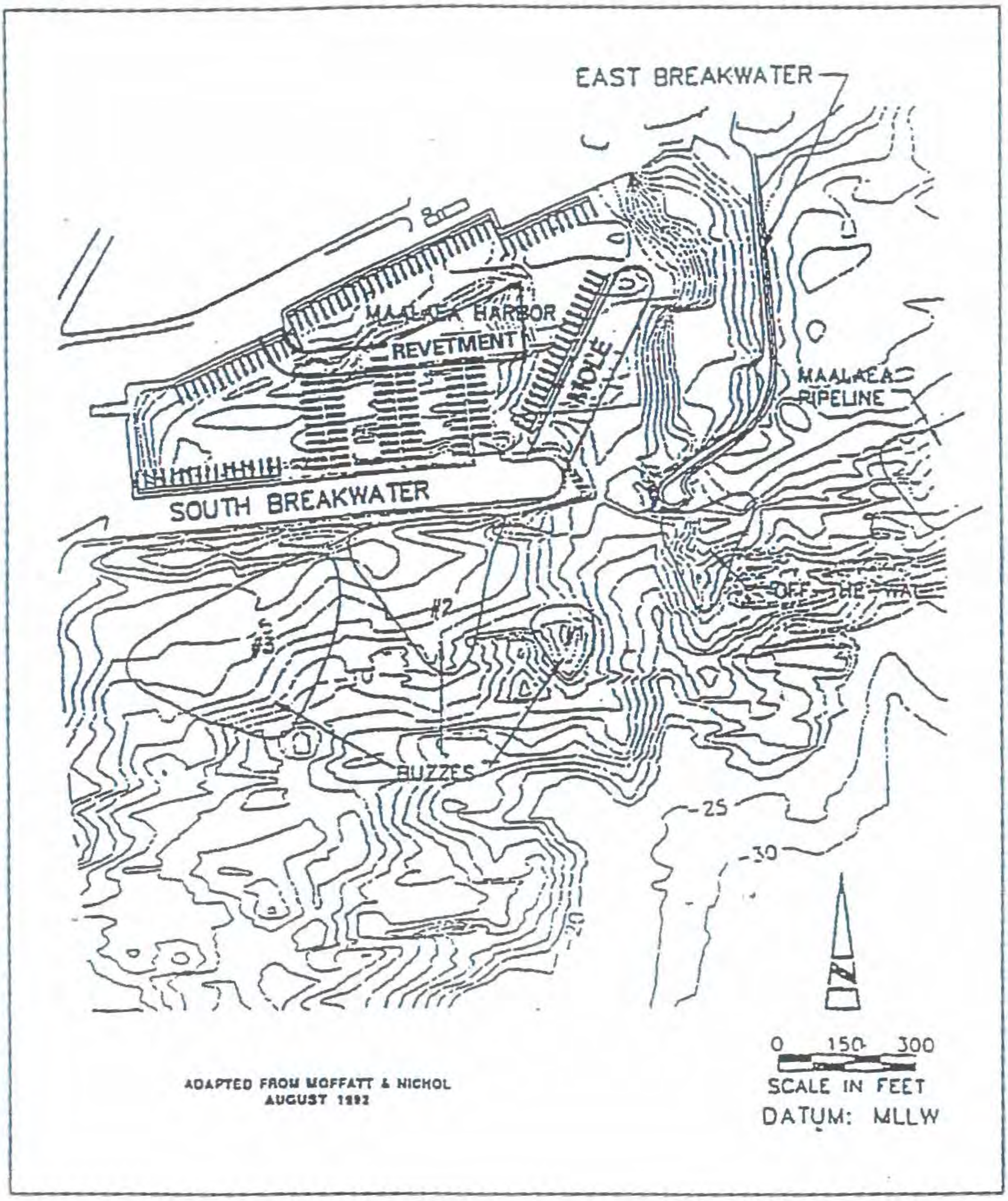


Figure 7. Proposed Plans 6 and 6a

Plan 6a is a structurally identical variation of Plan 6 in which dredging of the existing harbor area is limited to the harbor interior. Plan 6a was considered to assess the effects of sediment accumulation in the channel entrance after initial dredging to the design depth. This plan also takes into account the possibility that funding for extensive dredging and maintenance of channel areas outside of the harbor would be unavailable. In this plan the existing entrance channel is dredged to a uniform depth of 10 ft with no additional dredging exterior to the harbor entrance.

Study objectives of the Headquarters, US Army Corps of Engineers (HQUSACE) and POD were to test the proposed harbor design improvements against the criteria that wind wave and swell wave heights not exceed 1 ft in berthing areas and 2 ft in the entrance and access channels and turning basin more than approximately 10 percent of the time per year. Another objective was to assess the potential for harbor oscillations in all plans relative to the existing harbor. To accomplish these objectives, the numerical harbor wave response model HARBD (Chen and Houston 1987) developed at USAEWES was used to test the existing harbor configuration and proposed plans.

Modeling Approach

Both numerical and physical modeling were originally considered for the study of alternative modifications to Maalaea small boat harbor. As discussed by Lillycrop et al. (1993), the numerical modeling approach was chosen to assess the variety of proposed alternatives. Assumptions inherent in the numerical modeling approach are as follows:

a. no wave transmission or overtopping of structures,

b. structure crest elevations will not be tested or optimized,

c. no wave-wave or wave-current interaction,

d. no wave breaking effects,

e. diffraction around the structure ends is represented by diffraction around a blunt vertical wall with specified reflection coefficient,

f. energy losses at constricted entrances are not explicitly included.

Within the limits of the assumptions, the numerical modeling approach can be expected to give a reasonable assessment of the proposed plans.

The procedures originally used to develop incident wind wave and swell information for the harbor response model are described by Lillycrop et al. (1993). The HARBD model and finite element grids used are presented in Chapter 2. The updated wind wave and swell results, including a discussion of the NDBC buoy data used as the deepwater wave climate in this study, are given in Chapter 3. Harbor oscillation results for all plans, including the Existing Plan, are given in Chapter 4. Evaluation of proposed improvement plans based upon navigational concerns is given in Chapter 5. Conclusions are summarized in Chapter 6.

2 Numerical Model

Model Formulation

The numerical wave model HARBD is a steady state hybrid element model used in the calculation of linear wave response in harbors of varying size and depth (Chen 1986, Chen and Houston 1987, and Lillycrop and Thompson 1996). Originally developed for use with long period waves (Chen and Mei 1974), HARBD has since been adapted to include capabilities for modeling wind waves and swell (Houston 1981), bottom friction, and partially reflective boundaries (Chen 1986). The model is based on a linearized mild slope equation. An overview of the model and its applications is given by Thompson and Hadley (1995).

The HARBD model has been shown to perform satisfactorily in comparison to analytic solutions and laboratory data for a variety of wind wave and swell cases (Houston 1981, Crawford and Chen 1988, Thompson et al. 1996) and long wave cases (Chen 1986, Chen and Houston 1987, Houston 1981, and Thompson et al. 1993). As a result it has been used with confidence in both long-wave and short wave studies. Long wave studies have included harbor oscillations (Thompson et al. 1997, Smith et al. 1997, Thompson et al. 1996b, Thompson and Hadley 1994b, Briggs et al. 1994, Briggs et al. 1992, Mesa 1992, Sargent 1989, Weishar and Aubrey 1986, and Houston 1976) and tsunamis (Farrar and Houston 1982, Houston and Garcia 1978, and Houston 1978). Wind wave and swell studies include Thompson et al. (1996b), Thompson and Hadley (1994a, 1994b), Lillycrop et al. (1990), Lillycrop and Boc (1992), Lillycrop et al. (1990), Kaihatu et al. (1989), Farrar and Chen (1987), Clausner and Abel (1986), and Bottin et al. (1985).

The HARBD model covers in detail a domain including the harbor and a portion of the adjacent nearshore area (Figure 8). This domain is bounded by a 180-deg semicircle in the water region seaward of the harbor entrance (∂A in Figure 8) and the land-water interface along the shoreline and harbor (∂C in Figure 8). The region defined by these boundaries is denoted Region A. If possible, the semicircle radius should be at least twice the wavelength of the longest incident wave to be modeled (using a typical water depth within the semicircle). Also, the semicircle should encompass any complex offshore bathymetry which strongly influences waves entering the harbor. In general,

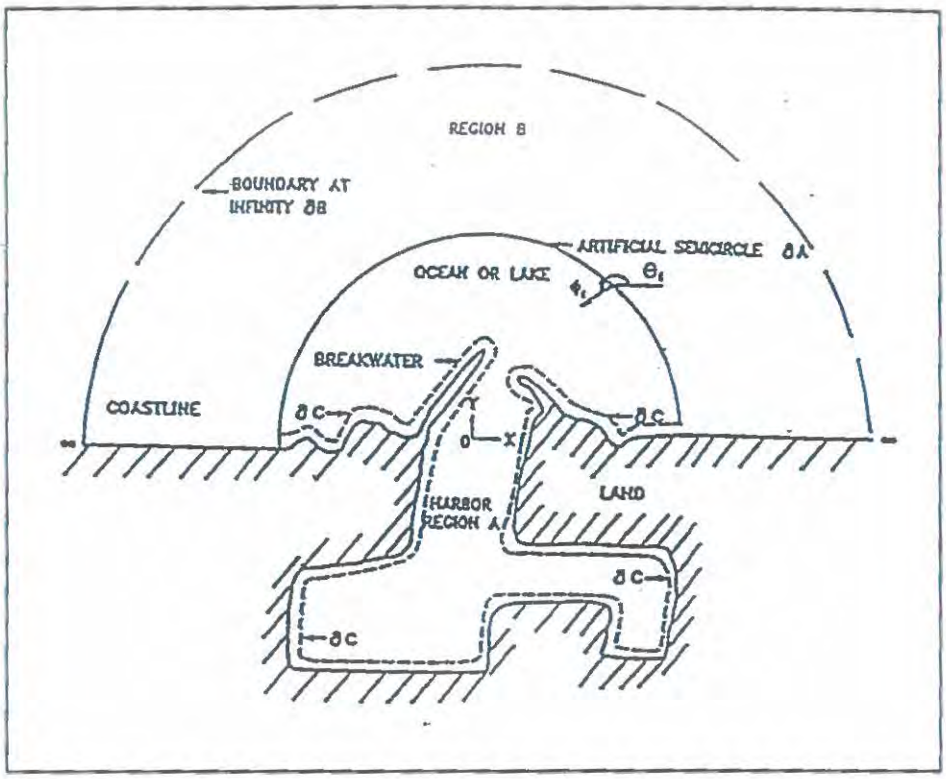


Figure 8. Representation of HARBD domain

the semicircle should be as large as practical constraints on grid size and resolution will allow.

The area outside the semicircle is treated as a semi-infinite region which extends from a straight coastline seaward to infinity (Region *B*). This region is assumed to have a constant water depth and no bottom friction.

Assuming linear, regular waves propagating over mild slope in arbitrary water depth, Chen (1986) derived the governing equation as

$$\nabla \cdot (\lambda \, c \, c_g \, \nabla\phi) + \frac{\omega^2 \, c_g}{c} \phi = 0 \tag{1}$$

where ∇ = horizontal gradient operator,
λ = complex bottom friction factor,
c = wave phase speed,
c_g = wave group speed,
ϕ = velocity potential,
ω = angular frequency.

This equation is identical to Berkhoff's (1972) equation except for addition of the bottom friction factor λ. The factor λ, which is a complex number with magnitude greater than zero and less than or equal to one, is specified as

$$\lambda = \frac{1}{1 + \dfrac{i\beta a_i}{d \sinh \kappa d} e^{i\gamma}} \tag{2}$$

where $i = (-1)^{1/2}$,

β = dimensionless bottom friction coefficient that can vary in space,

a_i = incident wave amplitude,

d = water depth,

κ = wave number,

γ = phase shift between stress and flow velocity.

The bottom friction factor is a factor tending to reduce local velocities proportionately through the relationships

$$u = \lambda \frac{\partial \phi}{\partial x}$$
$$v = \lambda \frac{\partial \phi}{\partial y} \tag{3}$$

where u,v = local horizontal velocity components,

x,y = horizontal coordinates.

Boundary conditions are specified in Regions A and B. At the solid boundary ∂C, a reflection/absorption boundary condition is used similar to the impedance condition in acoustics. The condition is specified as

$$\frac{\partial \phi}{\partial n} - \alpha \phi = 0 \tag{4}$$

with

$$\alpha = i\kappa \frac{1 - K_r}{1 + K_r} \tag{5}$$

where n = unit normal vector directed into the solid region,

K_r = reflection coefficient of the boundary.

Values of K_r for wind waves and swell are normally chosen based on the boundary material and shape. General guidelines for K_r can be assembled from laboratory and field data (Thompson et al. 1996). In wind wave and swell studies, K_r is generally chosen to be consistent with this guidance. Effects such as slope, permeability, relative depth, wave period, breaking, and overtopping can be considered in selecting values within these fairly wide ranges. For long wave studies, K_r is generally set equal to 1.0, representing full reflection.

The second boundary condition is imposed in the far region (Region B) at infinity. It requires that the scattered wave, defined as the difference between the total wave and incident wave, behave as a classical outgoing wave at infinity. This radiation condition may be expressed as

$$\lim_{r \to \infty} \sqrt{r} \left(\frac{\partial}{\partial r} - i\kappa \right) \phi^s = 0 \tag{6}$$

where r = radial polar coordinate,
ϕ^s = velocity potential of the scattered wave.

The complete boundary value problem is specified by equations 1, 4, and 6. A hybrid element method is employed to solve the boundary value problem. A conventional finite element grid is developed and solved in Region A. The triangular elements allow detailed representation of harbor features and bathymetry within Region A. An analytical solution with unknown coefficients in a Hankel function series is used to describe Region B. For a given grid, short wave period tests (relatively large values of κ) require more terms than long period tests to adequately represent the series. A variational principle with a proper functional is established such that matching conditions are satisfied along ∂A. Details are given by Chen (1986) and Lillycrop and Thompson (1996).

Experience with the model has indicated that the element size Δx and local wavelength L should be related by

$$\Delta x \leq \frac{L}{6} \tag{7}$$

Typically, harbor domains include some shallow areas in which many elements would be needed to satisfy the constraint in Eq. 7. In practice, Eq. 7 is at least satisfied in the harbor channel and basin depths. If additional elements can be accommodated, it is generally preferred to extend the semicircle further seaward rather than to greatly refine shallow harbor regions.

Input information for HARBD must be carefully assembled. In addition to developing the finite element grid to suit HARBD requirements, a number of parameters must be specified. Critical input parameters and ranges of typical values are summarized in Table 1.

The principal output information available from HARBD consists of amplification factor and phase at each node. These are defined as

Table 1
Critical HARBD Input Parameters and Ranges of Typical Values

Parameter	Where Specified	Typical Values	
		Short Waves	Long Waves
Bottom friction, β	Every element	0.0	0.0-0.1
Boundary reflection, K_r	Every element on solid boundary	0.0 - 1.0	1.0
Coastline reflection, $K_{r,coast}$	Single value	1.0	1.0
Depth in infinite region, d_{far}	Single value	Between avg. & max. on semicircle	
Number of terms in Hankel function series	Single value	8 - 100*	8

* The number of terms needed increases as wave period decreases.

$$A_{amp} = \left|\frac{a}{a_i}\right| = \left|\frac{H}{H_i}\right| = |\phi|$$

$$\theta = \tan^{-1}\left[\frac{Im\{\phi\}}{Re\{\phi\}}\right] \tag{8}$$

where A_{amp} = amplification factor,
a, a_i = local and incident wave amplitudes,
H, H_i = local and incident wave heights,
θ = phase relative to the incident wave,
$Im\{\phi\}$ = imaginary part of ϕ,
$Re\{\phi\}$ = real part of ϕ.

Amplification factors are easily interpreted. Phases are helpful in viewing wind wave and swell propagation characteristics and in interpreting standing wave patterns. In long wave applications, phases prove useful for determining relative phase differences within the harbor, interpreting harbor oscillation patterns, and identifying potentially troublesome nodal areas.

Spectral Adaptation

HARBD computes harbor response to specified wave period and direction combinations. However the model is often used to approximate irregular wind wave and swell behavior, as in physical model tests with irregular waves and all field cases. More realistic numerical model simulations can be obtained by linearly combining HARBD results from a range of regular wave frequencies in the irregular wave spectrum. Regular wave results are weighted to properly represent the desired spectral distribution of energy. The concept of linear superposition of weighted regular wave results can also be extended to include directional spreading in the spectrum to be simulated.

Spectral adaptation of the HARBD model is done as a post-processing step using the standard, regular wave output from the model. For a given incident wave direction, HARBD is run for a number of wave periods spread between the shortest period satisfying the grid resolution constraint of Equation 7 and the longest swell period of interest.

Spectral post-processing is based on the assumption that a consistent spectral form can be applied at every node. This major assumption provides the basis for a workable, reasonable spectral weighting which improves on the traditional regular wave approach. The JONSWAP spectral form was chosen (Hasselmann et al. 1973). The JONSWAP spectrum is specified as (U.S. Army Corps of Engineers 1989)

$$S(f_i) = \frac{\alpha g^2}{(2\pi)^4 f_i^5} e^a \gamma^b \tag{9}$$

where $S(f_i)$ = spectral energy density at frequency f_i

The parameters a and b are given by the following relationships

$$a = \frac{-1.25}{f_i T_p^4}$$

$$b = e^{\frac{-1}{2\sigma^2}(f_i T_p - 1)^2} \tag{10}$$

$$\sigma = 0.07 \quad \text{for } f_i \le f_p$$

$$= 0.09 \quad \text{for } f_i \ge f_p$$

where T_p = peak spectral period

f_p = peak spectral frequency = $\frac{1}{T_p}$

Parameters α and γ are calculated as

$$\alpha = 157.9\, \epsilon^2$$

$$\gamma = 6614\, \epsilon^{1.59} \tag{11}$$

$$\epsilon = \frac{H_s}{4\, L_p}$$

where H_s = significant wave height
L_p = wavelength for waves at peak frequency

The parameter ϵ is a significant wave steepness. The parameter γ, called the peak enhancement factor, controls the sharpness of the spectral peak.

Although the JONSWAP spectrum was developed primarily for actively growing wind waves, it can be used with appropriate choice of γ to approximate any single-peaked spectrum, including old swell which has travelled a great distance from the generation area (e.g. Goda 1985) (Table 2).

Table 2
Guidance for Choosing γ

Wave Condition	γ
Growing sea	3.3
Old swell	8-10

Spectral post-processing begins with specification of the desired H_s, T_p, and γ and the arrays of HARBD amplification factors. A refined JONSWAP spectrum is computed with 1000 points, where the f_i's in Equation 9 are

$$f_1 = 0.5{*}f_p\,,\quad f_2 = 0.502{*}f_p\,,\ f_3 = 0.504{*}f_p\,, \ldots,\ f_{1000} = 2.498{*}f_p$$

The number of wave periods computed with HARBD is always much smaller than 1000, typically less than 20. These periods, converted to frequency (reciprocal of period), can be used to define bands in the JONSWAP spectrum. Bands are bounded by the midpoints between HARBD computational frequencies. The highest and lowest frequency bands are assumed to be centered on the highest and lowest HARBD computational frequencies, respectively. A weighting factor for each HARBD-defined band is computed by summing values from the refined JONSWAP spectrum which fall within the band and normalizing by the total spectral energy.

$$w_k = \frac{\sum_{i=N_{k1}}^{N_{k2}} S(f_i)}{\sum_{i=1}^{1000} S(f_i)} \tag{12}$$

where w_k = weighting factor for k'th HARBD computational frequency

N_{k1} = index of lowest JONSWAP frequency, f_i, satisfying

$$f_i > \frac{f_{k-1}+f_k}{2}$$

N_{k2} = index of highest JONSWAP frequency, f_i, satisfying

$$f_i < \frac{f_k+f_{k+1}}{2}$$

f_{k-1}, f_k, f_{k+1} = (k-1)'th, k'th, and (k+1)'th HARBD computational frequencies, with $f_{k-1}<f_k<f_{k+1}$

Though not shown in the equation, the weighting factor also includes fractional energy interpolated across JONSWAP frequencies bracketing the two end points of each HARBD band.

The effective amplification factor at each node is computed as

$$(A_{amp})_{eff} = \sqrt{\sum_{k=1}^{N_T} w_k A_{amp}^2(f_k)} \tag{13}$$

where $(A_{amp})_{eff}$ = effective , or spectral, amplification factor at a node
$A_{amp}(f_k)$ = nodal amplification factor for HARBD computational frequency f_k
N_T = number of HARBD computational wave periods

Finite Element Grids

The finite element numerical grid depicting existing conditions at Maalaea Harbor was created previously using WES's finite element grid development software (Turner and Baptista) (Figure 9). The grid covers the entire Maalaea Harbor area and extends somewhat seaward from the harbor entrance. The land boundary was digitized from a NOAA nautical chart. Grid element size is based on the criterion of 6 elements per wavelength (the minimum recommended resolution with HARBD) for a 8-sec wave in 8-ft water depth. Depths over virtually the entire embayment exceed 8 ft. For the longer period waves, the grid gives a high degree of resolution. Grid characteristics are summarized in Table 3.

Table 3
Grid Sizes

Harbor Plan	Number of:				Length of Typical Element (ft)
	Elements	Nodes	Solid Boundary Nodes	Semicircle Boundary Nodes	
Existing	7,140	3,749	252	105	20
Plan 1	6,765	3,613	355	105	20
Plans 1a & 1b	6,810	3,636	357	105	20
Plan 2	7,882	4,184	353	132	20
Plan 3	7,911	4,215	386	132	20
Plans 6 & 6a	6,747	3,603	353	105	20

The radius of the seaward semicircle is approximately 790 ft. This is equivalent to 5.7 and 2.1 wavelengths for the shortest and longest short wave periods considered, assuming a representative water depth of 10 ft. The semicircle size and location were chosen to include all breakwaters and moles and significant bathymetry south of the harbor entrance. The semicircle extends sufficiently far seaward to cover the most important nearshore bathymetry.

Bathymetric data, obtained from NOAA hydrographic charts and POD bathymetric survey data taken in 1989, were unchanged from previous studies. Depths were transferred onto the finite element grid using the USAEWES grid software package.

Reflection coefficients, K_r, are needed for all solid boundaries. For the short wave tests, K_r values were estimated from existing Corps of Engineers guidance, photos, and past experience. The solid boundary of the existing harbor was divided into seven zones and a reflection coefficient was estimated for each zone (Figure 10). Reflection coefficients ranged from 0.0 for open water areas east of the harbor to 1.0 at the wharf face along the northern portion of the harbor. Other parameter values used in the numerical model are summarized in Table 4.

Different parameters are used for long wave tests. Reflection coefficients were set to 1.0 for all boundaries, since long waves generally reflect very well from coastal boundaries. Long waves are more affected by bottom friction than short waves, so a value of β greater than zero is appropriate. The value of β is best determined by calibration with field data. A value of β=0.032 was determined for Kahului Harbor (Thompson et al. 1996b). In this case, to be

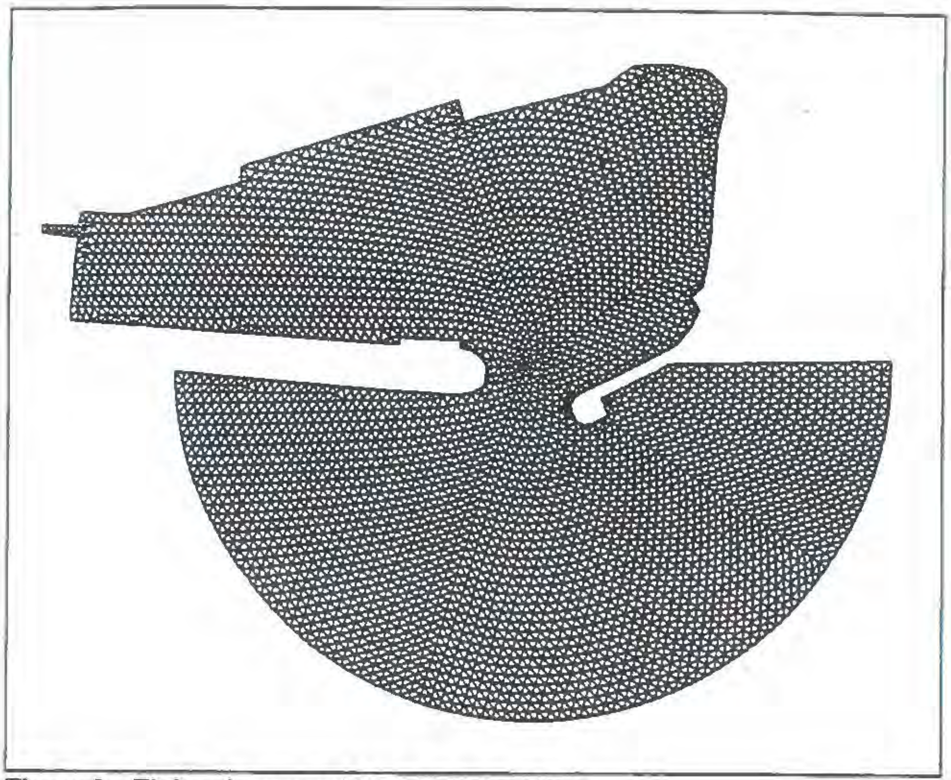


Figure 9. Finite element grid for Existing Plan

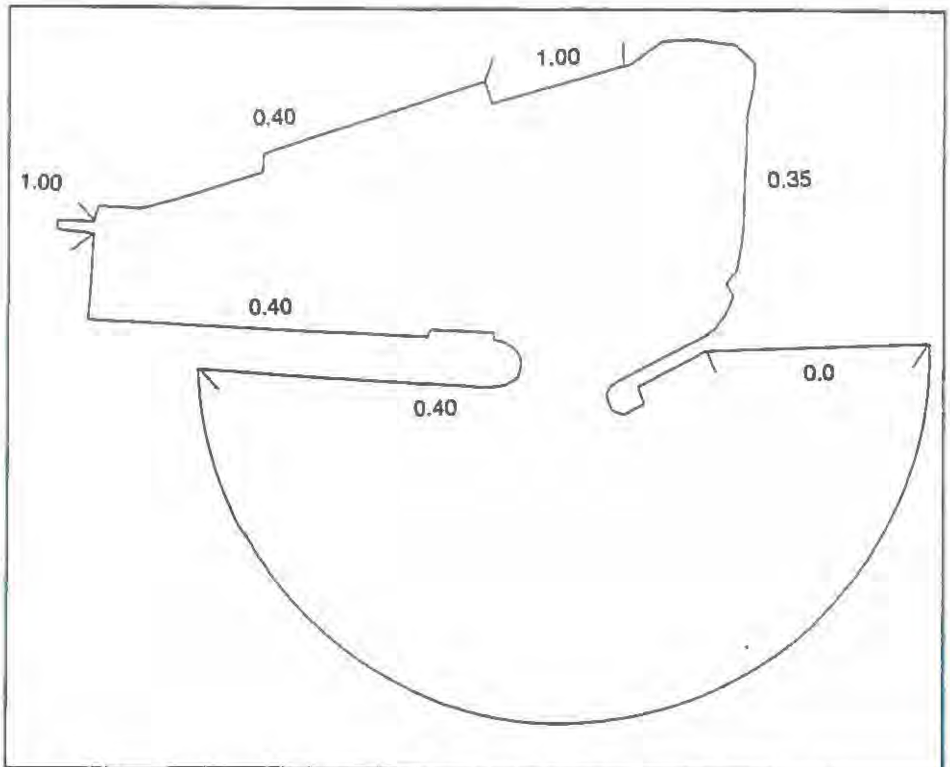


Figure 10. Boundary reflection coefficients for Existing Plan

consistent with long wave runs previously conducted for the Existing Plan and Plan 6 (Thompson and Hadley 1994b) and because an accurate value for β is not critical to the objectives of the study, a default value of β=0.0 was used. This and other parameters are summarized in Table 4.

In addition to existing conditions, seven harbor modification plans were specified for evaluation, as discussed in Chapter 1. Harbor grids were generated previously to represent each alternative configuration. Grid characteristics for each configuration are included in Table 3. Short wave reflection coefficients were modified as appropriate for each plan. General guidelines were K_r=0.40 to K_r=0.50 along moles and K_r=0.25 to K_r=0.35 along breakwater extensions.

Table 4
Parameter Values Used in HARBD

Parameter	Value	
	Short Waves	Long Waves
Bottom friction, β	0.0	0.0
Coastline reflection, $K_{r,coast}$	1.0	1.0
Depth in infinite region, d_{far}	25 ft	25 ft

3 Harbor Response To Wind Waves and Swell

Percent occurrence statistics for wind wave and swell climate in Maalaea Harbor were estimated based on deepwater wave climate percent occurrence tables. For this study, the deepwater wave climate was taken from 12 months of data (Dec 94 through Nov 95) from National Data Buoy Center buoy 51027, located approximately 25 miles southwest from the island of Lanai (Appendix A). The buoy had an open exposure to wave directions of importance to Maalaea Harbor. Only those deepwater directions likely to impact Maalaea Harbor were considered. Percent occurrences for these directions were taken directly from the buoy climate, assuming that Maalaea Harbor would be calm for cases when the buoy recorded wave directions headed away from the harbor. The buoy is a much more reliable source of deepwater wave information than was available when earlier studies of Maalaea Harbor were conducted. This change contributes significantly to the reliability of study results.

To establish wave climate incident to Maalaea harbor, a total of 187 deepwater wave height, period, and direction combinations were input to the SHALWV model (Lillycrop et al. 1993). The SHALWV grid extended beyond the island of Kahoolawe. It allowed estimates of sheltering and shallow water effects on waves between the deepwater, open ocean south of Kahoolawe and the Maalaea harbor area. To determine wave heights in Maalaea harbor, SHALWV wave heights near the harbor (in the vicinity of the seaward boundary of the HARBD grid) were multiplied with the HARBD amplification factors corresponding to each deepwater condition. The 187 wave height, period, and direction combinations were tested. All simulations were run on the WES CRAY Y-MP and SGI PCA1 supercomputing facilities.

Output "basins" were selected for each plan to determine wave response throughout the harbor. A basin is a small cluster of elements over which the HARBD response is averaged to give a more representative output. The number of basins for each plan varied between 16 and 24. The locations, selected by WES and POD, are shown for the Existing Plan in Figure 11 and in Appendix B for all remaining plans. Since the wave height criteria which must be satisfied differ for channel areas and berthing areas, output basins for each plan are designated by area (Table 5).

The percent occurrences of wave heights exceeding 1 ft in the berthing areas and 2 ft in the entrance and access channels and turning basin were calculated for all plans. The procedure is based upon the same principles employed by Lillycrop et al. (1993).

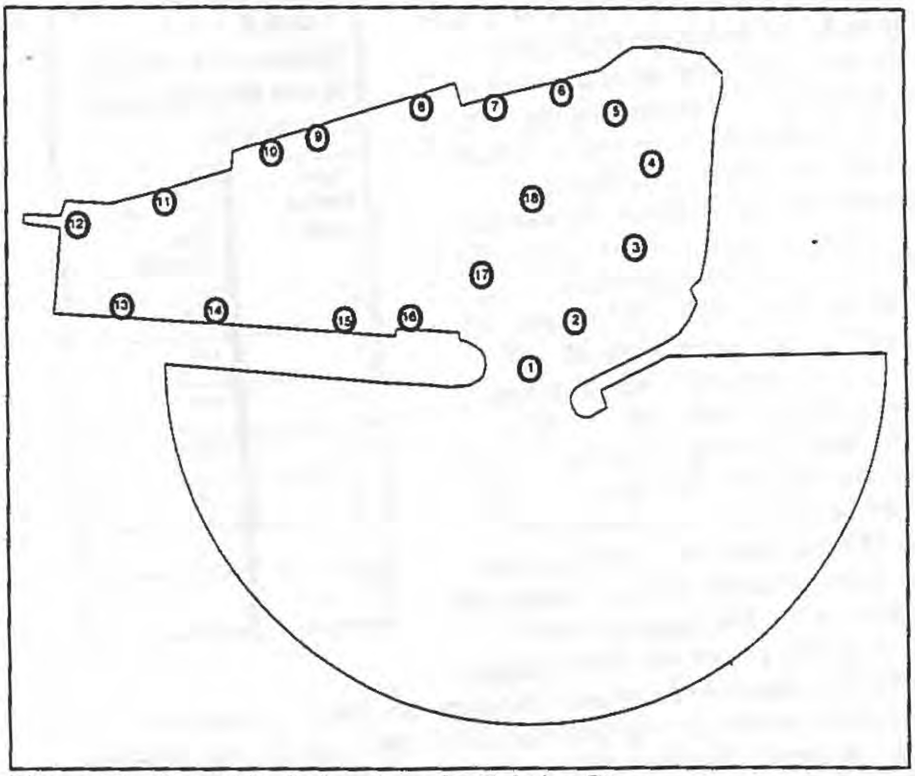


Figure 11. Output basin locations for Existing Plan

Percent occurrence of wave heights exceeding 2 ft in entrance channels is related to the amount of exposure to incident waves. Basins with full exposure to incident waves typically have a higher percentage of exceedence than basins located in more protected channel areas. For Maalaea Harbor wave studies, the most seaward basin in the entrance channel of each harbor plan was placed at or near the entrance constriction point where vessels have minimum maneuvering space between harbor structures while being subjected to ocean wave forces.

Table 5
Designation of Output Basin Areas

Plan	Basin Numbers	
	Channel	Berthing
Existing	1-6	7-18
Plans 1, 1a, 1b	1-5	6-23
Plan 2	1-6	7-23
Plan 3	1-7	8-24
Plans 6, 6a	1-6	7-18

HARBD amplification factors from which percent occurrences were generated were obtained by first running a range of short wave conditions (Table 6) encompassing minimum and maximum periods and directions of the full array of short wave input conditions generated from SHALWV results. Model results were then evaluated for directional spectra with peak period and direction values equivalent to the original array of short wave input conditions.

Table 6
Summary of Short Wave Periods and Directions

Wave Period (sec)	Wave Direction (deg, azimuth)
8	202
9	195
11	185
13	175
15	165
17	160
20	

Tabulations of the HARBD-SHALWV wave heights initially exceeding the HQUSACE criteria for each deepwater wave direction are given in Appendix C. For the Existing Plan, Table C1 shows that the wave heights initially exceeding the maximum 1 ft criterion in berthing areas (basins 7 through 18) resulted from 9-sec waves coming from the 135-, 157.5-, 180-, 202.5-, and 225-deg directions; 11-sec waves from the 157.5-, 180-, 202.5-, and 225-deg directions; 13-sec waves from the 157.5-, 180-, 202.5-, 225-, and 247.5-deg directions; 15-sec waves from the 135-, 157.5-, 180-, 202.5-, 225-, and 247.5-deg directions, 17-sec waves from the 135-, 157.5-, 180-, and 202.5-deg directions; and 20-sec waves from the 157.5- and 180-deg directions. Predominantly, initial exceedence occurred at basin 7, along the existing wharf, with a few cases of initial exceedence at basins 17 and 18. Wave heights exceeding the 2 ft maximum criterion in the entrance channel (basins 1-6) resulted from 9-sec waves coming from the 157.5-, 180-, 202.5-. and 225-deg directions; 11-sec waves from the 157.5- and 180-deg directions; 13-sec waves from the 157.5-, 180-, 202.5-, and 225-deg directions; 15-sec waves from the 157.5-, 180-, 202.5- and 225-deg directions; 17-sec waves from the 157.5-, 180-, and 202.5-deg directions; and 20-sec waves from the 157.5- and 180-deg directions. These waves occurred at the harbor entrance in basin 1.

Tables C2 and C3, for Plan 1 and Plan 1a respectively, show that with a single exception, wave heights initially exceeding the maximum 1 ft criterion in berthing areas did not occur for deepwater incident wave heights of 9 ft or less. The exception is a 9 ft, 17-sec wave from the 180-deg direction which exceeds at basin 11 of Plan 1a. There was no occurrence of wave heights initially exceeding the maximum 2 ft criterion in the entrance channel for either of the plans.

Table C4 (Plan 1b) shows that the wave heights initially exceeding the maximum 1 ft criterion in berthing areas (basins 6 through 23) resulted from 13-sec waves coming from the 180-deg direction; 15-sec waves from the 157.5- and 180-deg directions; 17-sec waves from the 157.5- and 180-deg directions; and 20-sec waves from the 157.5- and 180-deg directions. There were no instances of exceedence of the 2 ft criterion for deepwater incident wave heights less than 9 ft for Plan 1b.

Wave conditions initially exceeding the maximum 1 ft criterion in berthing areas for Plan 2 (Table C5) include 9-sec waves coming from the 135-, 157.5-, 180-, 202.5-, and 225-deg directions; 11-sec waves from the 157.5- and 180-deg directions; 13-sec waves from the 157.5-, 180- and 202.5-deg directions; 15-sec waves from the 157.5-, 180-, and 202.5-deg directions; 17-sec waves from the 157.5-, 180-, and 202.5-deg directions; and 20-sec waves from the 157.5-and 180-deg directions. Exceedence occurred primarily at basins 7 and 8, near the north end of the east breakwater, and basin 23, near the tip of the west mole. Wave heights exceeding the 2 ft maximum criterion in the entrance channel resulted from 9-sec waves from the 135-, 157.5-, 180-, 202.5-, and 225-deg directions; 11-sec waves from the 157.5- and 180-deg directions; 13-sec waves from the 157.5-, 180-, 202.5-, and 225-deg directions; 15-sec waves from the 157.5-, 180-, 202.5- and 225-deg directions; 17-sec waves from the 157.5-, 180- and 202.5-deg directions; and 20-sec waves from the 157.5- and 180-deg directions. These waves occurred at the harbor entrance in basin 1.

As shown in Table C6, none of the deepwater wave conditions resulted in wave heights exceeding the maximum 1- and 2-ft criteria for Plan 3. However, the percent occurrence of wave heights greater than 9 ft was included in the tabulations for this plan.

For Plan 6 and Plan 6a (Tables C7 and C8), there was no exceedence of the maximum 1 ft criterion in the berthing areas for either plan. Wave heights exceeding the 2 ft criterion in the entrance channel resulted from 9-sec waves from the 157.5-, and 180-deg directions; 11-sec waves from the 180-deg direction; 13-sec waves from the 157.5- and 180-deg directions; 15-sec waves from the 157.5-, 180-, 202.5- and 225-deg directions; 17-sec waves from the 157.5-, 180-, and 202.5-deg directions; and 20-sec waves from the 157.5- and 180-deg directions in both plans. Plan 6a also experienced exceedence of the 2 ft criterion for the additional conditions of 9- and 13-sec waves from the 202.5-deg direction and 13-sec waves from the 225-deg direction. Initial exceedence occurred at basin 1 in all cases.

The percent occurrence of wave heights exceeding the maximum 1-ft and 2-ft criteria for each plan was calculated using the percent occurrence tables of deepwater conditions and HARBD-SHALWV wave height results. These results are given in Appendix D. Although wave breaking was not taken into account in the tables, higher wave heights may break over the reef, thus reducing wave heights in the harbor. In evaluating the percent occurrence results, it is apparent that waves approaching from the west to southwest (270.0 to 247.5 deg) directions are insignificant in comparison to waves approaching from the southwest to southeast (225.0 to 135.0 deg) directions.

The percentage of wave heights exceeding the maximum 1-ft and 2-ft criteria for the Existing and Plans 1, 1a, 1b, 2, 3, 6, and 6a are summarized in Table 7 along with the HQUSACE criteria. These values are somewhat conservative since they represent basins with the largest wave heights occurring in the harbor for each deepwater wave condition.

Table 7
Summary of Percent Occurrence of Wave Heights

Location	Percent of Time Criterion is Exceeded								
	USACE Crit.	Exist. Plan	Plan 1	Plan 1a	Plan 1b	Plan 2	Plan 3	Plan 6	Plan 6a
Berthing areas (1 ft crit.)	< 10	32.8	0.6	0.8	1.6	10.8	0.6	0.6	0.6
Entrance Channel (2 ft crit.)	< 10	15.4	0.6	0.6	0.6	18.1	0.6	8.8	13.5

The Existing Plan allows the 1 ft wave height criterion in the berthing areas to be exceeded 32.8 percent of the time per year. This violates the HQUSACE standard that wave heights exceed 1 ft in these areas no more than 10.0 percent of the time per year. The entrance channel in the Existing Plan shows an exceedence of 15.4 percent of the time per year of the 2 ft wave height criterion which also exceeds the HQUSACE standard.

Plans 1 and 1a, which include structural modification to the east, and Plan 3, which includes structural modification to the west, allow exceedence of the 1- and 2-ft criteria less than 1 percent of the time per year. This falls well below HQUSACE guidelines for providing adequate protection in the berthing and channel areas. Plan 1b also falls below the guidance, exceeding the criteria less than 2 percent of the time. Plan 2 shows exceedence of the 1 ft and 2 ft criterion 10.8 and 18.1 percent of the time per year, respectively, which exceeds HQUSACE guidelines. Plans 6 and 6a both fall below the HQUSACE guidance for berthing areas with an exceedence of the 1 ft criteria less than 1 percent of the time. Plan 6a, however, exceeds the 2 ft wave height criteria 13.5 percent of the time per year while Plan 6 is marginally acceptable with an exceedence of 8.8 percent of the time per year.

4 Harbor Oscillations

The HARBD numerical model was run for all plans, including the Existing Plan, to investigate harbor response to wave periods characteristic of harbor oscillations. These tests were included because the "surge" problem reported in the existing harbor may arise in part from a resonant response to long period wave energy impacting the harbor. Harbor oscillations were not considered in the earlier study by Lillycrop et al. (1993), but were considered by Thompson and Hadley (1994b) for the Existing Plan and Plan 6. Runs for both of these plans were repeated in the present study in order to incorporate changes in the modeling technology. Current results for the Existing Plan differ significantly from those obtained by Thompson and Hadley (1994b). Differences in results for Plan 6 were negligible.

Incident long wave conditions considered are given in Table 8. A fine resolution in wave frequency was used over the full range of possible resonant conditions to ensure that all important peaks were identified. Only one approach direction is included, since past studies have indicated that harbor response is relatively insensitive to incident long wave direction. This direction represents a wave directly approaching the harbor entrance from deep water.

Table 8
Summary of Incident Long Wave Conditions

Wave Period (sec)	Wave Direction (deg, azimuth)
20.00	180
20.08	
20.16	
...[1]	
780.00	

[1] Frequency increments are 0.0002 Hz for periods of 20-100 sec and 0.00007 Hz for periods of 100-780 sec

Amplification factors for all improvement plans compared to the existing harbor plan are shown for selected corner basins in Appendix E. It is important to note that although basin numbers for individual plans may differ from those of the existing harbor plan, locations of the basins are comparable. Coincident basin locations allow for a more straightforward comparison of oscillation characteristics of harbor configurations.

Figures E1 through E6 show amplifications at the west end of the harbor basin nearest the small boat ramp. In general, Plans 1, 1a, and 1b, show significantly higher peak amplifications over the Existing Plan at this location for the range of frequencies from 0.01 to 0.05 hz, particularly at the higher frequencies (0.02 - 0.05 hz). Plans 2 and 3, on the contrary, show a marked decrease in peak amplifications over the Existing Plan for the same range of frequencies, with the exception of two notable peaks between 0.04 and 0.05 hz. Plans 6 and 6a, also display higher peak amplifications over the Existing Plan for lower frequency waves (0.01 to 0.025 hz) while showing lower peak amplifications by comparison for higher frequencies (0.025 to 0.05 hz). Harbor oscillation patterns for resonances near 0.019 hz and 0.025 hz were given by Thompson and Hadley (1994b) for Plan 6.

Figures E7 through E12 show amplifications at a point located along the north boundary of the harbor basin. This point is significant relative to the Existing Plan due to the addition of a new "corner" area created by the development of the interior revetment. Plans 1, 1a, and 1b (Figures E7 and E8) show a marked decrease in the number of resonant peaks as well as significant reduction in the magnitude of amplification compared to the Existing Plan for higher frequency waves (0.035 to 0.05 hz). For lower frequency waves (0.01 to 0.035 hz), these plans show little difference in the number of resonant peaks but display comparable or increased magnitudes of amplification. Plans 2 and 3 (Figures E9 and E10) also show reductions in both the number of resonant peaks and the magnitude of the amplifications relative to the Existing Plan (with exceptions), but over the full range of frequencies from 0.01 to 0.05 hz. Plans 6 and (figures E11 and E12) give results similar to those of Plan 1, 1a, and 1b, with higher peak amplifications over the Existing Plan at lower frequencies (0.01 to 0.025 hz) and decreased amplifications at higher frequencies. There is a single exception to this trend, a sharp but relatively small peak at approximately 0.036 hz for Plan 6.

The new corner area may act as an antinode for a number of different resonant modes in several of the plans, as indicated by high amplification factor peaks. The strong response could make this region less desirable for berthing facilities. However, amplification factors shown in Appendix E should be viewed as conservatively high for several reasons. Wave reflection coefficients at all solid boundaries were taken as 1.0. Bottom friction was neglected (β=0.0). Energy losses through a constricted entrance are not explicitly included in the HARBD model (Thompson et al. 1993). Finally, the east breakwater in each plan is represented as a solid barrier; but for harbor oscillation wave periods, significant energy may be transmitted through it.

Based on experience with field data and numerical modeling of various harbors employing nonzero bottom friction and boundary reflections varying from 1.00 at low frequencies to approximately 0.95 for higher oscillation frequencies, it is expected that lower frequency resonances, ranging from about 0.005 to 0.025 hz, are the most significant considerations. Thus, the plan conditions, especially Plans 1, 1a, 1b, 6, and 6a, may be expected to oscillate more than the existing harbor in the semi-enclosed area north of the plan revetted interior mole. However, differences in overall strength of oscillation between the existing and plan harbors appear to be relatively small, and long wave activity in other harbor areas should be comparable to the existing harbor.

5 Navigation

Introduction

A primary objective in harbor entrance design is to provide a safe passage for boats to enter and exit the harbor, while maintaining adequate protection of the harbor interior from wave action. Engineering design guidance is available to determine a channel width and depth which will permit safe navigation. That guidance has been applied in formulating the plan alternatives for Maalaea Harbor. However, navigation guidelines concerning layout of the entrance channel and protective harbor structures are not well established. Judgement and experience must be used to insure that plan entrances will function effectively over a sufficient range of environmental conditions. This chapter addresses navigation concerns relative to the Maalaea Harbor plans.

WES Experiments

The WES has an ongoing research study of small boat response in a variety of wave environments. Preliminary results from the research study are available and they have relevance to Maalaea Harbor. Experiments were conducted in open water with the conditions given in Table 9. Other vessel lengths are being tested, but the data have not yet been analyzed.

Vessels approaching Maalaea Harbor typically experience a following wave environment (waves approaching the harbor from approximately the same direction as the vessel). The WES experiments indicate that for this situation, the vessel may be difficult to control. The most influential experimental variables were vessel speed and wavelength, though wave height was also a factor. The vessel was under control at the highest speed (8 knots) in all cases. Also, the vessel was always controllable in the presence of the shortest wavelength (0.5 L_s). At speeds less than 8 knots and wavelengths longer than 0.5 L_s, the vessel begins losing maneuverability. At vessel speeds of 4 knots or less, the vessel stops responding to the rudder, indicating a complete loss of control.

Vessel controllability, as determined from the limited number of WES experiments available, is summarized in Figure 12. In the zone of no control, the vessel is likely to be carried in the direction of wave travel. There is also a possibility that the waves could cause the vessel to broach (turn sideways to the waves and capsize).

Table 9
Experimental Conditions for WES Small Boat Navigation Tests

Variable	Symbol	Values
Vessel length	L_s	40 ft
Vessel draft	D	5.24 ft
Vessel speed	V_s	4, 6, and 8 knots
Wavelength	L	0.5 L_s, 1.0 L_s, and 2.0 L_s
Relative water depth	d/D	1.5 and 3.8
Wave height	H	varied from 1 ft to 5 ft

Application To Maalaea Harbor Plans

The existing Maalaea Harbor and Plans 2, 3, 6, and 6a have entrance channel orientations which would require vessels to approach the harbor from the south. Plans 1, 1a, and 1b would require an approach from the southeast. For the wave climate and local exposure at Maalaea, vessels entering Plans 2, 3, 6, and 6a would be significantly more likely to experience following waves (due to both the fairly open southern exposure and refraction near the harbor) than for Plans 1, 1a, and 1b.

Since the WES experiments show that the ratio of wavelength to vessel length is a critical factor in controllability, percent exceedence statistics of that ratio in the entrance channel were estimated. The estimates are based on deepwater percent occurrence information for wave periods and the design 15-ft water depth in the outer entrance channel. Vessel lengths of 20 ft and 120 ft were considered to cover the range of vessels using Maalaea Harbor. These results indicate that 100 percent of the wave conditions in the entrance channel would give wavelengths longer than 0.5 L_s (Figure 13).

Vessel speed entering Maalaea Harbor is restricted to limit vessel wakes. Vessel speed entering the harbor is expected to be less than 5 knots. This restricted speed coupled with the wavelength to vessel length ratios indicate that vessels entering the harbor are in jeopardy of experiencing poor or no control, especially if wave heights are big. Plans 1, 1a, 1b, and 3 would be safer in this regard, because they offer a protected section of entrance channel before vessels actually enter the harbor. With these plans, vessels could maintain a higher speed and good control until they are safely behind the outer breakwater. Plans 2, 6, and 6a appear to be the most hazardous for navigation because they require entering vessels to travel at reduced speed in a fairly exposed entrance. If a vessel were to lose control in the Plan 2 entrance, it could be thrust against the south breakwater. Similarly, if a vessel loses control in the Plan 6 or Plan 6a entrance, it could be carried against the mole paralleling the channel.

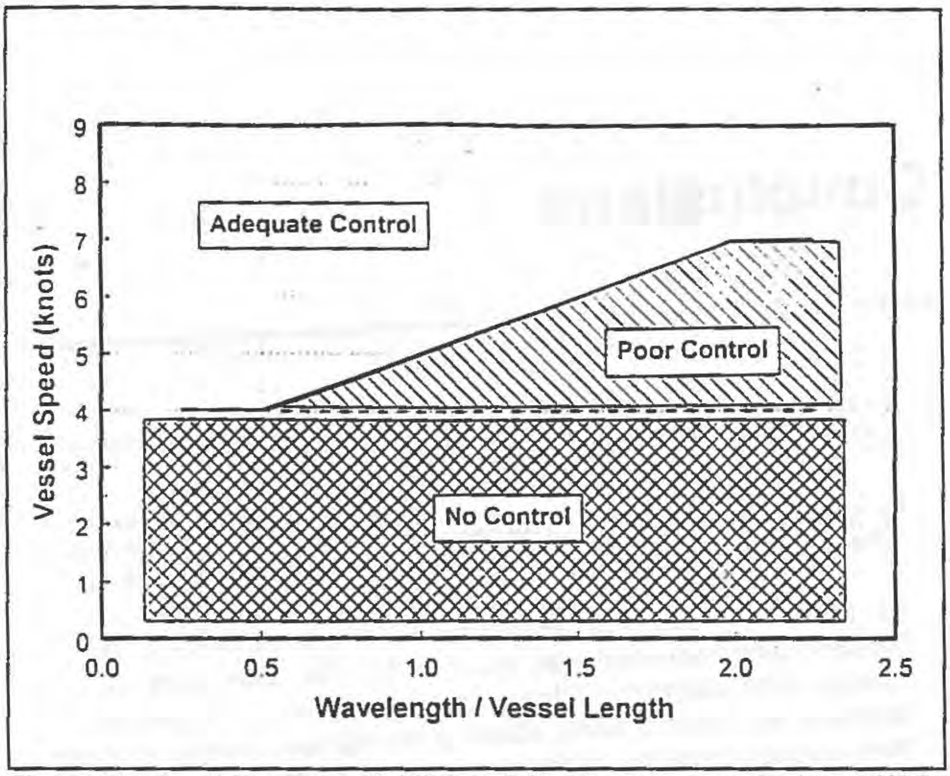


Figure 12. Small boat controllability in following waves, preliminary WES data

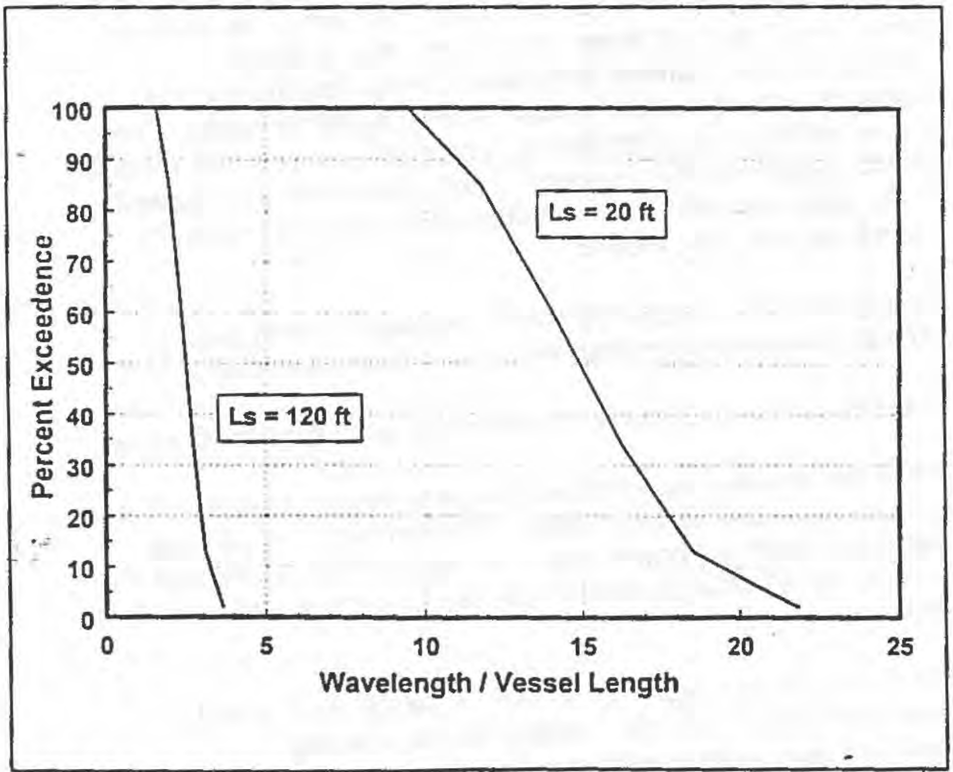


Figure 13. Wavelength percent exceedence in outer entrance channel

6 Conclusions

The numerical model studies and results described in this report should be seen in light of the following considerations:

a. Reflection coefficients were estimated as described by Lillycrop et al. (1993). Research in this area continues at WES for better guidance.

b. The following assumptions were made in the implementation of the HARBD numerical model used in this study. The model does not consider wave transmission through the breakwater, overtopping of structures, and wave breaking effects in the entrance channel; structure crest elevations were not tested or optimized; currents and nonlinear effects were neglected; and diffraction around the structure ends was represented by diffraction around a blunt vertical wall with specified reflection coefficients. If wave transmission through the breakwater and overtopping of structures did occur in the harbor, the increased energy could result in larger wave heights than predicted. The presence of wave currents and breaking would increase hazardous navigation, however wave breaking would reduce the energy in the harbor and result in lower wave heights than predicted. The primary effects which must be considered within a harbor such as Maalaea are wave refraction, diffraction, and dissipation effects for which the model has been well verified.

c. Energy losses for long period (harbor oscillation) waves passing through a constricted entrance were not explicitly modeled.

Based on the results of this study, the following conclusions were reached:

a. All of the proposed harbor plans show some degree of improvement over the Existing Plan in providing protection from incident wind waves and swell to berthing areas. All but the Existing Plan and Plan 2 satisfy the HQUSACE criterion for adequate harbor protection in these areas.

b. All of the proposed harbor plans, with the exception of Plan 2, show improvement over the Existing Plan in providing protection from incident wind waves and swell to entrance channel areas. Plans 1, 1a, 1b, and 3 appear to offer the most protection, falling well below HQUSACE criterion for these areas. Plan 6 falls marginally below HQUSACE criterion. Plans 2 and 6a exceed the criterion significantly.

c. Navigation during high wave conditions is potentially more hazardous in Plans 2, 6, and 6a relative to other plans because they will require vessels to travel at reduced speed through a constricted entrance exposed to wind waves and swell.

d. Plans 1, 1a, 1b, 6, and 6a may be expected to experience stronger oscillations than the existing harbor, particularly at lower frequencies. The increase is due to the addition of the internal mole and breakwater structures, which can potentially lead to a significant increase in the amplitude of harbor oscillations by creating more confined corners (which can act as antinodes) in desired berthing areas. Differences in the overall strength of oscillation between the existing and plan harbors at higher frequencies appear to be small.

References

Berkhoff, J. C. W. 1972. "Computation of Combined Refraction-Diffraction," *Proceedings of the 13th Internal Conference on Coastal Engineering*, American Society of Civil Engineers, Vol 1, pp 471-490.

Bottin, R. R., Jr., Sargent, F. E., and Mize, M. G. 1985. "Fisherman's Wharf Area, San Francisco Bay, California, Design for Wave Protection: Physical and Numerical Model Investigation," Technical Report CERC-86-7, US Army Engineer Waterways Experiment Station, Vicksburg, Miss.

Briggs, M. J., Lillycrop, L. S., Harkins, G. R., Thompson, E. F., and Green, D.R. 1994. "Physical and Numerical Model Studies of Barbers Point Harbor, Oahu, Hawaii," Technical Report CERC-94-14, US Army Engineer Waterways Experiment Station, Vicksburg, Miss.

Briggs, M. J., Lillycrop, L. S., and McGehee, D. D. 1992. "Comparison of Model and Field Results for Barbers Point Harbor," *Proceedings, Coastal Engineering Practice*, American Society of Civil Engineers, pp 387-99.

Chen, H. S. 1986. "Effects of Bottom Friction and Boundary Absorption on Water Wave Scattering," *Applied Ocean Research*, Vol 8, No 2, pp 99-104.

Chen, H. S., and Houston, J. R. 1987. "Calculation of Water Oscillation in Coastal Harbors: HARBS and HARBD User's Manual," Instruction Report CERC-87-2, US Army Engineer Waterways Experiment Station, Vicksburg, Miss.

Chen, H. S., and Mei, C. C. 1974. "Oscillations and Wave Forces in an Offshore Harbor," Report No. 190, Department of Civil Engineering, Massachusetts Institute of Technology, Cambridge, MA.

Clausner, J. E., and Abel, C. E. 1986. "Contained Aquatic Disposal: Site Location and Cap Material Investigations for Outer Indiana Harbor, IN. and Southern Lake Michigan," Technical Report, US Army Engineer Waterways Experiment Station, Vicksburg, Miss.

Crawford, P. L., and Chen, H. S. 1988. "Comparison of numerical and physical models of wave response in a harbor," Miscellaneous Paper

CERC-88-11, U.S. Army Engineer Waterways Experiment Station, Vicksburg, M.S.

Farrar, P. D., and Chen, H. S. 1987. "Wave Response of the Proposed Harbor at Agat, Guam: Numerical Model Investigation," Technical Report CERC-87-4, US Army Engineer Waterways Experiment Station, Vicksburg, Miss.

Farrar, P. D., and Houston, J. R. 1982. "Tsunami Response of Barbers Point Harbor, Hawaii," Miscellaneous Paper HL-82-1, US Army Engineer

Goda, Y. (1985). *Random seas and design of maritime structures.* University of Tokyo Press, Tokyo, Japan.

Hasselmann, K., Barnett, T.P., Bouws, E., Carlson, H., Cartwright, D.E., Enke, K., Ewing, J.A., Gienapp, H., Hasselmann, D.E., Druseman, D., Meerburg, A., Muller, D., Olberg, D.J., Richter, K., Sell, W., and Walden, H. 1973. "Measurements of wind wave growth and swell decay during the Joint North Sea Wave Project (JONSWAP)," Deutsches Hydrographisches Institut, Hamburg, Germany.

Houston, J. R. 1976. "Long Beach Harbor Numerical Analysis of Harbor Oscillation; Existing Conditions and Proposed Improvements," Miscellaneous Paper H-76-20, Report 1, US Army Engineer Waterways Experiment Station, Vicksburg, Miss.

Houston, J. R. 1978. "Interaction of Tsunamis with the Hawaiian Islands Calculated by a Finite-Element Numerical Model," *Journal of Physical Oceanography,* Vol 8, No 1, pp 93-101.

Houston, J. R. 1981. "Combined Refraction and Diffraction of Short Waves Using the Finite Element Method," Applied Ocean Research, Vol 3, No. 4, pp 163-170.

Houston, J. R., and Garcia, A. W. 1978. "Type 16 Flood Insurance Study: Tsunami Predictions for the West Coast of the Continental United States," Technical Report H-78-26, US Army Engineer Waterways Experiment Station, Vicksburg, Miss.

Kaihatu, J. M., Lillycrop, L. S., and Thompson, E. F. 1989. "Effects of Entrance Channel Dredging at Morro Bay, California," Miscellaneous Paper CERC-89-3, US Army Engineer Waterways Experiment Station, Vicksburg, Miss.

Lillycrop, L. S., and Boc, S. J. 1992. "Numerical Modeling of Proposed Kawaihae Harbor, HI," *Proceedings, Coastal Engineering Practice,* American Society of Civil Engineers, pp 412-24.

Lillycrop, L. S., Bratos, S. M., and Thompson, E. F. 1990. "Wave Response of Proposed Improvements to the Shallow-Draft Harbor at Kawaihae, Hawaii" Miscellaneous Paper CERC-90-8, US Army Engineer Waterways Experiment Station, Vicksburg, Miss.

Lillycrop, L. S., Bratos, S. M., Thompson, E. F., and Rivers, P. 1993. "Wave Response of Proposed Improvements to the Small Boat Harbor at Maalaea, Maui, Hawaii," Miscellaneous Paper CERC-93-4, US Army Engineer Waterways Experiment Station, Vicksburg, Miss.

Lillycrop, L. S., and Thompson, E. F. 1996. "Harbor wave oscillation model (HARBD) theory and program documentation," *Coastal Modeling System (CMS) User's Manual*, Instruction Report CERC-91-1, M. A. Cialone, ed., U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

Mesa, C. 1992. "A Dual Approach to Low Frequency Energy Definition in a Small Craft Harbor," *Proceedings, Coastal Engineering Practice*, American Society of Civil Engineers, pp 400-11.

Sargent, F. E. 1989. "Los Angeles - Long Beach Harbor Complex 2020 Plan Harbor Resonance Analysis: Numerical Model Investigation," Technical Report CERC-89-16, US Army Engineer Waterways Experiment Station, Vicksburg, Miss.

Smith, E. R. (editor) 1997. "Wave response of Kaumalapau Harbor, Lanai, Hawaii," in preparation, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

Thompson, E. F., Chen, H. S., and Hadley, L. L. 1993. "Numerical Modeling of Waves in Harbors," *Proceedings, WAVES 93*, American Society of Civil Engineers, 590-601.

Thompson, E. F., Chen, H. S., and Hadley, L. L. 1996. "Validation of a numerical model for wind waves and swell in harbors," J. *Waterway, Port, Coastal and Ocean Engineering* 122 (5), 245-257, American Society of Civil Engineers.

Thompson, E. F., and Hadley, L. L. 1994. "Numerical Modeling of Harbor Response to Waves," *Journal of Coastal Research* 11(3), 744-753.

Thompson, E. F., and Hadley, L. L. 1994a. "Wave Response of Port Allen Harbor, Kauai, Hawaii," Miscellaneous Paper CERC-94-9, US Army Engineer Waterways Experiment Station, Vicksburg, Miss.

Thompson, E. F., and Hadley, L. L. 1994b. "Wave response of proposed improvement plan 6 to the small boat harbor at Maalaea, Maui, Hawaii" Miscellaneous Paper CERC-94-17, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS

Thompson, E. F., and Hadley L. L. 1995. "Numerical modeling of harbor response to waves," *J. Coastal Research* 11(3), 744-753.

Thompson, E. F., Hadley, L. L., Brandon, W. A., McGehee, D. D., and Hubertz, J. M. 1996b. "Wave response of Kahului Harbor, Maui, Hawaii," Miscellaneous Paper CERC-96-11, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

Thompson, E. F., Lin, L., Hadley, L. L., and Hubertz, J. M. 1997. "Wave response of Kikiaola Harbor, Kauai, Hawaii," Miscellaneous Paper CERC-97-xx, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

Turner, P. J., and Baptista, A. M. "ACE/gredit User's Manual," Center for Coastal and Land-Margin Research, Oregon Graduate Institute of Science and Technology, Beaverton, OR.

U.S. Army Corps of Engineers. 1989. "Water levels and wave heights for coastal engineering design," Engineer Manual 1110-2-1414, Washington, DC.

US Army Engineer Division, Pacific Ocean 1980. "General Design Memorandum and Final Environmental Impact Statement: Maalaea Harbor for Light-Draft Vessels," Maui, Hawaii.

Weishar, L. L., and Aubrey, D. G. 1986. "A study of Inlet Hydraulics at Green Harbor, Marshfield, Mass.," Miscellaneous Report CERC 88-10, US Army Engineer Waterways Experiment station, Vicksburg, MS.

LANAI
NDBC 51027
20.45 N, 157.13 W
PERCENT OCCURRENCE(x1000) OF HEIGHT AND PERIOD BY DIRECTION
22.5 DEGREES ABOUT 135.0 DEGREES AZIMUTH

NO. OF CASES: 347
% OF TOTAL: 4.15

HEIGHT(FEET)	PERIOD(SECONDS)								TOTAL
	<8.0	8.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- 17.9	18.0- 21.9	22.0- LONGER	
0.00 - 0.99									0
1.00 - 1.99									0
2.00 - 2.99		518	207						725
3.00 - 3.99	656	2037	242	35	35	35			3040
4.00 - 4.99	1899	2485	311	35	69				4799
5.00 - 5.99	656	828	345	69	35				1933
6.00 - 6.99	345	552	173						1070
7.00 - 7.99	35	207							242
8.00 - 8.99	35	69			35	35			174
9.00 - GREATER									0
TOTAL	3626	6696	1278	139	174	70	0	0	

MEAN HS(FT) = 4.6 LARGEST HS(FT) = 8.9 MEAN TP(SEC) = 8.5 NO. OF CASES = 347.

LANAI
NDBC 51027
20.45 N, 157.13 W
PERCENT OCCURRENCE(x1000) OF HEIGHT AND PERIOD BY DIRECTION
22.5 DEGREES ABOUT 157.5 DEGREES AZIMUTH

NO. OF CASES: 465
% OF TOTAL: 5.56

HEIGHT(FEET)	PERIOD(SECONDS)								TOTAL
	<8.0	8.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- 17.9	18.0- 21.9	22.0- LONGER	
0.00 - 0.99									0
1.00 - 1.99									0
2.00 - 2.99		242	449	173	35				899
3.00 - 3.99	587	1691	621	794	759	69			4521
4.00 - 4.99	967	1450	483	1036	932	104	35		5007
5.00 - 5.99	621	587	69	311	725	311	104		2728
6.00 - 6.99	173	173		35	414	552	69		1416
7.00 - 7.99					104	1001	35		1140
8.00 - 8.99						276	35		311
9.00 - GREATER						35			35
TOTAL	2348	4143	1622	2349	2969	2348	278	0	

MEAN HS(FT) = 4.8 LARGEST HS(FT) = 9.2 MEAN TP(SEC) = 11.6 NO. OF CASES = 465.

LANAI
NDBC 51027
20.45 N, 157.13 W
PERCENT OCCURRENCE(x1000) OF HEIGHT AND PERIOD BY DIRECTION
22.5 DEGREES ABOUT 180.0 DEGREES AZIMUTH

NO. OF CASES: 852
% OF TOTAL: 10.19

HEIGHT(FEET)	PERIOD(SECONDS)								TOTAL
	<8.0	8.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- 17.9	18.0- 21.9	22.0- LONGER	
0.00 - 0.99									0
1.00 - 1.99									0
2.00 - 2.99		173	621	1657	1588	173			4212
3.00 - 3.99	276	380	897	2761	3038	345	35		7732
4.00 - 4.99	414	311	1208	2106	4522	828			9389
5.00 - 5.99	35	311	483	967	2623	863	69		5351
6.00 - 6.99				173	1174	518	173		2038
7.00 - 7.99				35	173	207			415
8.00 - 8.99						173	104		277
9.00 - GREATER									0
TOTAL	725	1175	3209	7699	13118	3107	381	0	

MEAN HS(FT) = 4.4 LARGEST HS(FT) = 8.6 MEAN TP(SEC) = 13.4 NO. OF CASES = 852.

LANAI
NDBC 51027
20.45 N, 157.13 W
PERCENT OCCURRENCE(x1000) OF HEIGHT AND PERIOD BY DIRECTION
22.5 DEGREES ABOUT 202.5 DEGREES AZIMUTH

NO. OF CASES: 337
% OF TOTAL: 4.03

HEIGHT(FEET)	PERIOD(SECONDS)								TOTAL
	<8.0	8.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- 17.9	18.0- 21.9	22.0- LONGER	
0.00 - 0.99									0
1.00 - 1.99									0
2.00 - 2.99		35	380	621	794	35			1865
3.00 - 3.99		242	414	1484	1139	207			3486
4.00 - 4.99	104	69	380	1346	1933	414	35		4281
5.00 - 5.99	69	69		173	828	207			1346
6.00 - 6.99		35		35	311	138			519
7.00 - 7.99					35				35
8.00 - 8.99					35	35			70
9.00 - GREATER					35				35
TOTAL	173	450	1174	3659	5110	1036	35	0	

MEAN HS(FT) = 4.1 LARGEST HS(FT) = 9.3 MEAN TP(SEC) = 13.3 NO. OF CASES = 337.

LANAI
NDBC 51027
20.45 N, 157.13 W
PERCENT OCCURRENCE(x1000) OF HEIGHT AND PERIOD BY DIRECTION
22.5 DEGREES ABOUT 225.0 DEGREES AZIMUTH

NO. OF CASES: 144
% OF TOTAL: 1.72

HEIGHT(FEET)	PERIOD(SECONDS)								TOTAL
	<8.0	8.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- 17.9	18.0- 21.9	22.0- LONGER	
0.00 - 0.99									0
1.00 - 1.99									0
2.00 - 2.99		35	69	104		35			243
3.00 - 3.99		104	345	1415	380				2244
4.00 - 4.99	104			587	518	138			1347
5.00 - 5.99			69	69	276	104			518
6.00 - 6.99	35	35		104	173				347
7.00 - 7.99	35			35	138				208
8.00 - 8.99					35				35
9.00 - GREATER					35				35
TOTAL	174	174	483	2314	1555	277	0	0	

MEAN HS(FT) = 4.4 LARGEST HS(FT) = 9.8 MEAN TP(SEC) = 12.8 NO. OF CASES = 144.

LANAI
NDBC 51027
20.45 N, 157.13 W
PERCENT OCCURRENCE(x1000) OF HEIGHT AND PERIOD BY DIRECTION
22.5 DEGREES ABOUT 247.5 DEGREES AZIMUTH

NO. OF CASES: 208
% OF TOTAL: 2.49

HEIGHT(FEET)	PERIOD(SECONDS)								TOTAL
	<8.0	8.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- 17.9	18.0- 21.9	22.0- LONGER	
0.00 - 0.99									0
1.00 - 1.99									0
2.00 - 2.99		69	104						173
3.00 - 3.99			587	1760	207	69			2623
4.00 - 4.99	276	69	345	863	828	104			2485
5.00 - 5.99	138	69	69	552	759	35			1622
6.00 - 6.99				35	104				139
7.00 - 7.99	35			35					70
8.00 - 8.99					35				35
9.00 - GREATER				35					35
TOTAL	449	207	1105	3280	1933	208	0	0	

MEAN HS(FT) = 4.4 LARGEST HS(FT) = 9.1 MEAN TP(SEC) = 12.3 NO. OF CASES = 208.

LANAI
NDBC 51027
20.45 N, 157.13 W
PERCENT OCCURRENCE(x1000) OF HEIGHT AND PERIOD BY DIRECTION
22.5 DEGREES ABOUT 270.0 DEGREES AZIMUTH

NO. OF CASES: 544
% OF TOTAL: 6.51

HEIGHT(FEET)	PERIOD(SECONDS)								TOTAL
	<8.0	8.0- 9.9	10.0- 11.9	12.0- 13.9	14.0- 15.9	16.0- 17.9	18.0- 21.9	22.0- LONGER	
0.00 - 0.99									0
1.00 - 1.99									0
2.00 - 2.99		35	138	35	35	69			312
3.00 - 3.99		104	1553	1105	897	207			3866
4.00 - 4.99	207	173	1139	3279	1622	35			6455
5.00 - 5.99	207	69	483	1622	1899	138	35		4453
6.00 - 6.99	138	69	449	621	621				1898
7.00 - 7.99	35		725	173	242				1175
8.00 - 8.99			69	35	69				173
9.00 - GREATER				138	311				449
TOTAL	587	450	4556	7008	5696	449	35	0	

MEAN HS(FT) = 5.1 LARGEST HS(FT) = 10.8 MEAN TP(SEC) = 12.5 NO. OF CASES = 544.

Appendix B
Output Basin Locations

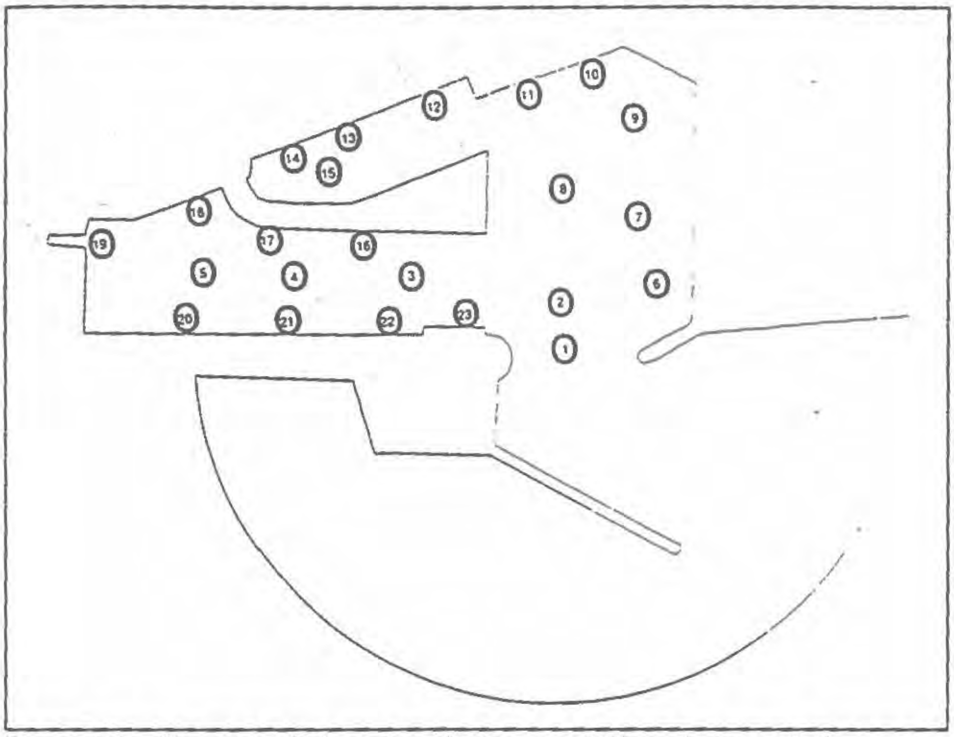


Figure B1. Output basin locations for Proposed Plans 1, 1a, and 1b

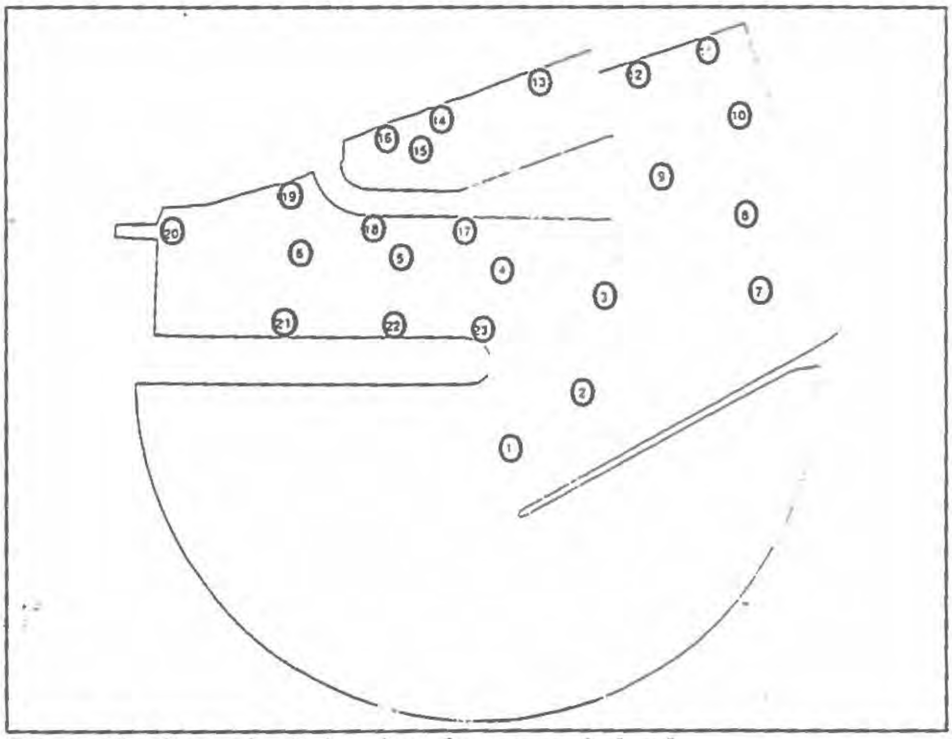


Figure B2. Output basin locations for proposed plan 2

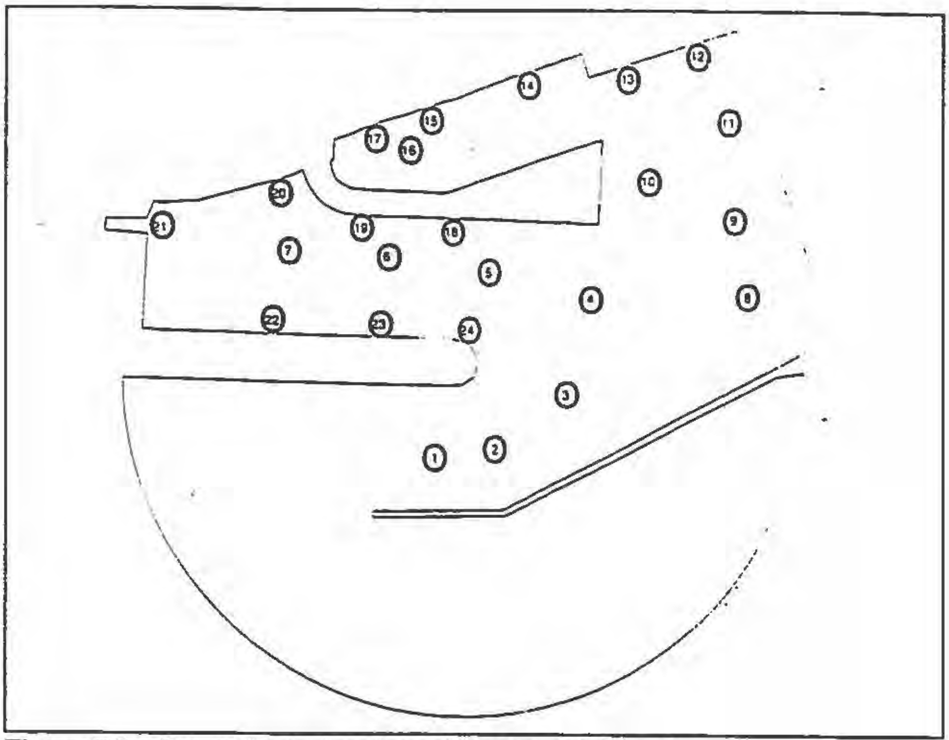


Figure B3. Output basin locations for proposed Plan 3

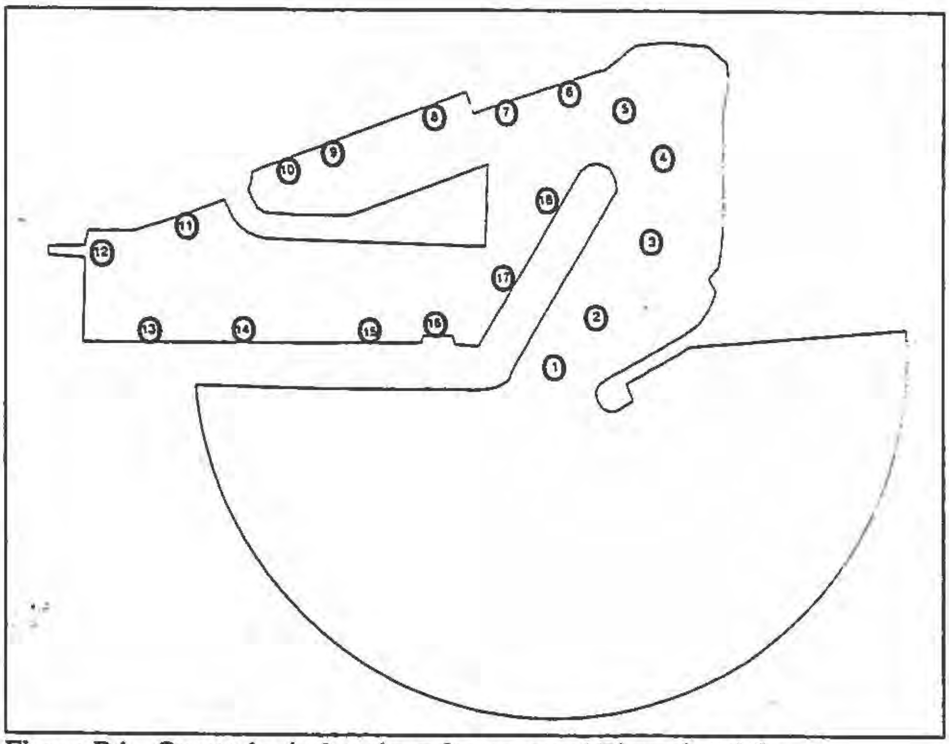


Figure B4. Output basin locations for proposed Plans 6 and 6a

Appendix C HARBD-SHALWV Wave Heights Exceeding HQUSACE Criteria

Table C1
HARBD-SHALWV Wave Heights Exceeding HQUSACE Criteria, Existing Plan

Deepwater Direction (deg az.)	Deepwater Period (sec)	Height (ft)	Deepwater Height (ft)	HARBD Amp. Factor	SHALWV Height (ft)	Basin Number
1-ft Criterion						
135.0	17	1.09	9.00	0.55	1.99	17
	15	1.00	7.91	0.55	1.82	7
	9	1.01	7.81	0.45	2.26	18
157.5	20	1.02	5.31	0.56		17
	17	1.01	5.00	0.55		7
	15	1.01	4.51	0.56		7
	13	1.01	3.91	0.56		7
	11	1.00	4.61	0.48		17
	9	1.02	4.21	0.48		18
180.0	20	1.02	4.71	0.56	1.83	17
	17	1.02	4.11	0.56	1.80	7
	15	1.00	3.71	0.59	1.70	7
	13	1.02	3.51	0.58	1.75	7
	11	1.02	3.81	0.50	2.01	18
	9	1.02	3.81	0.50	2.05	17
202.5	17	1.00	5.31	0.57	1.75	7
	15	1.01	4.91	0.61	1.67	7
	13	1.00	4.71	0.59	1.69	7
	11	1.01	4.91	0.53	1.92	7
	9	1.01	4.91	0.51	1.96	17
225.0	15	1.01	5.71	0.66	1.54	7
	13	1.01	5.61	0.62	1.62	7
	11	1.00	5.81	0.56	1.80	18
	9	1.00	5.51	0.55	1.81	17
247.5	15	1.01	8.00	0.60	1.68	7
	13	1.01	7.71	0.65	1.54	7
270.0	•					

(Continued)

Table C1 (Concluded)
HARBD-SHALWV Wave Heights Exceeding HQUSACE Criteria, Existing Plan

			2-ft Criterion			
135.0	*					
157.5	20 17 15 13 11 9	2.02 2.02 2.04 2.03 2.03 2.01	6.11 5.91 5.71 5.41 5.81 5.11	0.97 0.93 0.89 0.82 0.78 0.78	2.07 2.18 2.29 2.48 2.61 2.60	1 1 1 1 1 1
180.0	20 17 15 13 11 9	2.01 2.01 2.00 2.00 2.02 2.01	5.31 5.00 4.91 4.71 4.71 4.71	0.97 0.91 0.88 0.85 0.81 0.79	2.07 2.20 2.25 2.35 2.49 2.53	1 1 1 1 1 1
202.5	17 15 13 9	2.02 2.03 2.01 2.00	6.61 6.61 6.41 6.11	0.93 0.90 0.87 0.82	2.18 2.24 2.31 2.44	1 1 1 1
225.0	15 13 9	2.01 2.00 2.02	7.81 7.41 6.91	0.95 0.93 0.89	2.11 2.15 2.28	1 1 1
247.5	*					
270.0	*					

*Deepwater wave heights between 1-9 ft do not exceed HQUSACE criteria for this condition.

Table C2
HARBD-SHALWV Wave Heights Exceeding HQUSACE Criteria, Plan 1

Deepwater Direction (deg az.)	Deepwater Period (sec)	Height (ft)	Deepwater Height (ft)	HARBD Amp. Factor	SHALWV Height (ft)	Basin Number
1-ft Criterion						
135.0	*					
157.5	*					
180.0	*					
202.5	*					
225.0	*					
247.5	*					
270.0	*					
2-ft Criterion						
135.0	*					
157.5	*					
180.0	*					
202.5	*					
225.0	*					
247.5	*					
270.0	*					

*Deepwater wave heights between 1-9 ft do not exceed HQUSACE criteria for this condition.

Table C3
HARBD-SHALWV Wave Heights Exceeding HQUSACE Criteria, Plan 1a

Deepwater Direction (deg az.)	Deepwater Period (sec)	Height (ft)	Deepwater Height (ft)	HARBD Amp. Factor	SHALWV Height (ft)	Basin Number
1-ft Criterion						
135.0	*					
157.5	*					
180.0	17	1.02	9.00	0.26	3.97	.11
202.5	*					
225.0	*					
247.5	*					
270.0	*					
2-ft Criterion						
135.0	*					
157.5	*					
180.0	*					
202.5	*					
225.0	*					
247.5	*					
270.0	*					

*Deepwater wave heights between 1-9 ft do not exceed HQUSACE criteria for this condition.

Table C4
HARBD-SHALWV Wave Heights Exceeding HQUSACE Criteria, Plan 1b

Deepwater Direction (deg az.)	Deepwater Period (sec)	Height (ft)	Deepwater Height (ft)	HARBD Amp. Factor	SHALWV Height (ft)	Basin Number
			1-ft Criterion			
135.0	*					
157.5	17 15	1.07 1.01	9.00 7.81	0.32 0.32	3.32 3.13	11 11
180.0	20 17 15 13	1.09 1.01 1.00 1.01	9.00 7.31 7.11 6.91	0.31 0.31 0.31 0.29	3.50 3.21 3.26 3.45	11 11 11 11
202.5	*					
225.0	*					
247.5	*					
270.0	*					
			2-ft Criterion			
135.0	*					
157.5	*					
180.0	*					
202.5	*					
225.0	*					
247.5	*					
270.0	*					

*Deepwater wave heights between 1-9 ft do not exceed HQUSACE criteria for this condition.

Table C5
HARBD-SHALWV Wave Heights Exceeding HQUSACE Criteria, Plan 2

Deepwater Direction (deg az.)	Deepwater Period (sec)	Height (ft)	Deepwater Height (ft)	HARBD Amp. Factor	SHALWV Height (ft)	Basin Number
1-ft Criterion						
135.0	9	1.01	7.91	0.44	2.29	7
157.5	20	1.01	7.81	0.38	2.66	7
	17	1.00	7.81	0.35	2.88	8
	15	1.01	7.00	0.36	2.81	23
	13	1.00	5.21	0.42	2.38	23
	11	1.00	5.21	0.43	2.33	7
	9	1.01	4.51	0.44	2.29	7
180.0	20	1.01	7.00	0.37	2.73	7
	17	1.00	6.31	0.36	2.77	8
	15	1.00	5.61	0.39	2.57	23
	13	1.01	4.81	0.42	2.40	23
	11	1.01	4.51	0.42	2.39	7
	9	1.02	4.31	0.44	2.32	7
202.5	17	1.09	9.00	0.37	2.98	8
	15	1.01	7.41	0.40	2.52	23
	13	1.01	6.61	0.42	2.38	23
	9	1.00	5.71	0.44	2.28	7
225.0	9	1.00	6.91	0.44	2.28	7
247.5	*					
270.0	*					

(Continued)

Table C5 (Concluded)
HARBD-SHALWV Wave Heights Exceeding HQUSACE Criteria, Plan 2

2-ft Criterion						
135.0	9	2.00	6.91	1.00	2.00	1
157.5	20	2.11	9.00	0.69	3.06	1
	17	2.03	7.11	0.77	2.63	1
	15	2.03	6.11	0.83	2.44	1
	13	2.01	4.71	0.93	2.16	1
	11	2.03	4.61	0.98	2.07	1
	9	2.04	4.00	1.00	2.04	1
180.0	20	2.02	7.21	0.72	2.81	1
	17	2.03	5.61	0.82	2.46	1
	15	2.01	5.00	0.87	2.30	1
	13	2.01	4.31	0.93	2.15	1
	11	2.03	3.91	0.98	2.07	1
	9	2.02	3.81	0.98	2.05	1
202.5	17	2.00	7.31	0.83	2.41	1
	15	2.02	6.71	0.89	2.28	1
	13	2.00	5.91	0.94	2.12	1
	9	2.02	5.11	0.99	2.04	1
225.0	15	2.02	8.00	0.93	2.16	1
	13	2.00	7.21	0.96	2.09	1
	9	2.02	6.21	0.99	2.05	1
247.5	*					
270.0	*					

*Deepwater wave heights between 1-9 ft do not exceed HQUSACE criteria for this condition.

Table C6
HARBD-SHALWV Wave Heights Exceeding HQUSACE Criteria, Plan 3

Deepwater Direction (deg az.)	Deepwater Period (sec)	Height (ft)	Deepwater Height (ft)	HARBD Amp. Factor	SHALWV Height (ft)	Basin Number
1-ft Criterion						
135.0	*					
157.5	*					
180.0	*					
202.5	*					
225.0	*					
247.5	*					
270.0	*					
2-ft Criterion						
135.0	*					
157.5	*					
180.0	*					
202.5	*					
225.0	*					
247.5	*					
270.0	*					

*Deepwater wave heights between 1-9 ft do not exceed HQUSACE criteria for this condition.

Table C7
HARBD-SHALWV Wave Heights Exceeding HQUSACE Criteria, Plan 6

Deepwater Direction (deg az.)	Deepwater Period (sec)	Height (ft)	Deepwater Height (ft)	HARBD Amp. Factor	SHALWV Height (ft)	Basin Number
			1-ft Criterion			
135.0	*					
157.5	*					
180.0	*					
202.5	*					
225.0	*					
247.5	*					
270.0	*					
			2-ft Criterion			
135.0	*					
157.5	20	2.02	6.61	0.90	2.24	1
	17	2.01	6.51	0.84	2.40	1
	15	2.02	6.41	0.79	2.55	1
	13	2.01	6.00	0.73	2.76	1
	9	2.00	6.81	0.58	3.47	1
180.0	20	2.00	5.71	0.90	2.22	1
	17	2.03	5.71	0.81	2.51	1
	15	2.01	5.51	0.79	2.53	1
	13	2.01	5.31	0.76	2.65	1
	11	2.00	5.51	0.68	2.91	1
	9	2.00	5.81	0.64	3.13	1
202.5	17	2.01	7.41	0.82	2.44	1
	15	2.02	7.31	0.81	2.48	1
225.0	15	2.12	9.00	0.87	2.43	1
247.5	*					
270.0	*					

*Deepwater wave heights between 1-9 ft do not exceed HQUSACE criteria for this condition.

Table C8
HARBD-SHALWV Wave Heights Exceeding HQUSACE Criteria, Plan 6a

Deepwater Direction (deg.az.)	Deepwater Period (sec)	Height (ft)	Deepwater Height (ft)	HARBD Amp. Factor	SHALWV Height (ft)	Basin Number
			1-ft Criterion			
135.0	*					
157.5	*					
180.0	*					
202.5	*					
225.0	*					
247.5	*					
270.0	*					
			2-ft Criterion			
135.0	*					
157.5	20	2.00	5.71	1.03	1.94	1
	17	2.00	5.71	0.95	2.11	1
	15	2.03	5.71	0.89	2.28	1
	13	2.01	5.51	0.79	2.53	1
	9	2.02	5.91	0.67	3.00	1
180.0	20	2.03	5.11	1.01	1.99	1
	17	2.02	5.00	0.90	2.20	1
	15	2.03	5.00	0.88	2.30	1
	13	2.02	4.91	0.80	2.45	1
	11	2.03	5.11	0.75	2.70	1
	9	2.03	5.21	0.72	2.81	1
202.5	17	2.03	6.61	0.92	2.18	1
	15	2.01	6.61	0.88	2.24	1
	13	2.01	6.61	0.85	2.38	1
	9	2.00	6.71	0.75	2.68	1
225.0	15	2.01	7.91	0.92	2.13	1
	13	2.02	7.71	0.88	2.23	1
247.5	*					
270.0	*					

*Deepwater wave heights between 1-9 ft do not exceed HQUSACE criteria for this condition.

Appendix D
Percent Occurrence of Wave Height Versus Direction

Table D1
Percent Occurrence of Wave Height Versus Direction Existing Plan - Wave Heights Exceeding 1 ft in Berthing Areas

Deepwater Wave Height, ft	Deepwater Wave Direction (deg azimuth)							
	135.0	157.5	180.0	202.5	225.0	247.5	270.0	Total
3.01-4.00		0.16	3.25					3.41
4.01-5.00		3.15	8.97	1.01				13.14
5.01-6.00		2.09	5.32	1.24	0.17			8.80
6.01-7.00		1.24	2.04	0.52	0.31			4.11
7.01-8.00	0.06	1.14	0.41	0.03	0.17	0.01		1.84
8.01-9.00	0.14	0.31	0.28	0.07	0.03	0.03		0.87
9.01+		0.03		0.03	0.03	0.03	0.45	0.59
TOTAL	0.20	8.13	20.28	2.91	0.72	0.08	0.45	32.77

Table D2
Percent Occurrence of Wave Height Versus Direction Existing Plan - Wave Heights Exceeding 2 ft in Channel

Deepwater Wave Height, ft	Deepwater Wave Direction (deg azimuth)							
	135.0	157.5	180.0	202.5	225.0	247.5	270.0	Total
3.01-4.00								
4.01-5.00			2.44					2.44
5.01-6.00		1.18	5.30					6.48
6.01-7.00		1.24	2.04	0.28	0.01			3.57
7.01-8.00		1.14	0.41	0.03	0.07			1.66
8.01-9.00		0.31	0.28	0.07	0.03			0.69
9.01+		0.03		0.03	0.03	0.03	0.45	0.59
TOTAL	0.0	3.91	10.47	0.42	0.14	0.03	0.45	15.43

Table D3
Percent Occurrence of Wave Height Versus Direction Plan 1 - Wave Heights Exceeding 1 ft in Berthing Areas

Deepwater Wave Height, ft	Deepwater Wave Direction (deg azimuth)							
	135.0	157.5	180.0	202.5	225.0	247.5	270.0	Total
3.01-4.00								
4.01-5.00								
5.01-6.00								
6.01-7.00								
7.01-8.00								
8.01-9.00								
9.01+		0.03		0.03	0.03	0.03	0.45	0.59
TOTAL	0.0	0.03	0.0	0.03	0.03	0.03	0.45	0.59

Table D4
Percent Occurrence of Wave Height Versus Direction Plan 1 - Wave Heights Exceeding 2 ft in Channel

Deepwater Wave Height, ft	Deepwater Wave Direction (deg azimuth)							
	135.0	157.5	180.0	202.5	225.0	247.5	270.0	Total
3.01-4.00								
4.01-5.00								
5.01-6.00								
6.01-7.00								
7.01-8.00								
8.01-9.00								
9.01+		0.03		0.03	0.03	0.03	0.45	0.59
TOTAL	0.0	0.03	0.0	0.03	0.03	0.03	0.45	0.59

Table D5
Percent Occurrence of Wave Height Versus Direction Plan 1a - Wave Heights Exceeding 1 ft in Berthing Areas

Deepwater Wave Height, ft	Deepwater Wave Direction (deg azimuth)							
	135.0	157.5	180.0	202.5	225.0	247.5	270.0	Total
3.01-4.00								
4.01-5.00								
5.01-6.00								
6.01-7.00								
7.01-8.00								
8.01-9.00			0.17					0.17
9.01+		0.03		0.03	0.03	0.03	0.45	0.59
TOTAL	0.0	0.03	0.17	0.03	0.03	0.03	0.45	0.76

Table D6
Percent Occurrence of Wave Height Versus Direction Plan 1a - Wave Heights Exceeding 2 ft in Channel

Deepwater Wave Height, ft	Deepwater Wave Direction (deg azimuth)							
	135.0	157.5	180.0	202.5	225.0	247.5	270.0	Total
3.01-4.00								
4.01-5.00								
5.01-6.00								
6.01-7.00								
7.01-8.00								
8.01-9.00								
9.01+		0.03		0.03	0.03	0.03	0.45	0.59
TOTAL	0.0	0.03	0.0	0.03	0.03	0.03	0.45	0.59

Table D7
Percent Occurrence of Wave Height Versus Direction Plan 1b - Wave Heights Exceeding 1 ft in Berthing Areas

Deepwater Wave Height, ft	Deepwater Wave Direction (deg azimuth)							
	135.0	157.5	180.0	202.5	225.0	247.5	270.0	Total
3.01-4.00								
4.01-5.00								
5.01-6.00								
6.01-7.00			0.03					0.03
7.01-8.00		0.03	0.37					0.40
8.01-9.00		0.28	0.28					0.55
9.01+		0.03		0.03	0.03	0.03	0.45	0.59
TOTAL	0.0	0.34	0.69	0.03	0.03	0.03	0.45	1.58

Table D8
Percent Occurrence of Wave Height Versus Direction Plan 1b - Wave Heights Exceeding 2 ft in Channel

Deepwater Wave Height, ft	Deepwater Wave Direction (deg azimuth)							
	135.0	157.5	180.0	202.5	225.0	247.5	270.0	Total
3.01-4.00								
4.01-5.00								
5.01-6.00								
6.01-7.00								
7.01-8.00								
8.01-9.00								
9.01+		0.03		0.03	0.03	0.03	0.45	0.59
TOTAL	0.0	0.03	0.0	0.03	0.03	0.03	0.45	0.59

Table D9
Percent Occurrence of Wave Height Versus Direction Plan 2 - Wave Heights Exceeding 1 ft in Berthing Areas

Deepwater Wave Height, ft	Deepwater Wave Direction (deg azimuth)							
	135.0	157.5	180.0	202.5	225.0	247.5	270.0	Total
3.01-4.00								
4.01-5.00		0.87	1.61					2.48
5.01-6.00		0.93	3.07	0.03				4.03
6.01-7.00		0.25	1.78	0.05	0.01			2.09
7.01-8.00	0.04	0.41	0.41	0.02				0.90
8.01-9.00	0.07	0.31	0.28	0.07	0.03			0.76
9.01+		0.03		0.03	0.03	0.03	0.45	0.59
TOTAL	0.11	2.81	7.15	0.21	0.08	0.03	0.45	10.84

Table D10
Percent Occurrence of Wave Height Versus Direction Plan 2 - Wave Heights Exceeding 2 ft in Channel

Deepwater Wave Height, ft	Deepwater Wave Direction (deg azimuth)							
	135.0	157.5	180.0	202.5	225.0	247.5	270.0	Total
3.01-4.00			0.29					0.46
4.01-5.00		0.17	3.66					5.76
5.01-6.00		2.11	4.82	0.10				5.89
6.01-7.00	0.11	0.97	1.86	0.19	0.03			2.82
7.01-8.00	0.21	0.62	0.41	0.03	0.05			1.81
8.01-9.00	0.07	1.10	0.28	0.07	0.03			0.76
9.01+		0.31		0.03	0.03	0.03	0.45	0.59
TOTAL	0.39	5.31	11.32	0.44	0.15	0.03	0.45	18.09

Table D11
Percent Occurrence of Wave Height Versus Direction Plan 3 - Wave Heights Exceeding 1 ft in Berthing Areas

Deepwater Wave Height, ft	Deepwater Wave Direction (deg azimuth)							
	135.0	157.5	180.0	202.5	225.0	247.5	270.0	Total
3.01-4.00								
4.01-5.00								
5.01-6.00								
6.01-7.00								
7.01-8.00								
8.01-9.00								
9.01+		0.03		0.03	0.03	0.03	0.45	0.59
TOTAL	0.0	0.03	0.0	0.03	0.03	0.03	0.45	0.59

Table D12
Percent Occurrence of Wave Height Versus Direction Plan 3 - Wave Heights Exceeding 2 ft in Channel

Deepwater Wave Height, ft	Deepwater Wave Direction (deg azimuth)							
	135.0	157.5	180.0	202.5	225.0	247.5	270.0	Total
3.01-4.00								
4.01-5.00								
5.01-6.00								
6.01-7.00								
7.01-8.00								
8.01-9.00								
9.01+		0.03		0.03	0.03	0.03	0.45	0.59
TOTAL	0.0	0.03	0.0	0.03	0.03	0.03	0.45	0.59

Table D13
Percent Occurrence of Wave Height Versus Direction Plan 6 - Wave Heights Exceeding 1 ft in Berthing Areas

Deepwater Wave Height, ft	Deepwater Wave Direction (deg azimuth)							
	135.0	157.5	180.0	202.5	225.0	247.5	270.0	Total
3.01-4.00								
4.01-5.00								
5.01-6.00								
6.01-7.00								
7.01-8.00								
8.01-9.00								
9.01+		0.03		0.03	0.03	0.03	0.45	0.59
TOTAL	0.0	0.03	0.0	0.03	0.03	0.03	0.45	0.59

Table D14
Percent Occurrence of Wave Height Versus Direction Plan 6 - Wave Heights Exceeding 2 ft in Channel

Deepwater Wave Height, ft	Deepwater Wave Direction (deg azimuth)							
	135.0	157.5	180.0	202.5	225.0	247.5	270.0	Total
3.01-4.00								
4.01-5.00								
5.01-6.00		0.03	3.10					3.13
6.01-7.00		0.74	2.04					2.78
7.01-8.00		1.14	0.41	0.03				1.58
8.01-9.00		0.31	0.28	0.07	0.03			0.69
9.01+		0.03		0.03	0.03	0.03	0.45	0.59
TOTAL	0.0	2.26	5.83	0.13	0.07	0.03	0.45	8.78

Table D15
Percent Occurrence of Wave Height Versus Direction Plan 6a - Wave Heights Exceeding 1 ft in Berthing Areas

Deepwater Wave Height, ft	Deepwater Wave Direction (deg azimuth)							
	135.0	157.5	180.0	202.5	225.0	247.5	270.0	Total
3.01-4.00								
4.01-5.00								
5.01-6.00								
6.01-7.00								
7.01-8.00								
8.01-9.00								
9.01+		0.03		0.03	0.03	0.03	0.45	0.59
TOTAL	0.0	0.03	0.0	0.03	0.03	0.03	0.45	0.59

Table D16
Percent Occurrence of Wave Height Versus Direction Plan 6a - Wave Heights Exceeding 2 ft in Channel

Deepwater Wave Height, ft	Deepwater Wave Direction (deg azimuth)							
	135.0	157.5	180.0	202.5	225.0	247.5	270.0	Total
3.01-4.00								
4.01-5.00			0.96					0.96
5.01-6.00		0.76	5.28					6.04
6.01-7.00		1.24	2.04	0.26				3.54
7.01-8.00		1.14	0.41	0.03	0.04			1.63
8.01-9.00		0.31	0.28	0.07	0.03			0.69
9.01+		0.03		0.03	0.03	0.03	0.45	0.59
TOTAL	0.0	3.49	8.97	0.40	0.11	0.03	0.45	13.45

Appendix E
HARBD Wave Amplification Factors, Harbor Oscillations

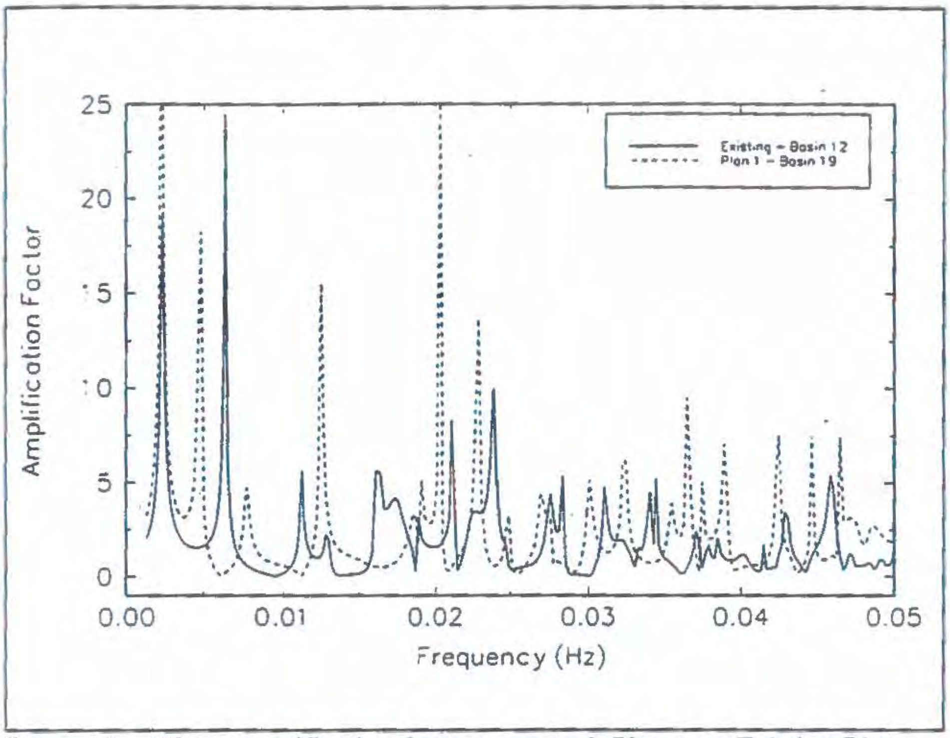


Figure E1. Wave amplification factor, west end, Plan 1 vs Existing Plan

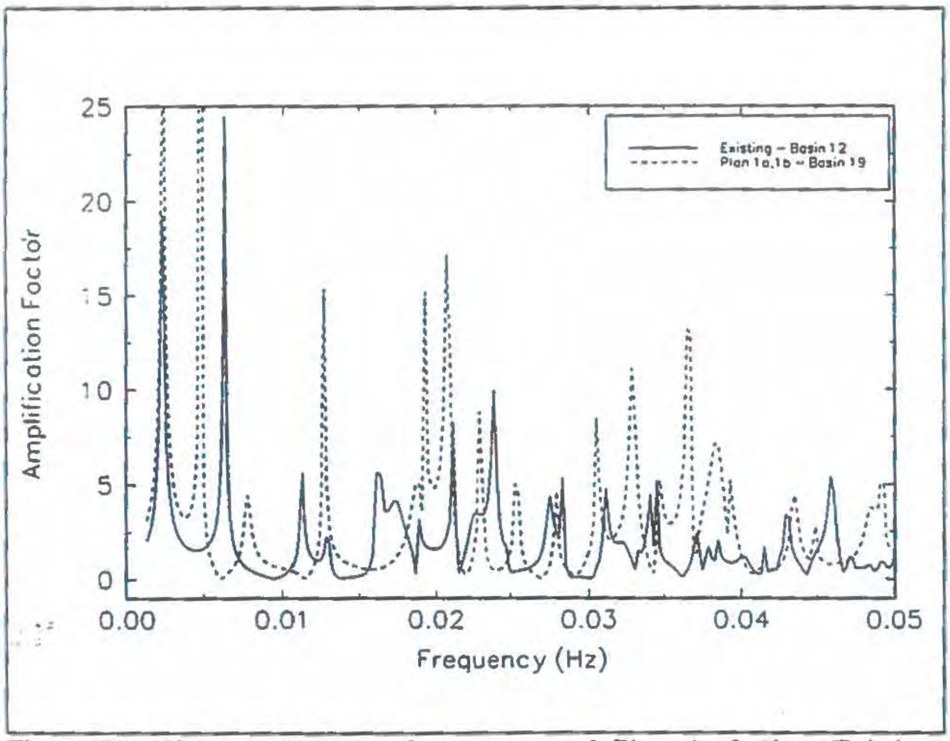


Figure E2. Wave amplification factor, west end, Plans 1a & 1b vs Existing Plan

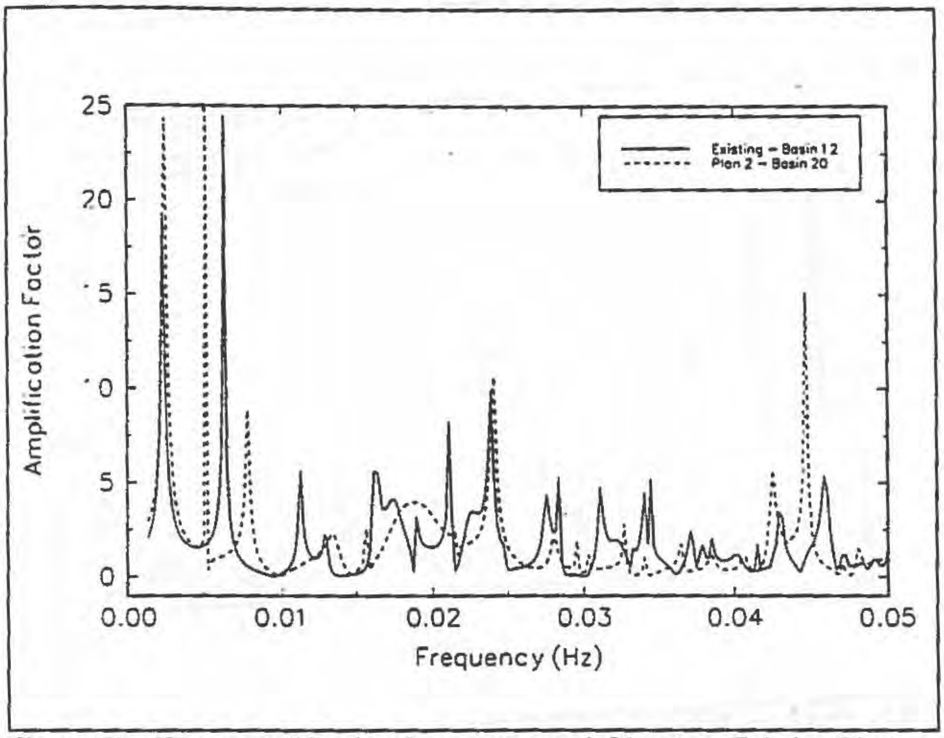


Figure E3. Wave amplification factor, west end, Plan 2 vs Existing Plan

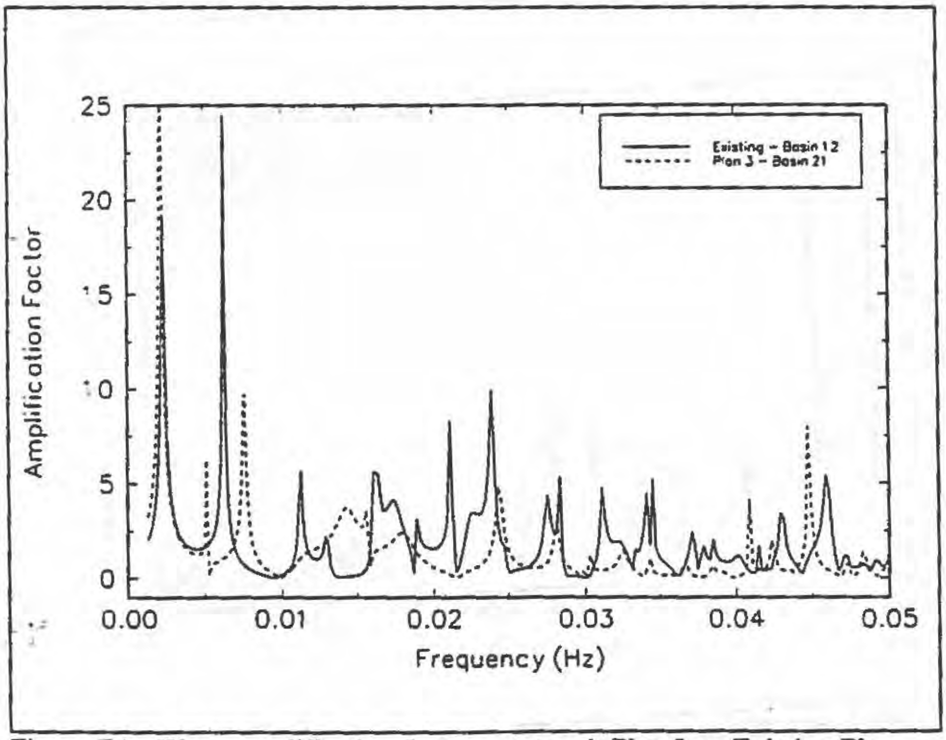


Figure E4. Wave amplification factor, west end, Plan 3 vs Existing Plan

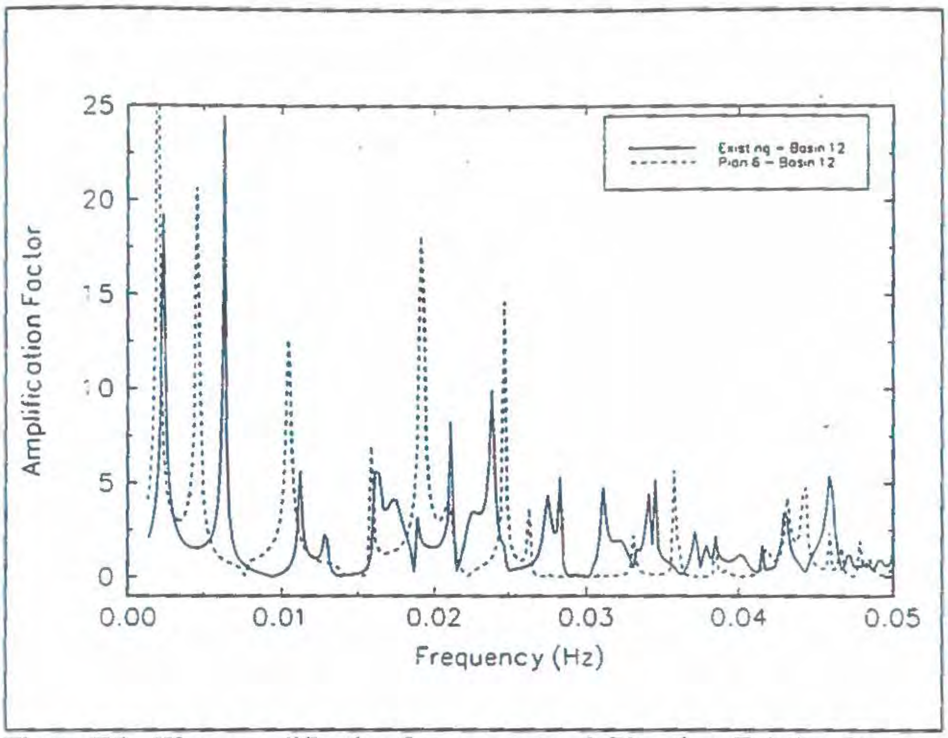


Figure E5. Wave amplification factor, west end, Plan 6 vs Existing Plan

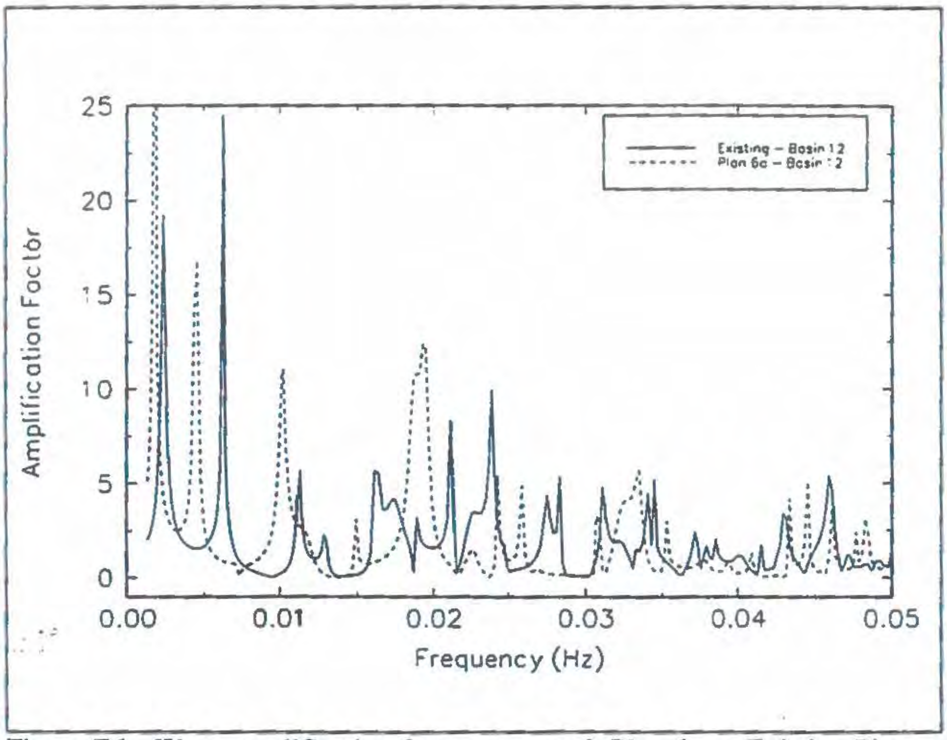


Figure E6. Wave amplification factor, west end, Plan 6a vs Existing Plan

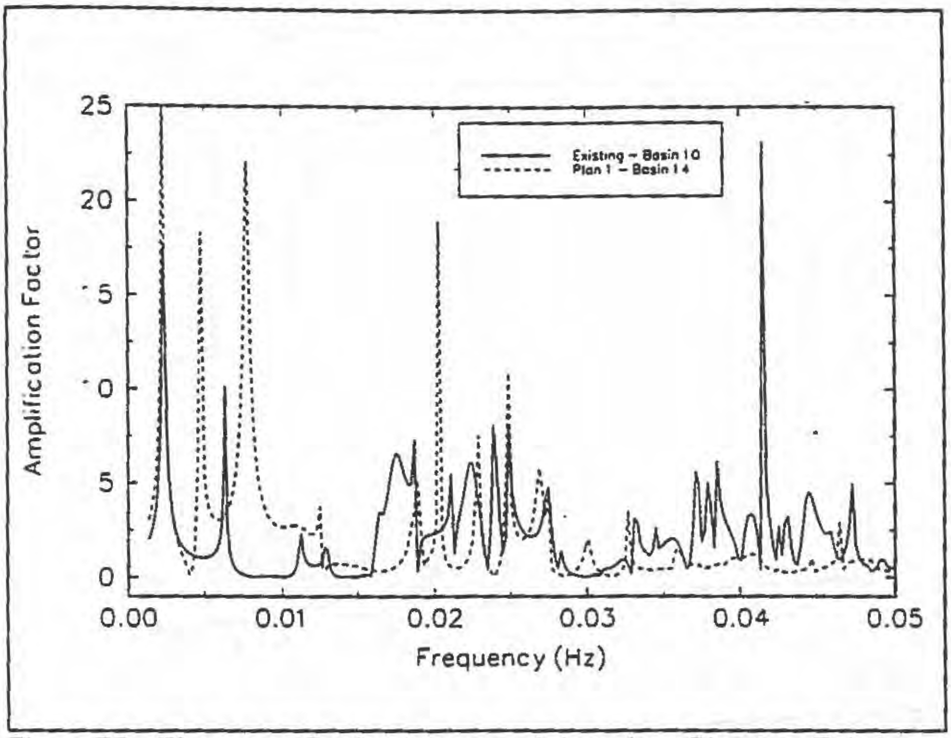


Figure E7. Wave amplification factor, north boundary, Plan 1 vs Existing Plan

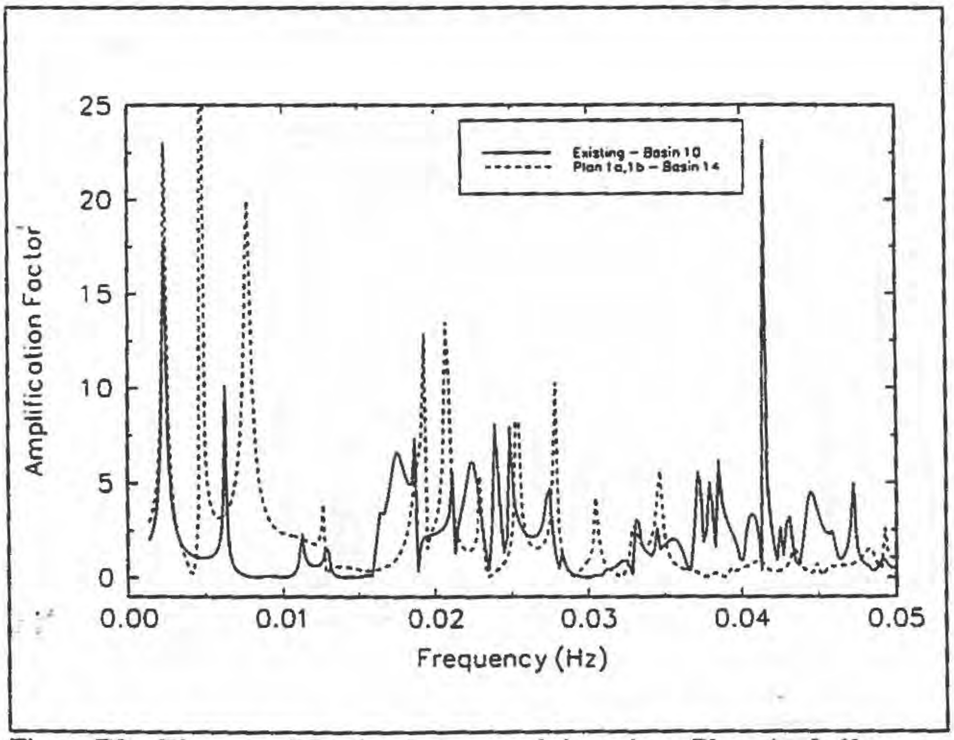


Figure E8. Wave amplification factor, north boundary, Plans 1a & 1b vs Existing Plan

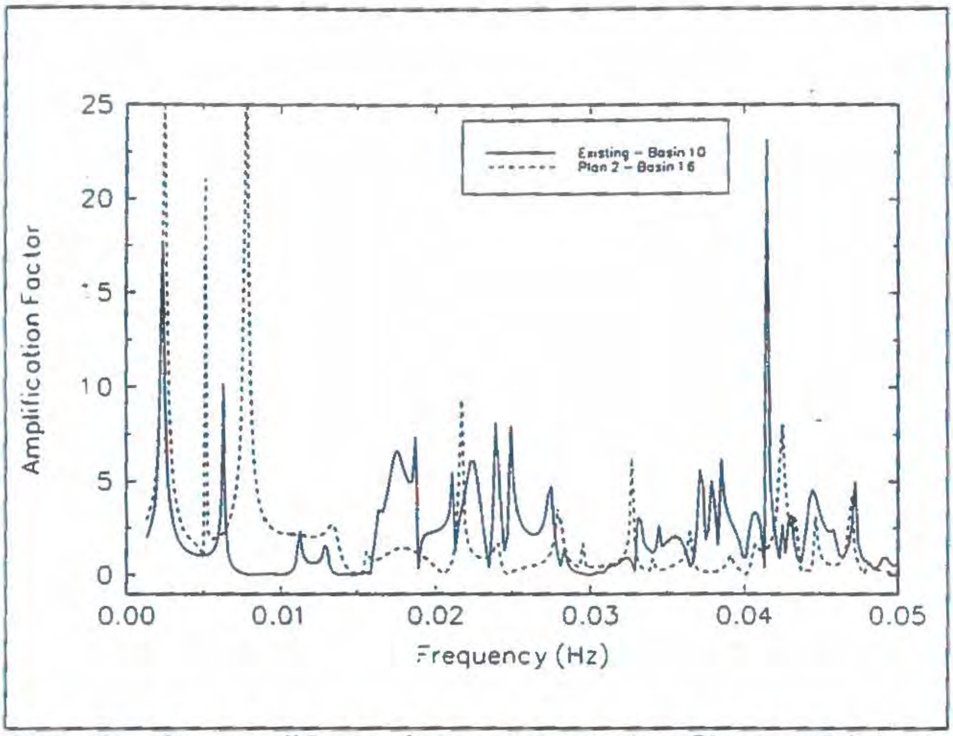


Figure E9. Wave amplification factor, north boundary, Plan 2 vs Existing Plan

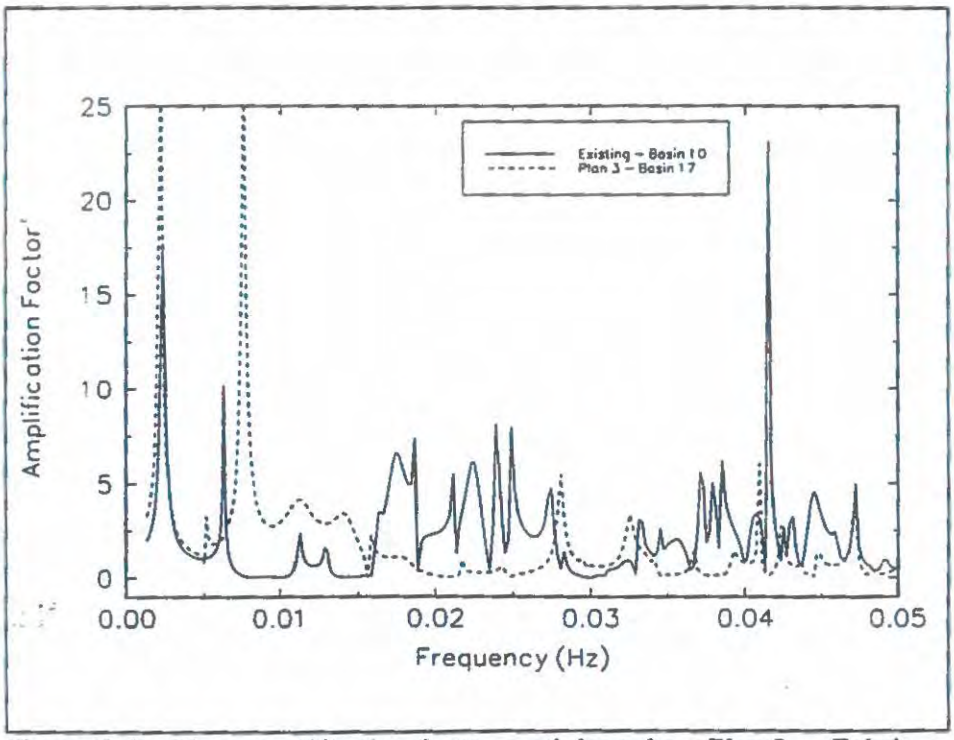


Figure E10. Wave amplification factor, north boundary, Plan 3 vs Existing Plan