HANA RAMP – IMPROVEMENTS TO ROCK REVETMENT AND BOAT RAMP LOADING DOCK, MAUI

FINAL ENVIRONMENTAL ASSESSMENT and FINDING OF NO SIGNIFICANT IMPACT (FONSI)

May 2008

Prepared for:

State of Hawaii, Department of Land and Natural Resources: Division of Boating and Ocean Recreation

Prepared by:

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SEI Job No: 6-30

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PROJECT SUMMARY

(Proposed) Action	Repair and Renovation of Hana Boat Ramp Facilities, Hana, Maui
Property	TMK 2-1-4-004:36
Owner	State of Hawaii, Department of Land and Natural Resources, Division of Boating and Ocean Recreation
Applicant	State of Hawaii, Department of Land and Natural Resources, Engineering Division
Agent	Sea Engineering, Inc., James H. Barry Makai Research Pier, Waimanalo, HI 96795 jb@seaengineering.com
Planning & Zoning	State Land Use: Urban Maui County Zoning: PK2 (Community Park) Community Plan: Park
Special Management Area, Shoreline Setback	Located within the County SMA and the Shoreline Setback Zone, and State Conservation District

Required Permits:

Federal	
Department of the Army (USACE)	1. Section 10, Rivers and Harbors Act (work in Navigable Waters) 2. Section 404, Clean Water Act (fill in waters of the U.S.)
State of Hawaii	
Department of Land and Natural Resources	1. Conservation District Use Permit 2. Shoreline Certification (Received 11/06)
Department of Health	1. Section 401, Clean Water Act (Water Quality Certification)
County of Maui	
Department of Planning/ Planning Commission	1. SMA (Special Management Area Permit) 2. Shoreline Setback Variance

Chapter 343 Action	343-5(3): Construction within the shoreline area as defined by Chapter 205A-41
Determination	Finding of No Significant Impact (FONSI)

FINDING OF NO SIGNIFICANT IMPACT (FONSI)

1.0 INTRODUCTION AND SUMMARY

1.1 Summary Description of the Proposed Action

This project is to repair and improve the existing boat ramp facility at Hana, Maui. The boat ramp is located in the lee of a short breakwater (termed "revetment" in the project title) at Hana Wharf. Anticipated improvements will consist of:

1. Repair of the existing breakwater,
2. Addition of a new loading dock that is compatible with the Americans with Disability Act of 1990 (ADA),
3. Renovation of the concrete launch ramp,
4. Establishment of a boat wash-down area,
5. Miscellaneous minor improvements including:
    - Renovation of the existing loading dock
    - New security fencing and lighting
    - Reconstruction of asphalt concrete pavement.

Major project features are shown on Figure 1.1.

1.1.1 Repair of the Existing Breakwater

Existing Condition
Hana Breakwater is a large masonry and rubble mound structure that forms a narrow salient on the southeast end of Hana Bay. The salient provides modest protection from prevailing trade wind waves for a boat launch ramp and utility dock constructed in the lee of the breakwater.

The breakwater is constructed from a wide assortment of rock sizes and appears to have been initially constructed as an un-cemented rubble mound structure. The structure has a steep face, varying in slope between 2V:1H and 3V:1H. As a result of the over-steep construction and partial use of undersized stone, portions of the structure have failed, and numerous repairs are evident. The structure is undermined at the toe in many places, and future failures are likely.

Proposed Repair
The proposed repair will be a combination seawall and rubblemound revetment. The inshore, or leeward side of the breakwater is protected from direct wave action and has lateral extents constrained by the boat ramp approach and surrounding shallow water areas. A seawall structure is therefore proposed for this side of the breakwater. The windward side of the breakwater has fewer constraints on lateral extents and faces direct breaking wave action. A rubble-mound structure is therefore proposed for this side of the breakwater.

The rubblemound structure will be constructed from two layers of 6,000 lb to 10,000 lb armor stone. The toe of the structure will be reinforced with a toe stone at least 10,000 lbs in weight. A layer of smaller rock, 250 lbs to1,000 lbs in weight will be used as an underlayer for the structure. The underlayer will rest on a dressed slope formed from the existing breakwater structure.

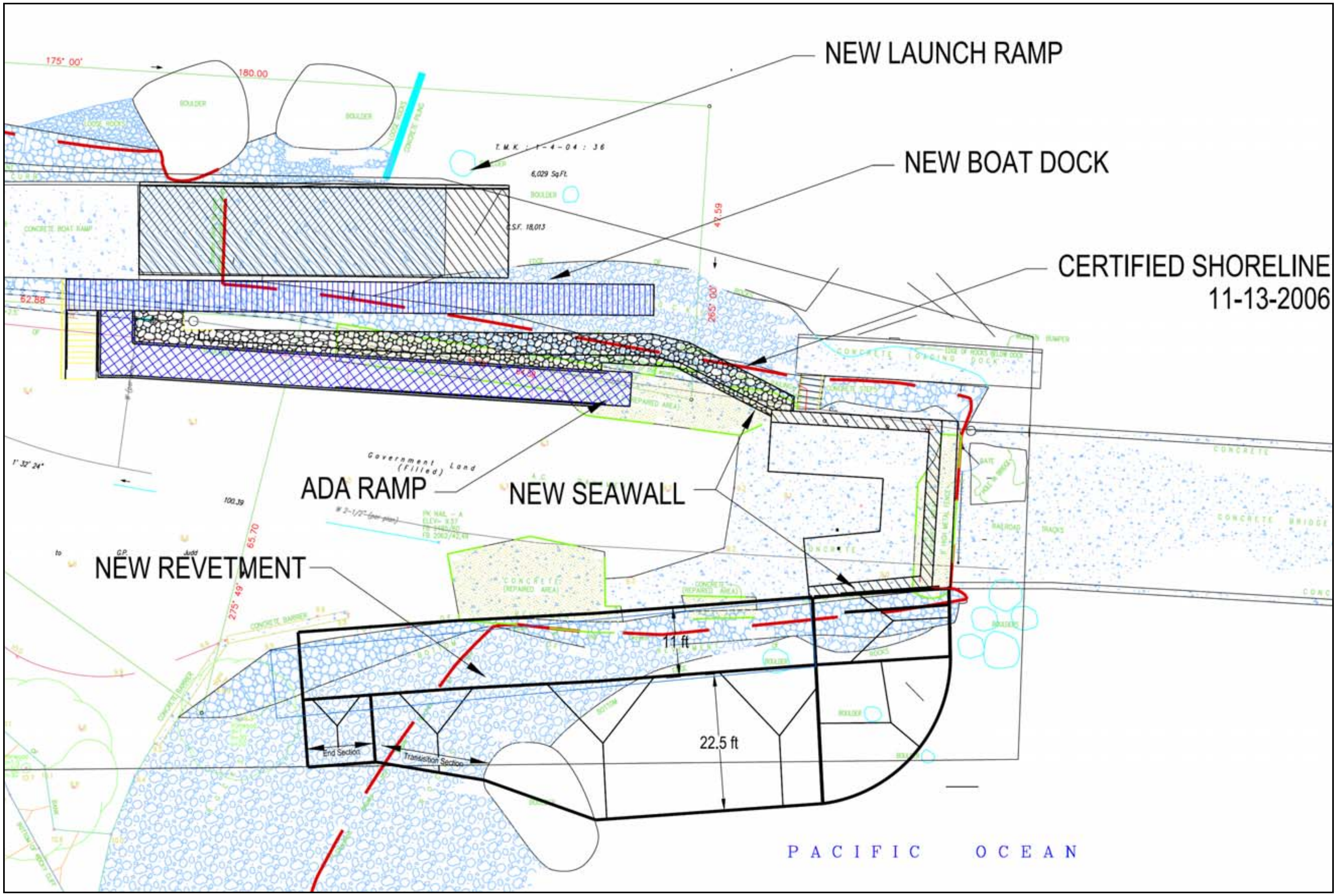

Figure 1.1 Major Project Features

Fill Quantities: The following fill quantities assume a conservative stone packing density of 70% (30% porosity).

Armor Stone: 440 cu yds total; 265 cu yds below the high tide line (MHHW)

Underlayer Stone: 160 cy yds total; 110 cu yds below the high tide line (MHHW)

The inshore, or leeward side of the Hana Breakwater is the location of the existing boat ramp and loading dock. The boat ramp alignment is constrained by the physical layout of the area – by the local bathymetry, location of shallow reefs, and massive boulders that border the ramp. A rubblemound structure is therefore not feasible to construct on the leeward side of the breakwater. Repair of the leeward side of the breakwater is limited to a seawall design.

A CRM construction was chosen for constructability, flexibility of design, and aesthetic appearance. As CRM is not feasible to construct below the water line, a cast concrete footing will extend at least high enough for CRM to be placed.

Fill Quantities: The following quantities are approximate, based upon cross-section and layout.

Concrete: 160 cu yds

CRM: 195 cu yds total; 75 cu yds below the high tide line (MHHW)

1.1.2 ADA Compatible Loading Dock

An additional loading dock will be constructed adjacent to the boat ramp. The dock will be used to control the boats as they slip off the trailer as well as be used for loading and unloading. Dock access will comply with requirements of Title III of the Americans with Disability Act of 1994. The new dock and access path footprint are shown in Figure 1.1.

1.1.3 Boat Ramp Repair

According to anecdotal accounts, during the storm of November 21, 2003, one of the concrete panels that form the existing boat ramp was torn from its place and thrown landward by large waves. The panel was subsequently lifted back into place, and has remained in service since that time. However, compressed air escaping from the sides of the ramp under wave action indicates that there are voids underneath the panels and they may be stripped off during another severe wave event. Boat ramp repair will consist of placing pre-cast concrete panels over a gravel bedding for in-water work, and cast-in-place or pre-cast panels for ramp access. A total of approximately 50 cu yds of material including pre-cast concrete panels, gravel bedding and grout will be placed below the high tide line. Concrete and rock debris such as concrete pile butts and boulders eroded from the existing breakwater are present in the vicinity of the ramp toe. These may be removed as hazards to navigation

1.1.4 Boat Wash-Down Area

One of the major complaints of users of the existing boat ramp facilities is the lack of a boat wash-down facility. Without prompt fresh water wash-down upon leaving the ramp, the salt water dries, leaving a layer of salt on the exposed surfaces of the boat, trailer and towing vehicle. Corrosion and premature failure of metal surfaces is the inevitable result. The boat wash down area will consist of a turn-out parking area, fresh water utility, and ground percolation drainage.

1.1.5 Miscellaneous Minor Improvements

Other improvements to the boat ramp facilities include:

- Renovations of the existing loading dock,
- New security fencing and lighting, and
- Reconstruction of asphalt concrete pavement for the surface of the breakwater area.

The existing loading dock has aged and corroded fixtures, and spalled concrete decking. The decking will be patched, and new mooring cleats, fenders and railings are planned.

Two pole-mounted light fixtures will be replaced, and new security fencing will be installed to control access to the wharf.

Finally, the surface of the repaired breakwater structure will be re-paved with asphalt concrete. This area serves as a turn-around and temporary parking area for the boat ramp.

1.2 Summary Description of Alternatives to the Proposed Action

1.2.1 Alternatives to Breakwater Repair

Alternatives to the proposed breakwater repair action consist of:

- No Action
- Seawall construction only

No Action
A no action alternative will result in increased deterioration of the breakwater. The structure is in a degraded state, with numerous voids that likely permeate the entire structure. Under severe wave attack, sections have failed and sinkholes have opened in the breakwater crest. This type of failure is likely to occur in the future with increased frequency unless a permanent repair solution is implemented.

Seawall Construction Only
Hana is remotely located with poor construction access. The road to Hana is narrow, bridges are old and of doubtful serviceability, and dock facilities for tug and barge service poor at best. The

seawall design presently proposed for the leeward side breakwater repair may need to be adapted for the windward side as well due to constraints of material availability and transport access.

The seawall design consists of a poured concrete footing below the water surface, integrated with a sloping CRM wall that is bonded to the existing revetment surface (see Section 3.3.2). It is a rigid structure and not likely to be as durable as a rubblemound structure in a severe wave environment. However it is a viable alternative that may be further considered if the availability of large rock or construction access become unresolved issues.

1.2.2 Alternatives to ADA Accessible Loading Dock

Based on Title III of the Americans with Disability Act, newly constructed public facilities must contain access provisions for disabled persons. The only alternative to the new loading Dock is no action.

No Action
No action would result in no ADA access at the site. The new loading dock is a desirable boat ramp feature that eases boat launch and retrieval as well as loading actions.

1.2.3 Alternatives to Boat Ramp Repairs

The alternatives to repairing the boat ramp include no action and repair in place.

No Action
During the November 2003 storm, at least one pre-cast panel of the boat ramp was displaced and thrown shoreward by wave action. Apparently there are voids beneath the panel that allow pressure to build up and lift the panel. The voids cause air to be compressed and audibly released during the rise and fall of wave-induced water levels. It is likely that displacement of one or more of the ramp slabs will occur in the future during extreme wave events unless the problem is corrected.

Repair in Place
The ramp could possibly be repaired in place by coring through the slab and grouting the underlying voids. Much of this work would take place in the water, increasing the difficulty and environmental exposure. As the ramp is old and worn, and this repair process has a degree of uncertainty, replacement is seen as the superior alternative.

1.2.4 Alternatives to Boat Washdown Area

The alternatives to construction of a Boat Washdown Area are no action and on-ramp washdown.

No Action
No action would prevent boat operators from fresh water washdown until they reach home. This condition has resulted in the premature corrosion of expensive boating equipment, especially the boat trailers. Premature loss of equipment is an economic burden for the local boating

community as it causes excess capital investment.

On-Ramp Washdown
Installing a hose spigot at the boat ramp is probably the easiest solution to the washdown problem. However, this would allow uncontrolled run-off into the nearshore waters and is a violation of State Dept. of Health guidelines.

1.2.5 Alternatives to Miscellaneous Minor Improvements

The only alternative to the minor improvements is no action.

No Action – Renovation of the Existing Boat Dock
The existing boat dock is in serviceable but poor condition. Not repairing the concrete would allow increased spalling of the deck surface and increase the amount of concrete delamination. Uneven deck surface and weakness around the mooring cleats are potential safety hazards that may develop in time. Mooring cleats are corroded, with rust staining the surrounding concrete. Replacement will eventually be required. The existing fenders are made from discarded tires. This is a low cost and effective system, however, it needs frequent maintenance, and has a limited vertical dimension that is not quite adequate for the dock.

No Action – New Security Fencing and Lighting
New security fencing is necessary to prevent unauthorized access to the wharf. The wharf is in an extreme state of disrepair, with holes in the decking that are dangerous for the unwary, and a very weakened underdeck structure. Lighting is also a safety concern for persons using the ramp after sunset.

No Action – Re-Pavement
The top of the breakwater area is presently used as a turnaround area for the launch ramp operations. Repair of the breakwater will likely require demolition or otherwise result in damage to much of the pavement surface. Re-paving the surface will be necessary to provide access to the boat launch ramp.

1.3 Summary of Environmental Consequences and Mitigation Measures

1.3.1 Environmental Consequences to the Natural Environment

Natural Physical Environment
Changes to the physical environment due to the project will primarily be related to repair of the existing breakwater. Failure of the present breakwater is primarily due to the steeply sloping uncemented design. The breakwater repair will be accomplished using large stone and a milder 1.5 (horizontal) to 1 (vertical) slope on the exposed seaward side, and a seawall design on the more protected harbor side. The footprint of the breakwater will therefore be expanded by up to 24 linear feet (approx. 2500 sq ft total) on the seaward side and by approximately 6 feet (approx. 750 sq ft total) on the harbor side. The substrate in these areas will be covered with construction features of the repair: armor rock, underlayer stone, or concrete footing. The overall size of the

top surface of the breakwater – the access and turnaround area - will remain approximately the same.

Other project features will effect only minor changes to physical features of the project area. The new launch ramp and ADA ramp will improve accessibility, but will have a negligible footprint. The renovated concrete launch ramp, and miscellaneous minor improvements are in-kind features. The boat wash down area will require a turnout area, minor water line plumbing, and possible construction of a dry well for ground percolation of water. The dry well may require some excavation and gravel fill.

Water Quality

Background water quality parameters measured by AECOS, Inc. for this study found mildly elevated levels of turbidity, total Phosphorus, and Chlorophyll α at the project site. Elevated turbidity and nutrient concentrations are not unusual in nearshore environments such as the project site.

While long term effects on water quality due to the project are not likely, there will probably be short term elevations in turbidity and total suspended solids (TSS) during the construction phase of the project.

Best management practices, including the use of silt curtains, will be used during all phases of the breakwater repair to minimize elevated water quality parameters, including turbid plumes. Project monitoring will include water quality monitoring before, during, and after construction.

Marine and Terrestrial Biology

Sensitive reef areas with high percentage of coral cover will not be directly affected by the project. The project footprint is contained in areas where the energetic environment prevents significant colonization of coral species. Increased armor rock surface area on the seaward side of the breakwater due to the breakwater repair may result in increased habitat for some fish and coral species. Areas and species disturbed by project construction are expected to recover due to re-colonization.

Threatened or Endangered Species

No threatened or endangered marine or terrestrial species were encountered during the biological survey by *AECOS*, Inc. However, species that could possibly be encountered at the site include the green sea turtle (*Chelonia midas)* – listed as threatened in Hawaiian waters, the hawksbill turtle (*Eretmochelys imbricata*) – listed as endangered (Federal Register 1999 a,b), and the Hawaiian monk seal – listed as endangered (Federal Register, 2001). Procedures should be in place during construction to cease activity if one of these species is in the vicinity.

One native plant was identified in the project area, east of the wharf. The small plant, `*Anaunau* (*Lepidium bidentatum* var. *o-waihiense*), is not endangered, but is considered a species of concern. Although construction staging is unlikely to spill over into the terrain where the plant occurs, construction personnel should be informed of the species occurrence and value.

1.3.2 Environmental Consequences to the Human Environment

Recreational Use

During construction of the breakwater and boat ramp repairs, the area will not be accessible by the general public. Construction will involve the use of heavy equipment, and exclusion of the public will be necessary for reasons of safety. Ramp closure is expected to be about 4 to 6 months.

Reservations and/or Conservation Zones

Various portions of the project will fall under Federal, State, and County jurisdictions. As outlined in Section 6.3, in order to proceed the project will require permits or permit exemptions from the appropriate government agencies in each jurisdictional area.

Existing Infrastructure

The purpose of the project is to improve the boat ramp infrastructure. Public access, safety, and use of the boat ramp will increase as a direct result of the project. A turnout area dedicated to boat wash-down will result in a re-allocation of a minor portion of parking or road use infrastructure, however this is expected to be viewed as a public benefit and not be a concern.

Historical and Cultural Resources

The project construction and staging area will be confined to the immediate project area at the boat ramp and breakwater. The Native Hawaiian historic areas on Ka'uiki Head and Puukii Island will not be disturbed.

Air and Noise Quality

The project will have no long term effects on air or noise quality at the site. However, both noise levels and air quality will be affected during construction due to the presence of heavy equipment and other machines. The brisk trade winds will rapidly dilute the engine exhaust, and increased noise levels will only be present during the daylight working hours.

1.3.3 Mitigation

Long Term Mitigation

The proposed project will not result in any significant long-term degradation of the environment or loss of habitat.

Mitigation During Construction

Best Management Practices (BMPs) for construction operations will be developed to help minimize adverse impacts to coastal water quality and the marine ecosystem. Project monitoring will include water quality monitoring before, during, and after construction.

2.0 PURPOSE AND NEED FOR THE PROPOSED ACTION

2.1 Purpose of the Proposed Action

The purpose of the proposed action is to provide the Hana fishing and boating community with a protected and usable boat ramp facility. Fishing is an important part of the local lifestyle and economy, and is a major food resource for this isolated community. There is no other protected launch facility in the region.

2.2 Need for the Proposed Action

The existing ramp facilities, including the breakwater, are aged and in a deteriorated to severely deteriorated condition. Over the years, damage has occurred during infrequent extreme weather events. The most recent extensive damage occurred during a severe northeast swell that occurred on November 21, 2003.

The breakwater is constructed from a wide assortment of rock sizes and appears to have been initially constructed as an un-grouted rubblemound structure. The structure has a steep face, varying in slope between 2V:1H and 3V:1H. For comparison, engineering guidelines for rubblemound structures set the slope at no steeper than 1V: 1.5H. As a result of the overly-steep construction and partial use of undersized stone, portions of the structure have failed, and numerous repairs are evident. The structure is undermined at the toe in many places, and future failures are likely. Undermining occurs on both sides of the breakwater, but is particularly severe on the more exposed windward side.

Recent repairs are evident on the crest of the breakwater, extending down both sides. These repairs are constructed from cemented rubble masonry (CRM). Other previous repairs types include the use of grout bags to pack voids in the breakwater. Figure 2.1 shows typical breakwater repairs.

The existing loading dock is in a deteriorated condition but is still a serviceable structure (Figure 2.2). The abutting concrete channels that form the deck are cracked in places, and show stains due to corrosion of rebar reinforcement. However, they appear structurally sound for the present use requirements. The deck hardware is corroded but still in place and useable, although replacement is warranted. The jib crane did not appear to be in service. The existing dock does not have ADA access. It is a relatively high structure, at +5 ft MLLW, which further reduces ease of boat access.

The small boat ramp is worn, but in reasonable cosmetic condition. The concrete is not severely cracked and the structure appears to be solid. However, voids underneath the structure cause an audible "blowhole" effect when air compressed by wave action escapes through small cavities. During the November 2003 swell event, one or more of the lower ramp sections was lifted from the bottom and transported landward up the ramp. The sections were put back in place and appear to be working reasonably well, although there is some mis-alignment. Nevertheless, the presence of voids beneath the lower ramp sections will allow uplift pressures to occur in the presence of large waves, and similar failures are likely to happen in the future. Figure 2.3 is a topographic drawing of the boat ramp area drawing showing the existing site conditions.

Figure 2.1 CRM and Grout Bag Repairs in the Breakwater

Figure 2.2 Existing Loading Dock

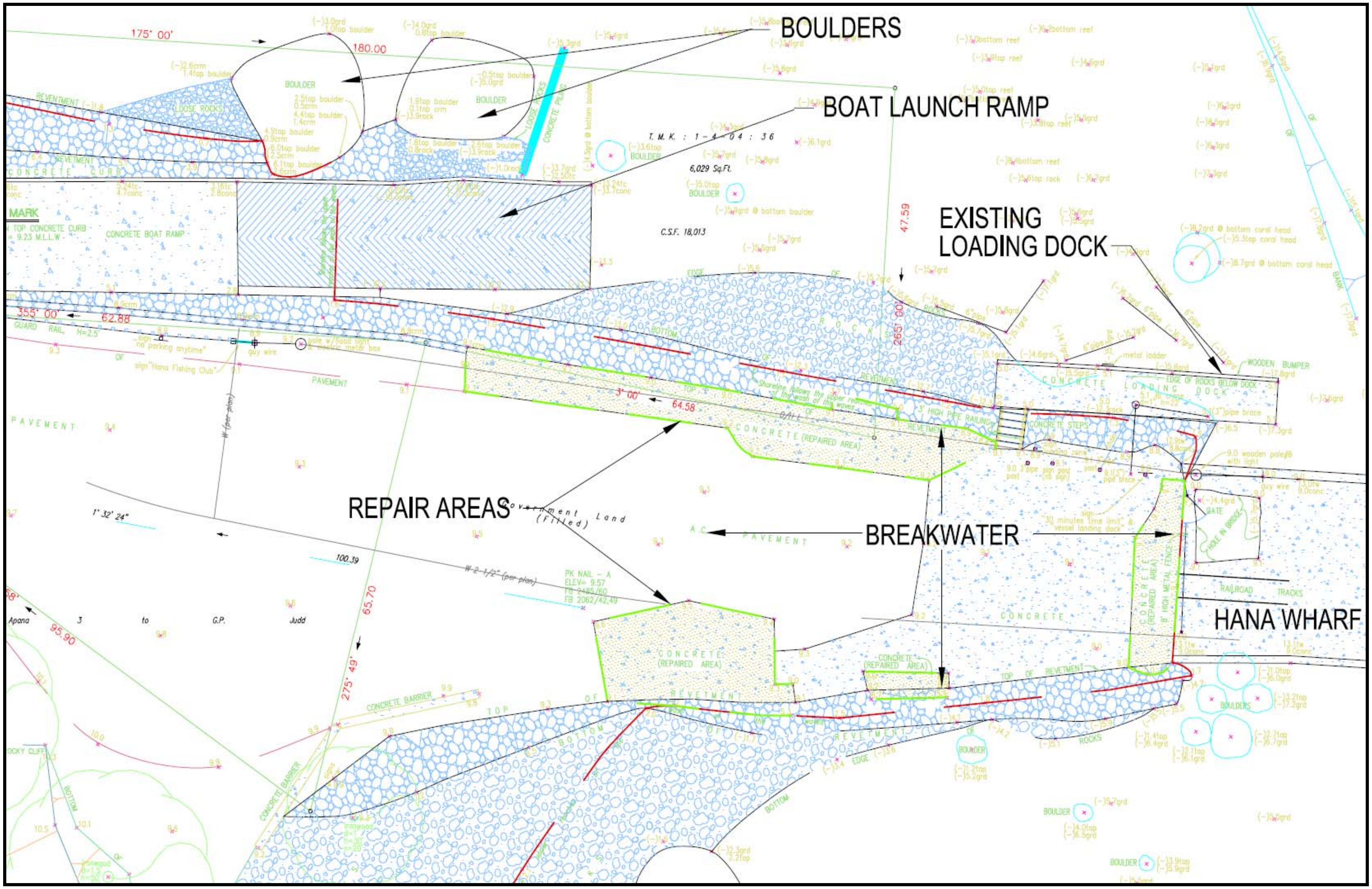

Figure 2.3 Existing Site Condition

3.0 DESCRIPTION OF THE PROPOSED ACTION

3.1 Project Location

Hana Bay is located on the east side of the island of Maui (Figure 3.1). The wharf and boat ramp facilities are located on the south side of the bay, somewhat protected by a natural rock headland (Figures 3.2, 3.3). Hana is approximately 50 miles from Kahului and access is limited to one road, the Hana Highway (State Route 360). The road is narrow with numerous hairpin turns. The route crosses 59 bridges, of which 46 are one lane. The oldest bridge dates back to 1908. The road was modified for motor vehicle use in 1926.

The boat ramp facility is in the lee of the short but massive breakwater. Hana Breakwater is a large masonry and rubble mound structure that forms a narrow salient on the southeast end of Hana Bay (see Figures 2.1 and 2.3). The salient provides modest protection from prevailing trade wind waves for the launch ramp and existing loading dock. The breakwater transitions to Hana Wharf, a large concrete pile-supported pier. The wharf is in a state of extreme disrepair and is not considered safe.

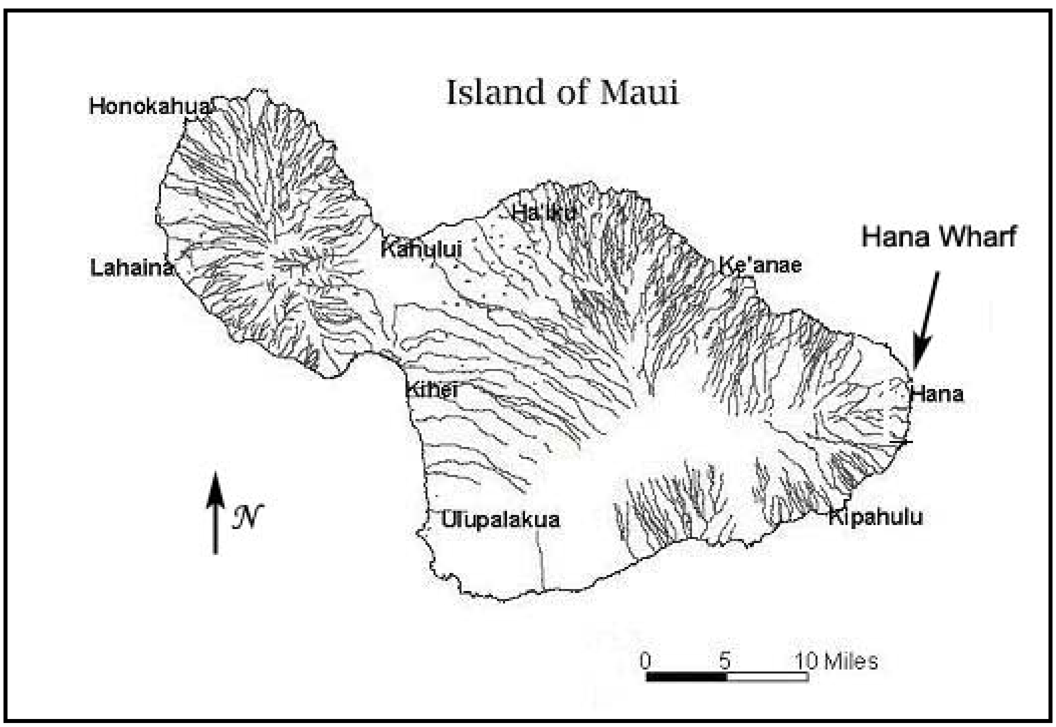

Figure 3.1 Project Location on the Island of Maui

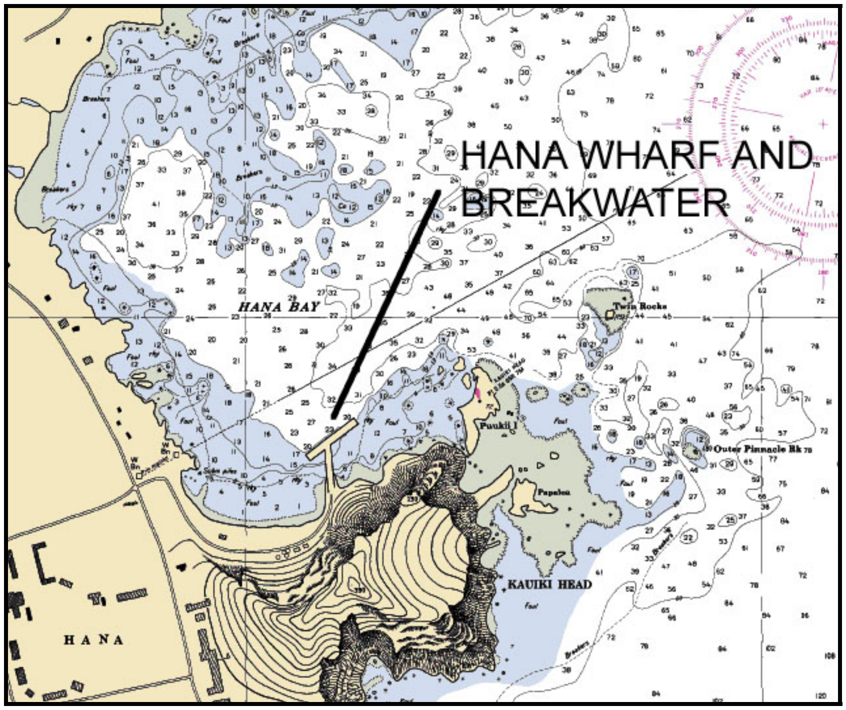

Figure 3.2 Location of Hana Wharf and Breakwater on the South Side of Hana Bay

Figure 3.3 Photograph of Pu'uiki Island, Ka'uiki Head, and Hana Wharf and Breakwater (*Kanoa Withington photo, 2006*)

3.2.1 Shoreline and Nearshore Characteristics

The project site is at the southern end of Hana Bay (also known by the Hawaiian name *Kapueokahi*). The terrain is volcanic, with prevalent massive basalt boulders, flow structures and cinder features. The north end of the bay is bordered by a low-lying basalt flow salient known as Nanualele Point. Adjacent to the wharf and boat ramp, the south side of the bay is defined by the steep remnant cinder cone known as Ka'uiki Head, which is almost 400 ft in elevation. The rocky basalt outcrops extending from the cinder cone feature offer some protection from prevailing easterly tradewinds for the boat ramp and wharf area.

The shoreline and surrounding environment is extremely rugged due to the volcanic terrain. The coast is formed by prominent lava outcrops, with isolated stream outlets forming cobble and sand pocket beaches. Similarly, the bathymetry in the bay is an irregular network of reefs with steep underwater relief.

The south end of the bay, adjacent to the boat ramp and wharf, is the site of the Hana Beach Park. The park is a popular gathering place, with grassy picnic areas, showers and restroom facilities. A black sand beach fronts the beach park area. The beach is 700 feet long , and about 100 feet wide. A seawall protects much of the shoreline behind the sand beach. Shallow reefs offshore of the beach promote generally calm and safe swimming conditions off the beach park (Clark, 1980).

Helene Hall, across the road from the beach park, is a County facility that serves as a community center.

To the east of the ramp and wharf on the headland formed by Ka'uiki Head, shoreline access is poor due to steep terrain and exposure to prevailing trade wind wave conditions. Kaihalulu Beach, on the south side of Ka'uiki Head, is a secluded sand beach formed from cinder sand eroded from adjacent bluffs (Clark, 1980).

The boat ramp facility is in the lee of the short but massive breakwater. Hana Breakwater is a large masonry and rubble mound structure that forms a narrow salient on the southeast end of Hana Bay (Figure 1.1). The salient provides modest protection from prevailing trade wind waves for the launch ramp and existing loading dock. The breakwater transitions to Hana Wharf, a large concrete pile-supported pier. The wharf is in a state of extreme disrepair and is not considered safe. The wharf was constructed in 1921 to load sugar cane. Repair of the wharf is not being contemplated in the existing project.

The rubble mound is paved, and provided access to Hana Wharf before extreme disrepair rendered the wharf inoperable. The paving is presently used as a turn-around leg for boat ramp access. The flat paved crest has an elevation of about 9 ft MLLW, and is 27 feet wide at the most narrow point where it joins the wharf.

The bathymetry in the immediate vicinity of the boat ramp is complex. Offshore depths of 15 to 20 feet, depths that previously allowed vessel mooring at the wharf, end abruptly at a ledge just offshore of the ramp area. The ledge rises to a nominal 6-foot depth. The depths become gradually shallower as the ramp is approached. A shallow reef lies on the beach park side of the ramp approach and stretches for several hundred feet or more. This reef is a potential hazard for boaters landing at the ramp if the boats are allowed to swing over too far.

The seaward side of the breakwater has numerous large basalt boulders scattered in front of the breakwater. Nominal 6-foot depths also end abruptly at a ledge that plunges down to about 20 feet. The boulders rise close to the water surface and can be exposed during low tide and surge conditions.

3.2.2 Shoreline Erosion

A seawall fronting Hana Beach Park is the only obvious sign of erosion abatement measures in the vicinity. A wide and healthy sand beach stands in front of the seawall area. For most of the region, the irregular hard rock shoreline is generally impervious to erosion. Shoreline erosion has apparently not been an important environmental issue in Hana Bay.

3.2.3 Shoreline Certification

A topographic survey was conducted at the project site on July 17, 2006, and included the establishment of a shoreline boundary. This shoreline was certified by the State Department of Land and Natural Resources on November 13, 2006. The Certified Shoreline is shown on Figure 3.4.

3.3 Project Features

3.3.1 Introduction

Anticipated improvements due to the project will consist of:

1. Repair of the existing breakwater,
2. Addition of a new loading dock that is compatible with the Americans with Disability Act of 1990 (ADA),
3. Renovation of the concrete launch ramp, and
4. Establishment of a boat wash-down area.
5. Miscellaneous minor improvements including:
    - Renovation of the existing loading dock
    - New security fencing and lighting
    - Reconstruction of the asphalt concrete pavement

Major project features at the boat ramp are shown in Figure 3.5.

3.3.2 Breakwater Repair Plan

The breakwater repair is a hybrid design incorporating a CRM seawall on the inshore side and a rubblemound revetment on the offshore side.

The proposed repair will be a combination seawall and rubblemound revetment. The inshore, or leeward side of the breakwater is protected from direct wave action and has lateral extents constrained by the boat ramp approach and surrounding shallow water areas. A seawall structure is therefore proposed for this side of the breakwater.

The windward, or offshore side of the breakwater has fewer constraints on lateral extents and faces direct breaking wave action. A rubblemound structure is therefore proposed for this side of the breakwater. Breakwater repair features are shown on Figure 3.4 (same as Figure 1.1).

Rubblemound Structure

Only the windward side of the Hana Breakwater is proposed for rubblemound construction. As the rubblemound stone will be placed on a dressed and modified existing surface, the structure will essentially be a revetment construction. The most common method of rubblemound construction is to place an armor layer of stone, sized according to the design wave height, over an under-layer and filter designed to distribute the weight of the armor layer and to prevent loss of fine material through voids in the revetment. A design cross-section of the rubblemound structure is shown in Figure 3.5.

The structure will be constructed from two layers of 6,000 lb to 10,000lb armor stone. The toe of the structure will be reinforced with a toe stone at least 10,000 lbs in weight. A layer of smaller rock, 250 lbs to1,000 lbs in weight will be used as an underlayer for the structure. The underlayer will rest on a dressed slope formed from the existing breakwater structure.

The bottom fronting the proposed rubblemound on the windward side of the breakwater is primarily composed of basalt boulders, and the potential for scour is low. To minimize the lateral extent of the structure, as well as the need for excavation, an extra large stone, or toe stone, with a weight 1.25 to 1.50 times the nominal W50 stone weight, will lock the armor stone in place at the base of the structure. Some excavation will be necessary to meet the lines and grade of the breakwater design, and ensure proper toe construction. The clean rock material to be excavated will likely be useful in the project construction as, for example, underlayer material or as extra toe mounding (i.e. material piled seaward of the rubblemound toe stone to help key the toe stone into the bottom). A preliminary conservative estimate of material that may be excavated in this way is approximately 150 cu yds.

The crest of the existing rubblemound structure will also need to be modified by grading and excavation to meet the design grade lines required for construction. Based on a preliminary site assessment, much of the rock material can likely be re-used in the reconstruction project. Unused material will be disposed of at on-land sites. Up to 190 cy of material may be excavated above the MHHW level, and about 160 cy of material below the MHHW level.

Fill Quantities: The following fill quantities assume a conservative stone packing density of 70% (30% porosity).

Armor Stone: 440 cu yds total; 265 cu yds below the high tide line (MHHW)

Underlayer Stone: 160 cy yds total; 110 cu yds below the high tide line (MHHW)

Seawall Structure

The leeward side (or inshore) of the Hana Breakwater is the location of the existing boat ramp and loading dock. The boat ramp alignment is constrained by the physical layout of the area – by the local bathymetry, location of shallow reefs, and massive boulders that border the ramp. Modifications to the inshore part of the breakwater are therefore necessarily limited in areal extent. For example, a rubblemound structure constructed on a 1.5H to 1V slope would have a footprint of approximately 22 feet, and extend into the access channel for the boat ramp. A rubblemound structure is therefore not feasible to construct on the ramp side of the breakwater. Repair of the leeward side of the breakwater is necesssarily limited to a seawall design.

Foundation conditions are a critical element in all seawall design. The bottom conditions on the inside of Hana Breakwater appear to be composed of uneven, but essentially firm substrate. A cast-in-place foundation is necessary in order to prepare an even footing for the wall. The wall itself must lay up against and integrate with the existing structure. A CRM construction was chosen for constructability, flexibility of design, and the aesthetic appearance. As CRM is not feasible to construct below the water line, the cast concrete footing should extend at least high enough for CRM to be placed. The seawall design section is shown in Figure 3.6.

Fill Quantities: The following quantities are approximate, based upon cross-section and layout.

Concrete Footing: 550 cu yds concrete

CRM: 195 cu yds total; 75 cu yds below the high tide line (MHHW)

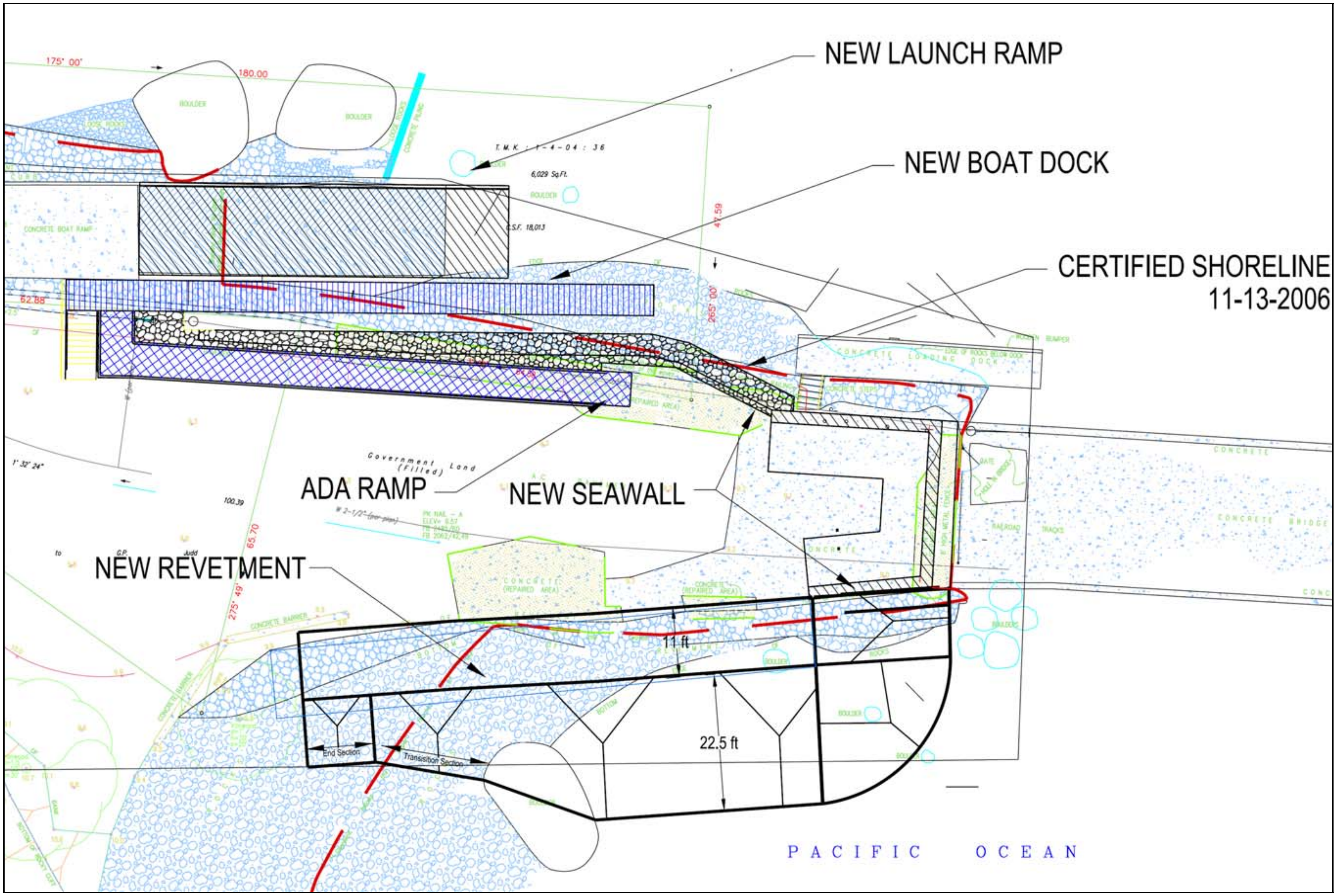

Figure 3.4 Breakwater Repair and other Project Features

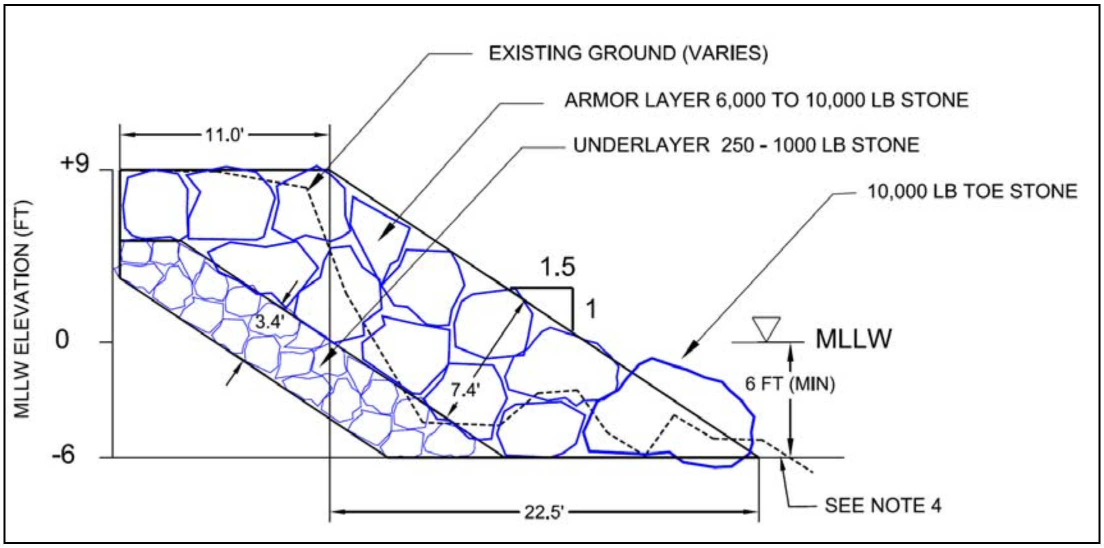

Figure 3.5 Typical Rubblemound Cross-Section

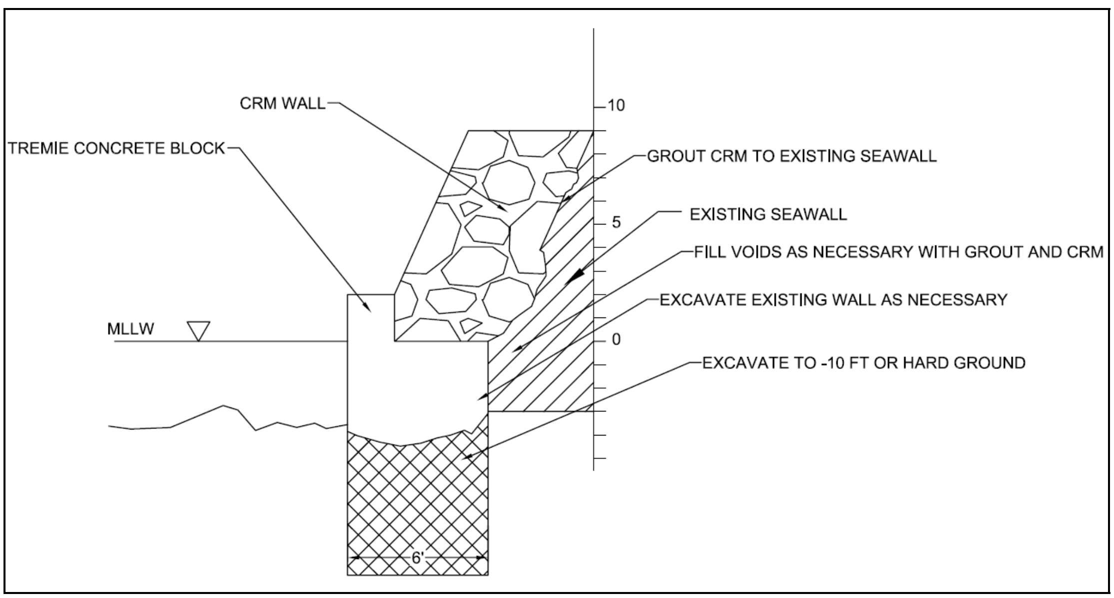

Figure 3.6 CRM Seawall Cross-Section

3.3.3 Boat Ramp Improvements, Including ADA Ramp and Dock

Boat ramp repair will consist of placing pre-cast concrete panels over a gravel bedding for in-water work, and cast-in-place or pre-cast panels for ramp access. A typical design cross-section is shown in Figure 3.7. A total of approximately 50 cu yds of material including pre-cast concrete panels, gravel bedding and grout will be placed below the high tide line. The concrete paving of the ramp approach will also be replaced as necessary. Approximately 20 cu yds of cast-in-place poured concrete will be necessary for the ramp approach construction. A total of approximately 50 cu yds of material including pre-cast concrete panels, gravel bedding and grout will be placed below the high tide line. Concrete and rock debris such as concrete pile butts and boulders eroded from the existing breakwater are present in the vicinity of the ramp toe. These may be removed as hazards to navigation

An additional loading dock will be constructed adjacent to the boat ramp. The dock will be used to control the boats as they slip off the trailer as well as be used for loading and unloading. Dock access will comply with requirements of Title III of the Americans with Disability Act of 1994. The new dock and access path footprint is shown in plan view in Figure 3.4. Figure 3.8 is a cross-section view of the ADA ramp and loading dock. All construction material will be placed above water with the exception of new pile supports for the loading dock.

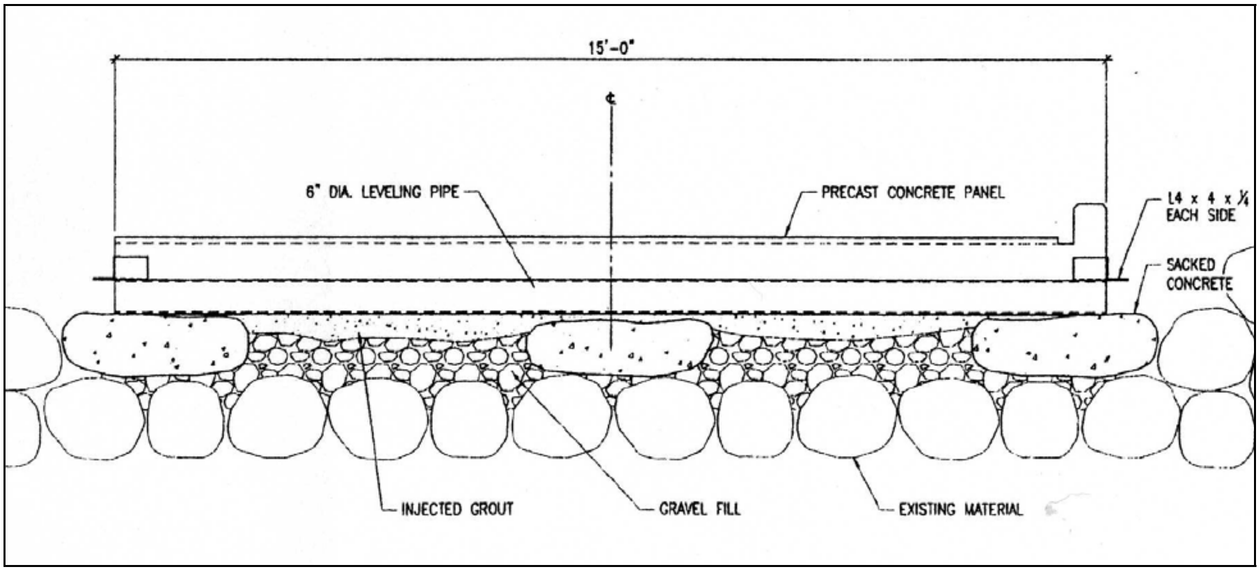

Figure 3.7 Cross-Section of Typical Boat Ramp Construction

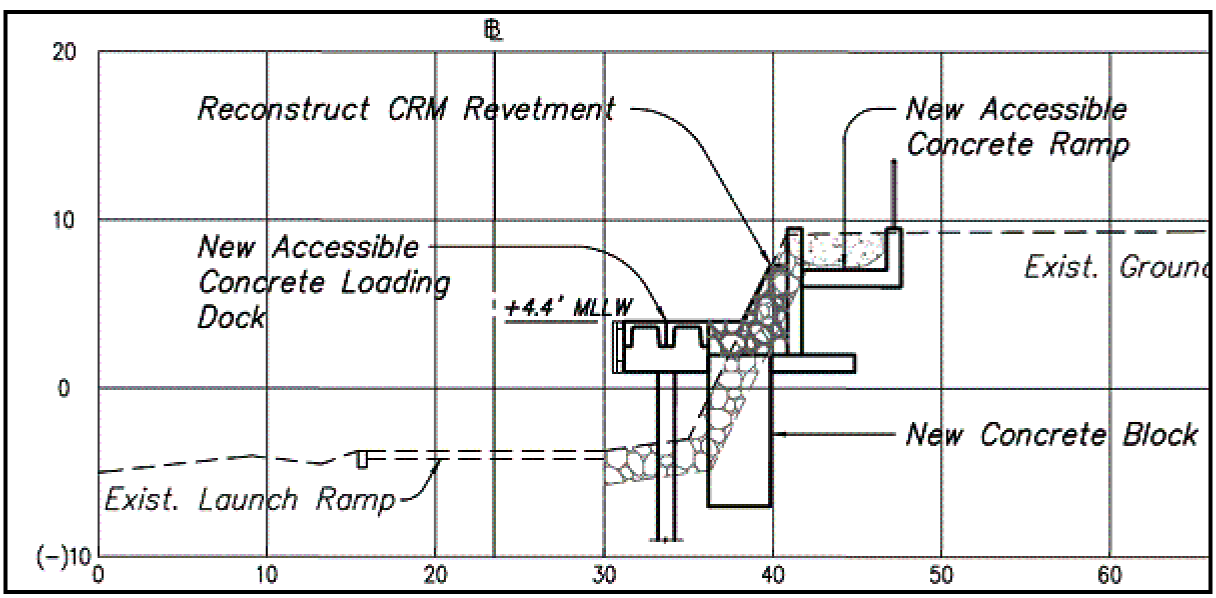

Figure 3.8 Cross-Section of New Loading Dock and ADA Ramp

3.3.4 Washdown Area

Current State Department of Health regulations prohibit the unimpeded runoff into coastal waters that would be created by washdown facilities at the boat ramp. A separate area is necessary where the runoff can percolate into the substrate. If necessary, percolation will be accomplished with a drywell system excavated and installed at the site (Figure 3.9). The washdown site location is presently being negotiated, but will be one of two alternate areas shown in Figure 3.10. The facility will consist of:

- Turn-out for temporary boat and trailer parking
- Water line installation
- Drywell drainage system

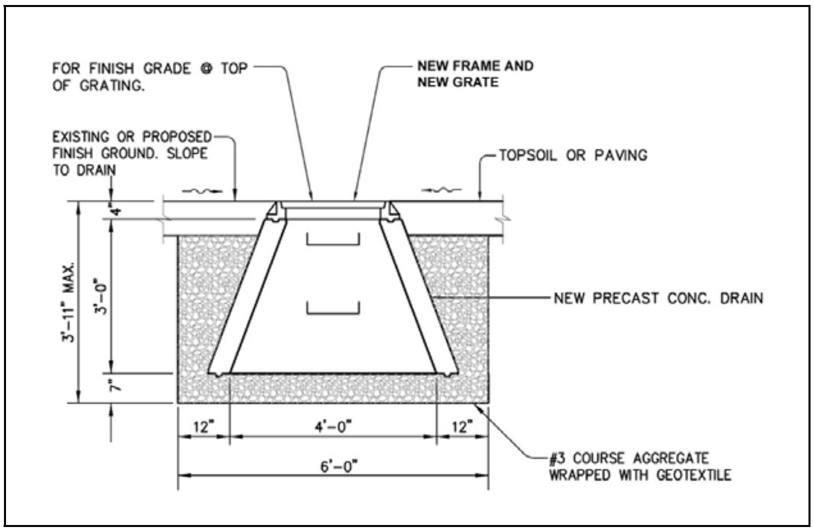

Figure 3.9 Typical Dry-Well Percolation System

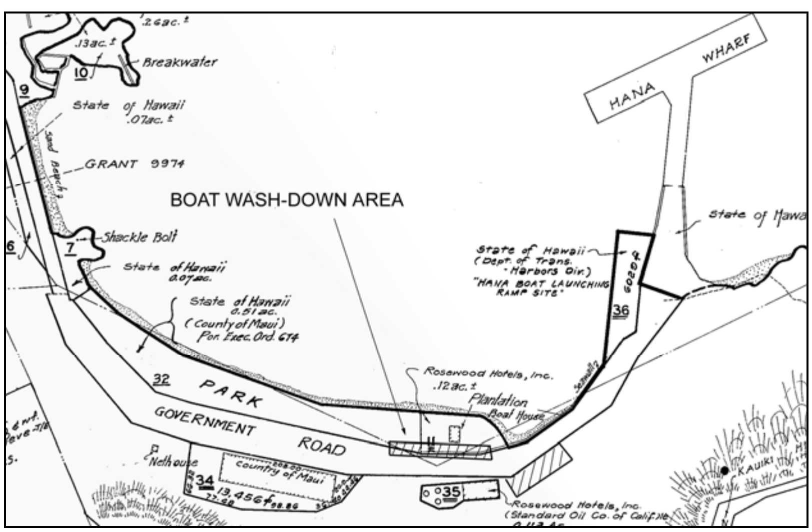

Figure 3.10 Washdown Location

3.3.5 Miscellaneous Minor Improvements

Miscellaneous improvements consist of repairs to the existing boat ramp, the installation of area lighting, a security fence and asphalt concrete (AC) paving.

The existing loading dock has aged and corroded deck hardware, and spalled concrete decking. The decking will be patched, and new mooring cleats, fenders and railings are planned.

Two pole-mounted light fixtures will be replaced, and new security fencing will installed to control access to the wharf.

Finally, the surface of the repaired breakwater structure will be re-paved with asphalt concrete. This area serves as a turn-around and temporary parking area for the boat ramp.

3.4 Construction Operations

Construction of the boat ramp improvements will face difficulties due to the remote location and poor access for heavy construction equipment. A crane capable of handling the three to five-ton armor rock will be necessary for breakwater repair construction. Both overland and marine transport for equipment and supplies are possible, but logistical problems are numerous for both. Overland transport is limited by the sharp highway curves and poor condition of some of the bridges. There are no reliable facilities for off-loading of marine transported materials. Hana Wharf is in extreme disrepair and not safe for normal mooring and loading operations, although it might be made to work with some temporary reinforcement or other such modifications by the contractor.

Revetment and seawall construction will involve work in the water close to the shoreline. In-water work for revetment construction will consist of:

- Debris removal and trenching of the bottom substrate,
- Slope preparation, geotextile installation
- Underlayer stone installation
- Toe stone and armor stone installation

In-water work for seawall construction will consist of:

- Debris removal and trenching of the bottom substrate,
- Slope preparation
- Installation of foundation wall form work
- Tremie concrete pouring for foundation wall
- Start of CRM construction (CRM will be above water)

Boat Ramp Construction will consist of:

- Removal of existing ramp
- Bed preparation, including gravel base

- Installation of pre-cast slabs
- Side curb construction (concrete or rip rap)
- Re-pavement of ramp approach

All other construction is above water, and mostly minor in nature

3.5 Material Quantities

Table 3-1 is a summary of fill and excavation materials for the project. Project design elements are further described in Section 3.3. Quantities are estimates based upon cross-sections and plans.

Table 3-1 Material Quantities Summary for Excavation and Fill.

Source	Composition	Quantity	Duration
Breakwater Repair (Rubblemound)			Permanent
Underlayer Stone	Basalt Boulder	110 cy	
Armor Stone	Basalt Boulder	265 cy	
Misc. Turbidity	Fine Silt	unknown	Temporary (hours)
Breakwater Repair (CRM Seawall)			Permanent
Tremie Concrete Footing and Seawall	Concrete	550 cy	
CRM	Basalt Rock and Grout	75 cy	Permanent
Forms for Concrete Footing	Wood	20 cy	Temporary (2 months)
Rebar	Steel		
#7		350 ft	Permanent
#8		3,000 ft	
#9		2,760 ft	
#10		7,778 ft	
Misc. Turbidity	Fine Silt	unknown	Temporary (hours)
Boat Launch Ramp			
Concrete Panels and Bedding	Pre-Cast Concrete and Gravel Bedding	50 cy	Permanent
Leveling Frame	6-inch Galv. Steel Pipe	112 ft	Permanent
Sacked Concrete	Concrete-filled bags	42 bags (1cy)	Permanent
Scour Protection	Grout-Filled Mattress	6.7 cy	Permanent
Misc. Turbidity	Fine Silt	unknown	Temporary (hours)

Source	Composition	Quantity	Duration
New Boat Dock *Bearing Piles*	Concrete	(6) 26" x 26"x 30ft (5.2 cy)	Permanent
Pile Caps	Concrete	6 (1.25 cy)	Permanent
Plastic Lumber	Plastic	8.6 cy	Permanent
Silt Curtains	Fabric	1800sq ft	Temporary (9 months)

3.6 Estimated Construction Cost

Preliminary estimates of the construction costs are as follows:

Revetment Repair	$1,675,000
ADA Ramp Construction	740,000
New Loading Dock Construction	615,000
New AC Pavement	680,000
Repair Existing Loading Dock	125,000
New Lighting and Fencing	75,000
New Washdown Facility	50,000
Total	$3,960,000

4.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

4.1 Description of the Proposed Action

This project is to repair and improve the existing boat ramp facility at Hana, Maui. The boat ramp is located in the lee of a short breakwater at Hana Wharf (Figure 1.2). Anticipated improvements will consist of:

1. Repair of the existing breakwater,
2. Addition of a new loading dock that is compatible with the Americans with Disability Act of 1990 (ADA),
3. Renovation of the concrete launch ramp, and
4. Establishment of a boat wash-down area.
5. Miscellaneous minor improvements including:
    - Renovation of the existing loading dock
    - New security fencing and lighting
    - New asphalt pavement

4.2 Alternatives to Breakwater Repair

Alternatives to the proposed breakwater repair action consist of:

- No Action
- Seawall construction only

No Action
A no action alternative will result in increased deterioration of the breakwater. The structure is in a degraded state, with numerous voids that likely permeate the entire structure. Under severe wave attack, sections have failed and sinkholes have opened in the breakwater crest. This type of failure appears to have been progressive, and is likely to occur in the future with increased frequency.

Seawall Construction Only
Hana is remotely located with poor construction access. The road is narrow, bridges are old and of doubtful serviceability, and dock facilities for tug and barge service are not safe or adequate. The seawall design presently used for the leeward side breakwater repair may need to be adapted for the windward side as well due to constraints of material availability and transport access.

The seawall design consists of a poured concrete footing below the water surface, integrated with a sloping CRM wall that is bonded to the existing revetment surface (see Section 3.3.2). It is a rigid structure and not likely to be quite as durable as a rubblemound structure in a severe wave environment. However it is a viable alternative that may be considered if the availability of large rock and construction access become unresolved issues.

4.3 Alternatives to ADA Accessible Loading Dock

Based on Title III of the Americans with Disability Act, newly constructed public facilities must contain access provisions for disabled persons. The only alternative to the new loading Dock is no action.

No Action
No action would result in no ADA access at the site. The new loading dock is a desirable boat ramp feature that eases boat launch and retrieval as well as loading actions.

4.4 Alternatives to Boat Ramp Repairs

The alternatives to repairing the boat ramp include no action and repair in place.

No Action
During the November 2003 storm, at least one pre-cast panel of the boat ramp was displaced and thrown shoreward by wave action. The panel was put back with only minor dislocation in alignment. However, there are voids beneath the panel that allow pressure to build up and lift the panel. The voids cause air to be compressed and audibly released during the rise and fall of wave-induced water levels. It is likely that displacement of one or more of the ramp slabs will occur in the future during extreme wave events unless the problem is corrected.

Repair in Place
The ramp could probably be repaired in place by coring through the slab and grouting the underlying voids. Much of this work would necessarily take place in the water, increasing the difficulty and environmental exposure. As the ramp is old and worn, and this repair process has a degree of uncertainty, replacement is seen as the superior alternative.

4.5 Alternatives to Boat Washdown Area

The alternatives to construction of a Boat Washdown Area are no action and on-ramp washdown.

No Action
No action would prevent boat operators from fresh water washdown until they reach home. This condition has resulted in the premature corrosion of expensive boating equipment, especially the boat trailers. Premature loss of equipment is an economic burden for the local boating community.

On-Ramp Wash-down
Plumbing a hose spigot at the boat ramp would be the most straightforward wash-down installation. However, this would allow uncontrolled run-off into the nearshore waters and is a violation of State Dept. of Health guidelines.

5.0 NATURAL ENVIRONMENTAL SETTING

5.1 General Physical Environment

Hana Bay is on the east side of the island of Maui, on the flanks of Haleakala Volcano. The rugged volcanic terrain has resulted in a complex shoreline of predominately rocky bays and inlets. Beaches are typically mixed volcanic and reef-derived carbonate detritus. The region is sheltered from wind and waves from the south and west, but is directly exposed to prevailing trade wind weather from the northeast. Moisture laden trade winds are lifted by the adjacent mountain, producing orographic rain showers and a lush tropical environment. Hana has an average annual rainfall of 47 inches (as recorded at the Hana Airport).

5.1.1 Bathymetry and Nearshore Bottom Conditions

The bathymetry in the immediate vicinity of the boat ramp is complex. Bathymetric features in the vicinity of the project site are shown on Figure 5.1. Depths of 15 to 20 feet in the bay and off the wharf end abruptly at a ledge just offshore of the ramp area. The ledge rises to a nominal 6-foot depth. The depths become gradually shallower as the ramp is approached. A shallow reef lies adjacent to the beach park side of the ramp approach and stretches for several hundred feet or more. This reef is a potential hazard for boaters landing at the ramp if the boats are allowed to swing over too far.

The seaward side of the breakwater has numerous large basalt boulders scattered in front of the breakwater. Nominal 6-foot depths also end abruptly at a ledge that plunges down to about 20 feet. The boulders rise close to the water surface and can be exposed during low tide and surge conditions (Figure 5.2).

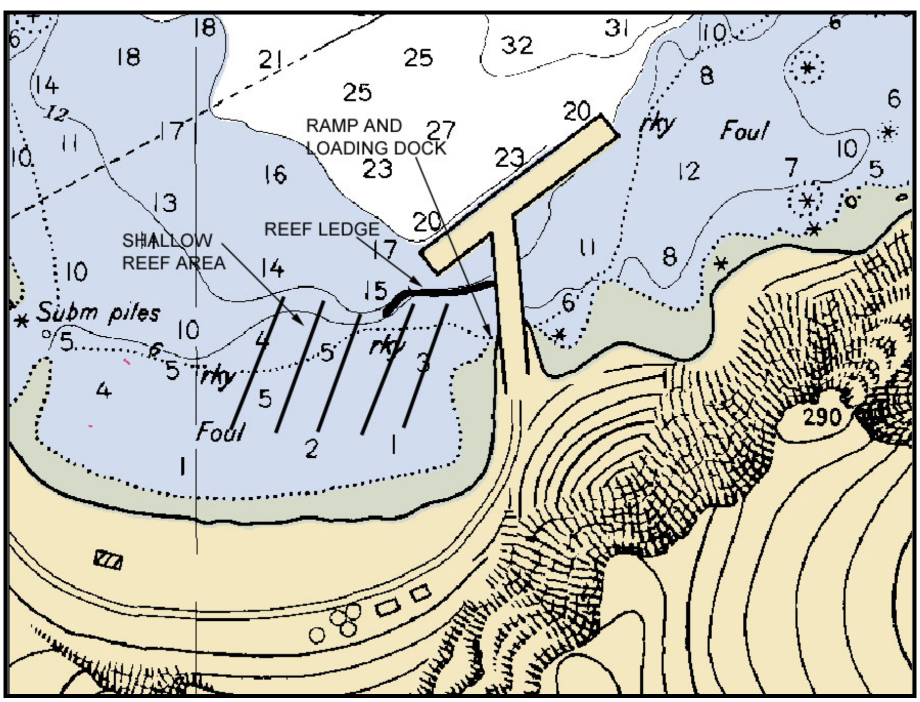

Figure 5.1 Bathymetric Features at Hana Wharf

Figure 5.2 Boulders and Rocks on the Seaward Side of the Breakwater

5.1.2 Shoreline Conditions

The shoreline and surrounding environment is extremely rugged due to the volcanic terrain. The coast is formed by prominent lava outcrops, with isolated stream outlets forming cobble and sand pocket beaches. Similarly, the bathymetry in the bay is an irregular network of reefs with steep underwater relief.

The south end of the bay, adjacent to the boat ramp and wharf, is the site of Hana Beach Park. The beach is 700 feet long , and about 100 feet wide. A seawall protects much of the beach park shoreline behind the sand beach, and enables flat vegetated picnic areas. Shallow reefs offshore of the beach promote generally calm and safe swimming conditions off the beach park. The coast on the west side of the bay is irregular and rocky, with small pocket beaches and lava rock shelves. Further north along the west side, a *muliwai* and cobble beach is formed by the confluence of the Kawaipapa and Holoinawawae streams. Hana Bay ends at the north end at the basalt rock lava flow forming Nanualele Point (Clark, 1980).

To the east of the ramp and wharf on the headland formed by Ka'uiki Head, shoreline access is poor due to steep terrain and exposure to prevailing trade wind wave conditions. Hana Bay is bounded on the south and east by Puukii Island, a volcanic remnant off of Ka'uiki Head. Kaihalulu Beach, on the south side of Ka'uiki Head, is a secluded sand beach formed from cinder sand eroded from adjacent bluffs.

5.1.3 Wind

Hana is directly exposed to the prevailing easterly trade winds, and occasional north winds. Winds from the south and west are mostly blocked by the island of Maui. Data collected at

Kahului Airport by the National Climatic Data Center between 1958 and 1995 show typical wind speeds between 7 and 16 knots, occurring over 53 percent of the time, and an overall annual average speed of 11.6 knots. Typical wind directions are easterly trade winds blowing from between north-northeast and east-northeast, occurring more than 67 percent of the time. No wind data are available from direct measurements at Hana, and speed and direction values are likely to differ somewhat from the Kahului values. Wind at both Hana and Kahului is greatly influenced by the presence of Haleakala volcano. Table 5.1 shows the return period of peak gust values for easterly winds based on the Kahului measurements.

Table 5-1 Return Period versus Easterly 10-Minute Wind Speed

Return Period (years)	Peak Gust (knots)
2	27
10	31
25	32
50	33

5.1.4 Waves

Hana Bay is exposed to ocean waves approaching from the northeast and southeast compass quadrants (directions north clockwise through south). North Pacific swell, easterly trade wind waves and southerly swell are the open-ocean waves that approach from this sector. The geographic orientation of Hana offers protection from the southwest through northwest direction, but makes the area particularly susceptible to ocean waves coming from the northeast. While trade wind generated waves occur most of the time and generally come from the northeast quadrant, they tend to be of modest size with short wave periods and are generally non-destructive. The large winter waves that affect Hawaii during the winter season are generated by intense low pressure weather systems to the north and west with gale and storm force winds blowing over large expanses of ocean. Occasionally (and predominately in the Fall) the storm systems become oriented in such a way that these strong winds blow toward the Hawaiian Islands from the northeast such that they directly impact Hana.

The wave event of November 21, 2003 was a particularly severe high wave condition that apparently resulted in damage to the breakwater and boat ramp at Hana Wharf. Figure 5.3 shows the North Pacific weather conditions that existed on November 20, 2003. A strong low pressure system lay to the east of a high pressure system in the North Pacific, resulting in high winds and waves directed at the Hawaiian Islands from the northeast. Figure 5.4 shows the corresponding wave height analysis, with 10-meter (33-foot) waves in the storm region, and 5-meter (16.5-foot) waves reaching the Hawaiian Islands. Breaking wave heights up to 40 feet were reported during this event (Honolulu Advertiser, Nov. 22, 2003).

Like most locations in the Hawaiian Island, Hana is exposed to tsunami, and is particularly vulnerable to those from the North and East Pacific. The April 1, 1949 tsunami resulted in the deaths of 12 persons and significant property damage along the shoreline of Hana Bay.

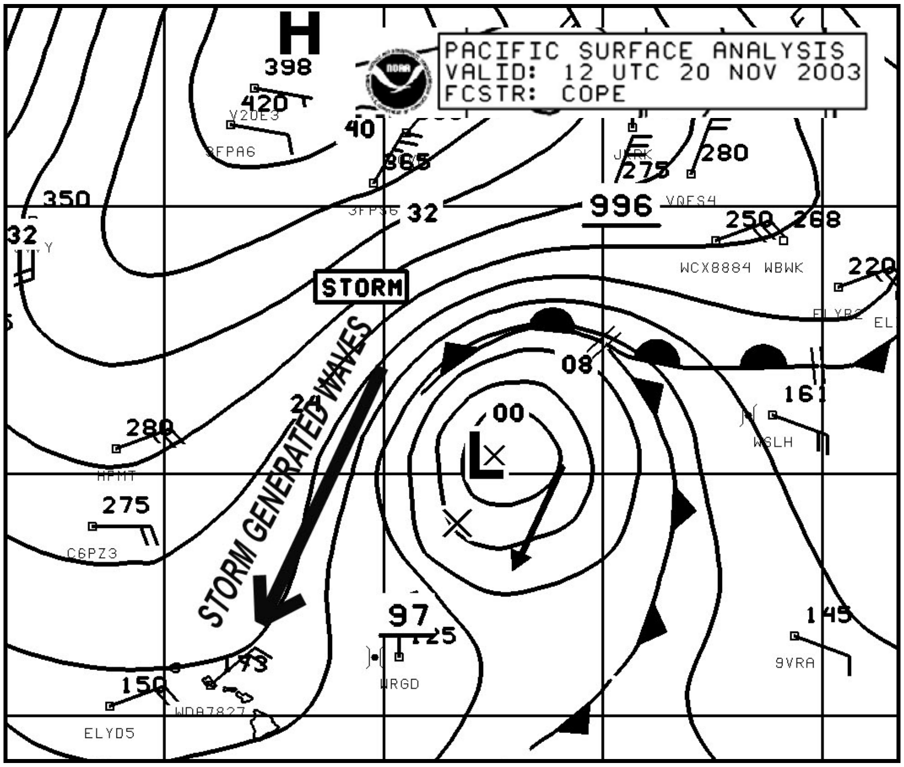

Figure 5.3 Weather map showing low pressure system NE of Hawaii (11-20-03)

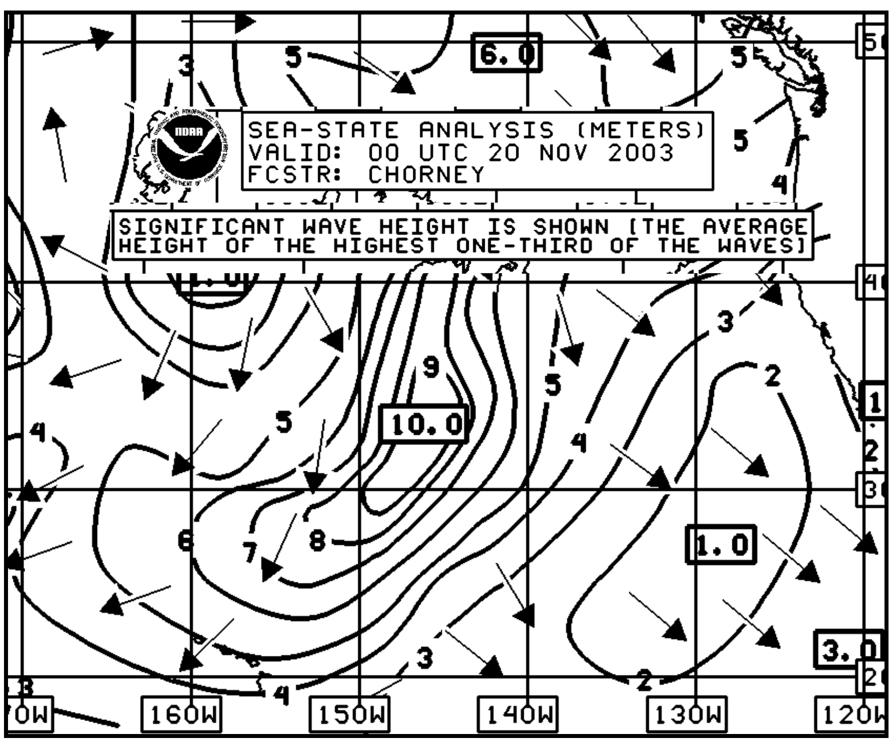

Figure 5.4 Sea-state analysis showing high waves NE of Hawaii (11-20-03)

5.1.5 Water Levels

Tide data for Hana Bay shown below in Table 5-2 were obtained from *Tide Tables 2006* (International Marine, McGraw-Hill, 2005), which is based on tide information from the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Service. The vertical datum used in this report is mean lower low water (MLLW).

Table 5-2 Astronomic Tide levels for Hana Bay

	Water Level (feet)
Highest recorded water level (12-20-68)	3.2
Mean higher high water (MHHW)	2.5
Mean high water (MHW)	2.0
Mean tide level (MTL)	1.1
Mean low water (MLW)	0.2
Mean lower low water (MLLW)	0.0
Lowest recorded water level (6-19-55)	-1.6

Note: Mean tide level and mean sea level (MSL) are approximately equivalent.

During a storm event, stillwater level rise at the shoreline is a combination of astronomical tide, storm surge (which consists of wind setup and setup due to sea level pressure reduction), and wave setup. During large wave events with non-storm weather conditions, the stillwater level rise is a combination of astronomical tide and wave setup without storm surge. Wave setup during very large wave conditions is on the order of 1.5 to 2.0 feet. Storm surge at Hana due to the combined effects of wind setup and sea level pressure reduction is on the order of 0.5 feet.

5.2 Marine Water Quality

Hawaii Water Quality Standards classify Hana Bay as Class AA Open Coastal marine waters by the State Water Quality Standards (HAR, Chapter 11-54). It is the objective of Class AA waters that they remain in their natural pristine state as nearly as possible with an absolute minimum of alteration of water quality from any human-caused actions. A water quality study was conducted for this project by AECOS, Inc. (AECOS, 2007). The AECOS report is included with this report as an appendix.

AECOS conducted field work at Hana on June 5, 2006 to characterize the marine environment at the site. The field effort included taking water quality measurements and samples for laboratory analysis. Four water quality sampling stations were established around the perimeter of the work site. Station 1 was located adjacent to the boat ramp, Station 2 at the foot of the boat dock ladder, Station 3 on the east side of the revetment, and Station 4 over the shallow reef to the west of the boat ramp (Figure 5.5).

Temperature, dissolved Oxygen (DO), pH, and salinity were measured with instruments in the field. Parameters measured in the laboratory from collected water samples include: turbidity, total suspended solids, ammonia, nitrate + Nitrite, total nitrogen, total phosphorus, and chlorophyll α. Table 5-3 is a summary of the water quality parameters measured at the project site for the AECOS study. For comparison, the values listed in Table 5-4 are the criteria for these parameters for Class AA waters in Hawaii.

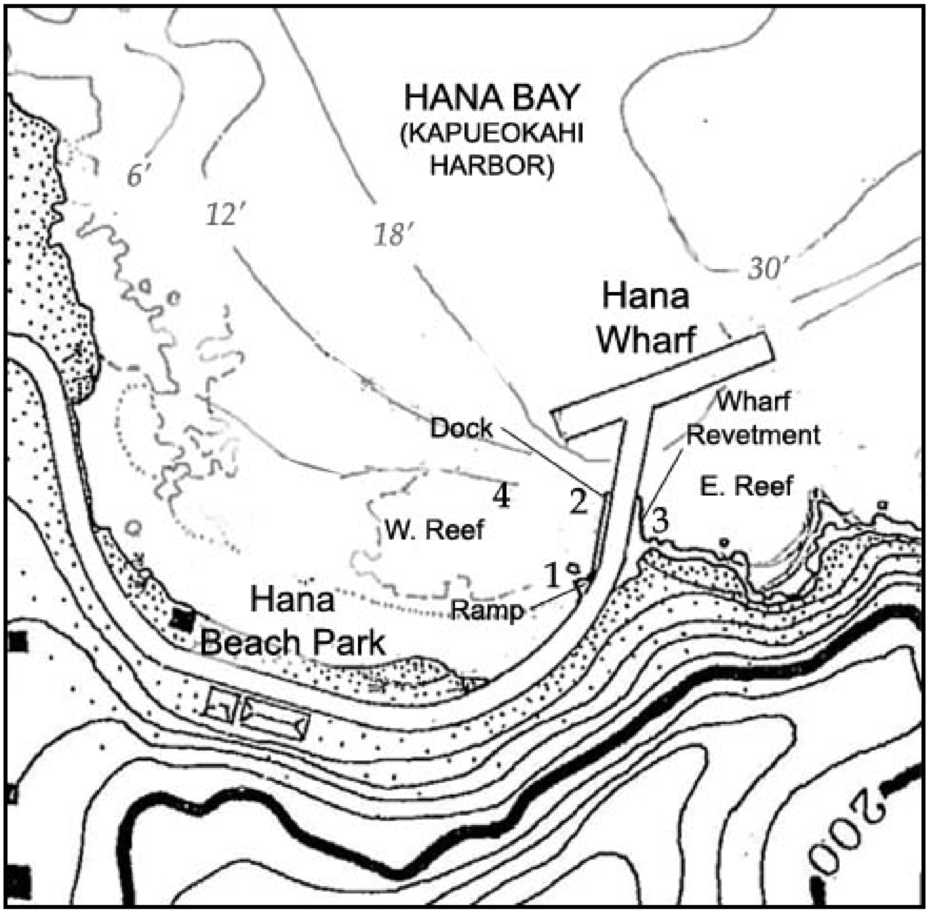

Figure 5.5 Location of the June 5, 2006 Water Quality Sample Stations (1-4) and Marine Biological Survey Areas (ramp and dock, west reef, wharf revetment, and east reef) for the Hana Wharf Project (Base map *AECOS*, Inc. (1980))

Table 5-3 Water Quality Characteristics at Hana Wharf and Nearby Waters from Samples Collected on June 5, 2006

STATION	Time Sampled	Temp (*C)	Salinity (%o)	Dissolved Oxygen (mg/l)	Dissolved Oxygen (% sat)	Total Susp. Solids (mg/L)	pH	Turbidity (NTU)	Ammonia (µg N/L)	Nitrate + Nitrite (µgN/L)	Total N (µgN/L)	Total P (µgN/L)	Chl α (µgN/L)
Sta. 1 (boat ramp)	1150	25.9	33.11	7.65	113	11.2	8.14	0.96	< 1	10	148	34	0.71
Sta. 2 (boat dock)	1140	26.1	32.54	6.72	100	4.1	8.09	0.84	< 1	18	148	22	0.68
Sta. 3 (wharf revet)	1115	25.8	33.60	7.66	114	4.3	8.02	0.84	< 1	18	148	22	0.68
Sta. 4 (west reef)	1200	26.3	32.47	5.66	84	8.0	8.14	0.66	< 1	15	142	20	0.59

Table 5-4 State of Hawaii Water Quality Criteria for Class AA Open Coastal Marine Waters (HAR §11-54-06 (b)(3)); (Geometric mean not-to-exceed criteria).

Class AA Open Coastal Marine Waters						
Criteria	Ammonia (µg N/l)	Nitrate + nitrite (µg N/l)	Total N (µg N/l)	Total P (µg P/l)	Chl α (µg/l)	Turbidity NTU
Wet *	**3.50**	**5.00**	**150.0**	**20.00**	**0.30**	**0.50**
Dry **	2.00	3.50	110.0	16.00	0.15	0.20

* Wet criteria apply when the open coastal waters receive more than three million gallons per day of fresh water discharge per shoreline mile.
** Dry criteria apply when the open coastal waters receive less than three million gallons per day of fresh water discharge per shoreline mile.

The following non-specific criteria are applicable during "Wet" and "Dry" conditions.

- pH shall not deviate from 7.6 to 8.6.
- Dissolved oxygen shall not be less than 75% saturation.
- Temperature shall not vary more than 1 °C from ambient.
- Salinity shall not vary more than 10% from natural or seasonal changes.

The following summary discussion concerning the water quality at the project site is from the AECOS report:

> "In general, basic water quality parameters (pH, dissolved oxygen, temperature, and salinity) met state criteria. On the other hand, several parameters (total phosphorus, chlorophyll α, and turbidity) were above the geometric mean not-to-exceed criteria for "wet" conditions and might be considered elevated. The difficulty of making any kind of comparison statement is that by definition, half of the values contributing to a geometric mean will be elevated (above) relative to the mean.
>
> Percent DO saturation ranged from a low of 84% at Sta. 4 to a high of 114% at Sta. 3. Ph ranged from 8.02 at Sta. 3 to 8.14 at Sta. 1 and 4. Both of these parameters fell within the acceptable range as defined by the State criterion for "wet" open coastal waters. Temperature ranged from 25.8 ^{o}C at Sta. 3 to 26.3 ^{o}C at Sta. 4. Salinity fell between 32.47 ppt at Sta. 4 and 33.60 ppt at Sta. 3, indicating some freshwater input. Total suspended solids ranged from a low of 4.1 mg/L at Sta. 2 to a high of 11.2 mg/L at Sta. 1.
>
> The State "wet" geometric mean not to exceed criterion for inorganic nitrogen in the form of ammonia is 5 µg N/L. At all stations ammonia concentrations were below 1 µg N/L. The state "wet" geometric mean not to exceed criterion for inorganic nitrogen in the form of nitrate + nitrite is 20 µg N/L. Nitrate + nitrite levels ranged from a low of 6 µg N/L at Sta. 3 to a high of 18 µg N/L at Sta. 2. The state "wet" geometric mean not to exceed criterion for total nitrogen (inorganic + organic nitrogen) is 150 µg N/L. Total nitrogen levels ranged from a low of 139 µg N/L at Sta. 3 to a high of 148 µg N/L at Sta. 1 and 2. The state "wet" geometric mean not to exceed criterion for total phosphorus is 20 µg P/L. Total phosphorus ranged from a low of 19 µg P/L at Sta. 3 to a high of 34 µg P/L at Sta.1.

The state "wet" geometric mean not to exceed criterion for chlorophyll α is 0.30 μg/L. Chlorophyll α ranged from a low of 0.59 μg/L at Sta. 4 to a high of 0.81 μg/L at Sta. 3. The state "wet" geometric mean not to exceed criterion for turbidity is 0.50 NTU. Turbidity ranged from a low at Sta. 4 of 0.66 NTU to a high of 0.96 NTU at Sta. 1.

Rainfall at Hana for the month of May was 4.03 inches (10.24 cm) with trace (0.03 in/0.08 cm) amounts of precipitation measured during the 5 days preceding the sampling event (NOAA/NWS, 2006a). Despite this lack of rainfall, AECOS biologists observed the Schlieren effect, a shimmering appearance to the water produced by density differences between mixing waters, usually fresh and salt waters, as well as cooler water mixing with warmer water, taken as an indication of fresh water intrusion. Fresh water inputs from nearby Kawaipapa and Holoinawawae Streams as well as groundwater intrusion likely introduce fresh waters to the nearshore system."

5.3 Biological Resources

AECOS, Inc. also conducted a survey of the project site biology, including marine and terrestrial flora and fauna. The full report is included as an appendix to this study.

5.3.1 Marine Biological Resources

The AECOS biologist identified four distinct areas for the survey (see Figure 5.5):

- Area 1 - Existing boat ramp and loading dock (boat ramp, the concrete dock pilings, and the west side of the breakwater out to its terminus)
- Area 2 – West reef (the reef adjacent to the boat dock out to a point parallel with the west end of the wharf)
- Area 3 – East breakwater (including the boulders on the east side of the wharf and adjacent bottom out 15 ft)
- Area 4 – East reef and wharf pilings (including the reef located east of the wharf in about 20 ft of water and the concrete wharf pilings out to the 5th set of pilings from shore)

Area 1 - Boat Ramp and Dock

Area 1 is shielded from heavy wave action by the breakwater. The area is dominated by algae rather than coral. Red algae species, including a fleshy variety at the boat ramp, appear to predominate. Green algae are uncommon. Juvenile fish were found taking shelter in the rocks of the breakwater. The following description of the boat ramp and existing loading dock is from the AECOS report (note: referenced figure are found in the original report):

"The submerged surfaces of the boat ramp are coated by a layer of the alga, *G. breviarticulata*. A variety of small fishes can be seen swimming in the boat ramp swash zone: belted wrasse (*Stethojulis balteata*), Christmas wrasse (*Thalassoma trilobatum*), whitesaddle goatfish (*Parupeneus porphyreus*), manybar goatfish (*Parupeneus multifasciatus*), white spotted surgeonfish (*Acanthurus leucopareius*) and bird wrasse (*Gomphosus varius*). The boulders framing the west side of the boat ramp are covered by the red alga, *Ahnfeltia concinna*. The concrete pilings of the boat dock shelter schools of Hawaiian flagtail or *aholehole* (*Kuhlia sandvicensis*) mixed with unidentified clupeids (Fig. 6). A variety of gastropod mollusks adhere to the upper splash zone of the pilings, including black nerites (*Nerita picea*), dotted periwinkles (*Littoraria pintado*), and black-foot limpets (*Cellana exarata*). An abundance of debris, including derelict fishing nets and tires litter the bottom at the end of the dock and amongst the wharf pilings."

Area 2 - West Reef Area

The reef west of the boat ramp has significant coral cover except for the area adjacent to the existing boat dock. The following description of the flora and fauna is from the AECOS report:

"The reef located on the leeward side of the wharf (Fig. 4), adjacent to the boat dock varies in depth from roughly 8 to 25 ft (2.5 to 8 m) deep. The portion of reef nearest to the boat dock is physically compromised by tangles of fishing line with many dead coral colonies. These corals have been encroached on by algae including fleshy and corraline reds. Knobby finger coral (*Porites duerdeni*), noted for large deep calyces, occurs at the lower reaches of this damaged reef. The reef area about 9 ft (3 m) from the dock and at greater depths is more pristine with nearly 50% live coral cover (Fig. 7). Rice coral (*Montipora capitata*), Duerden's coral (*Pavona duerdeni*) and finger coral (*Porites compressa*) dominate the coral community, while lobe coral (*Porites lobata*), cauliflower coral (*Pocillopora meandrina*), spreading coral (*Montipora patula*), and blue rice coral (*Montipora purpurea*) are present, but less common. Petroglyph shrimp (*Alpheus deuteropus*) channels are visible on the surfaces of many *P. lobata* and *M. capitata* colonies. Several other coral species including; corrugated coral (*Pavona varians*), ocellated coral, and lace coral, are found here but are less obvious than those mentioned above. Invertebrates include the blue-black urchin, rock boring urchin, and sea cucumber.

A total of 26 fish species were recorded at the west reef. Adult fish forage and find refuge amongst the coral formations (Fig. 7). The most well-represented families on the reef are the Acanthuridae (surgeonfish) with eleven species, Chaetodontidae (butterflyfish) with seven species, and Labridae (wrasse) with six species. Few fish species are in great abundance; only the whitespotted surgeonfish (*Acanthurus leucopareius*) and lavender tang (*Acanthurus nigrofuscus*) occur in large numbers. Commonly sighted fish include the white saddle goatfish, four-spot butterflyfish, Hawaiian sergeant or *mamo* (*Abudefduf abdominalis*), saddle wrasse (*Thalasoma duperrey*), ring-tail surgeonfish (*Acanthurus blochii*), eye-stripe surgeonfish (*Acanthurus dussumieri*), orangeband surgeonfish (*Acanthurus olivaceus*), manini, goldring surgeonfish (*Ctenochaetus strigosus*), and orangespine unicornfish (*Naso lituratus*). Fish sighted in low numbers (less than 12) include the peacock grouper or *roi* (*Cephalopholis argus*), aholehole, stocky hawkfish (*Cirrhitus pinnulatus*) manybar goatfish, chub, threadfin butterflyfish (*Chaetodon auriga*), raccoon butterflyfish (*Chaetodon lunula*), oval butterflyfish (*Chaetodon lunulatus*), ornate butterflyfish (*Chaetodon ornatissimus*), one-spot butterflyfish (*Chaetodon unimaculatus*), forcepsfish (*Foricipiger flavissimus*), black spot sergeant, blackfin chromis (*Chromis vanderbilti*), Pacific gregory, pearl wrasse (*Anampses cuvier*), Hawaiian cleaner wrasse, bird wrasse, Christmas wrasse, belted wrasse, pale nose parrotfish (*Scarus psittacus*), red-lipped parrotfish (*Scarus rubroviolaceus*), yellowfin surgeonfish (*Acanthurus xanthopterus)*, yellow tang (*Zebrasoma flavescens)*, sailfin tang (*Zebrasoma veliferum*), black durgon (*Melichthys niger)*, ambon toby, and spotted toby."

Area 3 - East Breakwater

The area on the east side of the breakwater is exposed to heavy wave action on a regular basis. The bottom is characterized by boulders, cobbles, and gravel and is scoured by constant movement of the substrate in the presence of waves. The following description of the area biology is from the AECOS report:

"Black-foot limpet and black nerite dot boulders above and at the water line, while thin-shelled rock crab (*Grapsus tenuicrustatus*) scramble in the splash zone. The submerged boulders (Fig. 9) are fairly void of macroalgae with only a thin layer of algal turf with scattered patches of calcareous red algae and rice coral. Several small lace coral colonies also adhere to the boulders. The sea floor adjacent to the east revetment is an unconsolidated mixture of red and black gravel, boulders, and coarse sand (Fig. 9). White-spotted sea cucumber and clumpy nudibranch (*Asteronotus cespitosus*) are among the few invertebrates noted here. Fishes observed include the *'ulae* lizardfish (*Synodus ulae*), manybar goatfish, ornate butterflyfish, white-spotted surgeonfish, lavender tang, orangeband surgeonfish, and *manini*. Few fishes were observed along the east revetment, although certainly there is greater overlap of species with the surrounding area than was observed. Below roughly 15 ft (5 m) depth, turf algae adhere to cobbles and rubble, with little sand present.

At the end of the revetment, where the water depth drops off beneath the wharf, the upper revetment boulders are almost entirely encrusted with red coralline algae (Fig. 10). The lower revetment boulders, on the other hand, support a mixture of coralline algae and mounds of occelated coral. Below the revetment boulders the wall of the dropoff beneath the wharf hosts heads of lobe coral."

Area 4 - East Reef and Wharf Pilings

East and seaward of the breakwater the underwater terrain is typified by large basalt boulders. The wharf pilings are also included in this area because they provide a similar habitat raised above the scoured bottom. This area has the greatest diversity of fish species of the four areas. The narrative from the AECOS report continues:

"The reef located east or seaward (Fig. 11) form the wharf is made up of several very large boulders amid a field of smaller boulders. Atop the large boulders occur cauliflower and rice coral colonies of varying sizes. Macro-invertebrates on the east reef include sea cucumbers, blue-black urchin, rock-boring urchin, and oblong urchin (*Echinometra oblonga*). The east reef has the greatest fish diversity of the four areas, with 41 species observed. Mixed schools of fishes, primarily acanthurid herbivores, swim amongst the large boulders (Fig. 12). The most abundant fishes are the white-spotted surgeonfish accompanied by manini, lavender tang, orangeband surgeonfish, orangespine unicornfish, and goldring surgeonfish or *kole* (*Ctenochaetus strigosus*). Other fish sighted include a variety of butterflyfish: raccoon, oval, ornate, and four-spot butterflyfish. A wide variety of wrasses occur including the commonly sighted saddle wrasse and Christmas wrasse, also occurring but all in low numbers are the pearl wrasse, bird wrasse, yellow striped coris, yellowtail wrasse, Hawaiian cleaner wrasse, and the belted wrasse. Fishes more closely associated with the benthos include the blackspot sergeant, brighteye damsel (*Plectroglyphidodon imparipennis*), Pacific gregory, peacock grouper or roi (*Cephalopholis argus*), and blenny (*Cirripectes* sp.).

Several meters beyond the large boulders, where the bottom grades into sand with sparse boulder outcrops, goatfish (blue goatfish [*Parupeneus cyclostomus*], manybar goatfish, and whitesaddle goatfish) scan the soft benthos for prey. Fishes observed in the open include: cornetfish (*Fistularia commersonii*), bluefin trevally or *omilu* (*Caranx melampygus*), green job fish or *uku* (*Aprion virescens*), chub, red-lip parrotfish (*Scarus rubroviolaceus*), and black durgon (*Melichthys niger*).

The pilings located on the east side of the wharf (Fig. 13), out to the fifth piling, are included in the discussion of the east reef and not the east revetment because they are similarly distanced from the revetment and less likely to be impacted than the revetment itself. Between the east reef and wharf pilings, encrusting colonies of rice coral, blue rice coral, lobe coral, and occelated coral are somewhat sparsely situated on a slightly undulating bottom amid silt covered turf algae. Bottom depth increases as it approaches the wharf and lobe coral colony mounds line the face of the drop off associated with the wharf (Fig. 13). The upper parts of the concrete wharf pilings are encrusted with rice coral colonies, whereas the deeper portions are rimmed by plate-like growths of the same.

Overall, fleshy macro-algae are uncommon except along the west facing rock revetment adjacent to the boat ramp. Few macro-invertebrates are observed throughout the survey area. The highest coral cover occurs along the reef located to the west of the wharf with the most common corals being rice coral, lobe coral, and Duerden's coral. Herbivorous surgeonfish are the most abundant fish group throughout the area with the most common being the whitespotted surgeonfish, lavender tang, orangeband surgeonfish, manini, and gold-ring surgeonfish. In addition, the saddle wrasse, a carnivore, was equally common. Of the 53 marine fish species recorded, 15% are endemic, meaning they are found only in the Hawaiian Islands and no other geographic region. The areas of greatest fish diversity occur in the coral reef environments on either side of the wharf, each with at least 40 fish species observed. No endangered or threatened species (DLNR, 1998; Federal Register, 2005; USFWS, 2005; USFWS, 2006) were encountered during our marine survey."

5.3.2 Terrestrial Biological Resources (Flora)

AECOS also conducted an inventory of plant species in the region around the wharf, predominately on the landward side of the access road. Most of the species encountered are naturalized. The exceptions are a croton (*Codiaeum variegatum*), an ornamental; bridal wreath (*Stephanotis floribunda*), also an ornamental; and ‘*anaunau* (*Lepidium bidentatum* var. *o-waihiense*), an endemic sub-shrub. The ‘*anaunau* is considered a species of special concern – an informal designation that refers to a possible need for conservation action. This species was found east of the wharf area, which will likely not be affected by the project. Table 5-5 is a list of plants identified during the field work. The AECOS report states:

> “The hillside bordering the bay is dominated by ironwood (*Casuarina equisetifolia*) with scattered sea almond or false *kamani* (*Terminalia catappa*), octopus tree (*Schefflera actinophylla*), and shoebutton ardisia (*Ardisia elliptica*). The ironwood was likely planted as an erosion control measure for the steep hillside behind the wharf. A variety of plants (Fig. 14) are found in the shaded understory surrounding the ironwood, including maile scented fern (*Phymatosorus grossus*), sword fern (*Nephrolepis multiflora*), bridal wreath, and shoebutton ardisia. Also occurring in the area, but closer to the roadside, are air plant (*Kalanchoe pinnata*), maunaloa (*Canavalia cathartica*), croton, and papaya (*Carica papaya*).
>
> The grass areas on either side of the wharf have a variety of grasses and ruderal weeds including nut grass (*Cyperus rotundus*), Chinese violet (*Asystasia gangetica*), yellow wood sorrel (*Oxalis corniculata*), Asiatic pennywort (*Centella asiatica*), garden spurge (*Chamaesyce hirta*), kyllinga (*Kyllinga nemoralis*), Oriental hawksbeard (*Youngia japonica*), and the endemic ‘*anaunau* (*Lepidium bidentatum* var. *o-waihiense*).
>
> Char (1990) found twelve of these same plant species during a survey conducted in October 1990 at nearby proposed Hana Ranch Country Club golf course. The areas she surveyed were primarily pasture land and mixed shrubland. The report documented 126 vascular plant species, of which 79% were introduced, 8% were considered Polynesian introductions, 13% were indigenous, and none were endemic. Our survey near the wharf documented twenty introduced species and one endemic species.
>
> ‘A*naunau* (Fig. 14), the only terrestrial endemic species observed, is considered a species of special concern, an informal term referring to a species that might be in need of conservation action. This may range from a need for periodic monitoring of populations and threats to the species and its habitat, to listing as threatened or endangered. Such species receive no legal protection and use of the term does not necessarily imply that a species will eventually be proposed for listing. A similar term is “a species at risk,” which is a general term for listed species as well as unlisted ones that are declining in population. US Geological Survey biologists identified ‘*anaunau* in the area of Hana Wharf (pers. comm.) and also on the nearby Pu‘u Ku Islet (discussed above as Pu‘u‘iki) in April 2006 (Starr et al., 2006). The

areas surveyed around Hana wharf represent disturbed areas of ruderal weeds, ornamental plantings, and an ironwood dominated hillside. No endangered or threatened species (DLNR, 1998; Federal Register, 2005; USFWS, 2005; USFWS, 2006) were encountered during our terrestrial survey."

Table 5.5 List of Terrestrial Plants Observed in Close Vicinity of Hana Wharf Hana, Maui on June 5, 2006.

- Chinese violet (*Asystasia gangetica*) Acanthaceae – nat
- [1]Asiatic pennywort (*Centella asiatica*) Apiaceae – nat
- [1]Octopus tree (*Schefflera actinophylla*) Araliaceae - nat
- Bridal wreath (*Stephanotis floribunda*) Asclepiadaceae – orn
- [1]Japanese hawks beard (*Youngia japonica*) Asteraceae - nat
- [2] '*Anaunau* (*Lepidium bidentatum* var. *o-waihiense*) Brassicaceae - end
- [1]Papaya (*Carica papaya*) Caricaceae - nat
- [2]Ironwood (*Casuarina equisetifolia*) Casuarinaceae – nat
- Sea almond or false *kamani* (*Terminalia catappa*) Combretaceae – nat
- [1]Air plant (*Kalanchoe pinnata*) Crassulaceae – nat
- [1]Nut grass (*Cyperus rotundus*) Cyperaceae – nat
- Kyllinga (*Kyllinga nemoralis*) Cyperaceae - nat
- [1]Garden spurge (*Chamaesyce hirta*) Euphorbiaceae – nat
- Croton (*Codiaeum variegatum*) Euphorbiaceae - orn
- [1]Maunaloa (*Canavalia cathartica*) Fabaceae - nat
- [1]Shoebutton ardisia (*Ardisia elliptica*) Myrsinaceae – nat
- [1]Sword fern (*Nephrolepis multiflora*) Nephrolepidaceae– nat
- [1]Yellow wood sorrel (*Oxalis corniculata*) Oxalidaceae – nat
- Sourgrass (*Digitaria insularis*) Poaceae– nat
- [1]Wire grass (*Eleusine indica*) Poaceae – nat
- [2]Maile scented fern or *lauae* (*Phymatosorus grossus*) Polypodiaceae - nat

KEY TO SYMBOLS:
Orn = ornamental (planted non-native)
Nat = naturalized (non-native)
Pol = Polynesian introduction (technically non-native)
Ind = indigenous (native)
End = endemic (native), unique to the Hawaiian Islands
[1]Also reported in Char (1990) from nearby areas south of Hana.
[2]Also reported in Starr et al. (2006) for nearby PuuKu Islet.

WEBSITES ASSISTING IN IDENTIFICATION:
http://www.hear.org/starr/hiplants/images/index.html
http://www.hear.org/plants/

6.0 HUMAN ENVIRONMENTAL SETTING

6.1 Introduction

Hana has a rich Native Hawaiian cultural history. During periods of war between the islands, it held a strategic position as a center for war raids on the neighbor island of Hawaii. It is the site of the largest heiau in the State, the Pi'ilanihali Heiau. Hana is the birthplace of King Kamehameha I 's favorite wife, Queen Ka'ahumanu. Sugar was a major economic force in Hana from the mid 1800's until the 1940's, when the last mill closed down. Hana Wharf was built in 1921 to service the sugar industry. The loss of the sugar industry was partly offset by the startup of Hana Ranch in 1944. The Hotel Hana Ranch has evolved into a high-end resort destination, the Hotel Hana-Maui (Clark, 1980).

The year 2000 population of Hana numbered 1,856 persons (Hana Visitor's Guide – Maui Visitors Bureau). The largest employer (over 190 employees) is the Hotel Hana-Maui. Hana is famous as the home and final resting place of the famous American aviator, Charles Lindbergh.

The economy of Hana is based primarily on diversified agriculture, the visitor industry, government services, and subsistence activities. Diversified agriculture includes ranching, tropical fruit, flower, and foliage, and cultivation of taro (Hana Community Plan, 1994).

6.2 Recreational Use

The beach at Hana Beach Park is the safest swimming beach in the district, and is heavily used by the local population. The inshore water tends to be turbid, however, good snorkeling is available just offshore, where shallow reefs contain flourishing coral colonies (Clark, 1980).

In days past, the wharf was a popular place for fishing and parties, especially when persons were able to drive out onto the wharf. The wharf is now considered structurally unsafe, and persons are not encouraged to venture onto it.

There are small pocket beaches with red cinder sand around much of Ka'uiki Head. Tourists, in particular, can be seen trying to hike around the head, but the terrain is extremely steep and rugged. The coast on the ocean side is exposed to open ocean swell and trade wind waves, and is not safe.

The boat ramp is heavily used by the local population for launching fishing boats. The fish catch is part of the local diet, and also sold to the Hotel Hana-Maui restaurant.

6.3 Reservations And/Or Conservation Zones

A portion of the project site is in navigable waters of the United States pursuant to Section 10 of the Rivers and Harbors Act of March 3, 1899 (33 U.S.C. 403). A Federal permit from the U.S. Army Corps of Engineers (ACOE) is required to perform work in these waters. If more than 25 cubic yards of material is to be placed in the water, then a Section 404 (Clean Water Act) permit is necessary, which may in turn trigger a Section 401 Water Quality Certification, which is administered by the State Department of Health. There are several levels of federal permitting. Some maintenance work is covered by general Nationwide Permits requiring only a simple information submittal to the Corps. A Nationwide Permit would likely be applicable for in-kind repair. However, the extensive breakwater construction and new loading dock construction will likely mean that an individual project permit is required.

As the project is on and within 100 yards of the shoreline, it is also within a Special Management Area of Maui County. The project will therefore need a Special Management Area Permit, or a Permit Exemption from the Maui County Planning Commission.

Portions of the project that extend seaward of the shoreline are within the jurisdiction of the State Department of Land and Natural Resources (DLNR). Work extending into State Waters normally requires a Conservation District Use Permit (CDUP). However, because the project is the repair and maintenance of existing facilities, it will likely be considered exempt from the CDUP process (HAR 11-200-8).

6.4 Existing Infrastructure

Hana Boat Ramp and the access road are important parts of the existing infrastructure. Hana Wharf was an important commercial structure when the sugar industry was active in the early 20^{th} century.

6.5 Historic and Cultural Resources

Hana is rich with historical significance. However, the State and National Register of Historic Places lists no historic structures within the project area. Of note however, are listings for the Hana Highway and the Wananalua Congregational Church. The birthplace of Queen Kaahumanu is adjacent to the project site at Ka'uiki Head. The immediate project site (Hana breakwater) is predominately a man-made structure. There are therefore no known archaeological or cultural resources likely to be impacted.

6.6 Air and Noise Quality

The project is on the windward side of the island and receives fresh trade wind air. There are no significant industrial emissions in the vicinity, or inversion-producing geographic influences. Air quality can be considered excellent. Minor influences on local air quality come from boats and trucks and other motor vehicles near the launch ramp. Similarly, the rural setting and isolated nature of the project site produce a generally quiet environment. The most significant sound producing elements are from waves and wind.

7.0 ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION

7.1 The Natural Environment

7.1.1 The Natural Physical Environment

The Project consists of the following features:

1. Repair of the existing breakwater,
2. Addition of a new loading dock that is compatible with the Americans with Disability Act of 1990 (ADA),
3. Renovation of the concrete launch ramp,
4. Establishment of a boat washdown area,
5. Miscellaneous minor improvements including:
   - Renovation of the existing loading dock
   - New security fencing and lighting
   - Reconstruction of the concrete asphalt pavement.

Changes to the physical environment due to the project will primarily be related to repair of the existing breakwater. Failure of the present breakwater is primarily due to the steeply sloping uncemented design. The breakwater repair will be accomplished using large stone and a milder 1.5 (horizontal) to 1 (vertical) slope on the exposed seaward side, and a seawall design on the more protected harbor side. The footprint of the breakwater will therefore be expanded by up to 15 linear feet (approx. 1500 sq ft total) on the seaward side and by approximately 3 feet (approx. 350 sq ft total) on the harbor side. The substrate in these areas will be covered with construction features of the repair: armor rock, underlayer stone, or concrete footing. The overall size of the top surface of the breakwater – the access and turnaround area - will remain approximately the same.

Other project features will effect only minor changes to physical features of the project area. The new launch ramp and ADA ramp will improve accessibility, but will have a negligible footprint. The renovated concrete launch ramp, and miscellaneous minor improvements are in-kind features. The boat wash down area will require a turnout area, minor water line plumbing, and construction of a dry well for ground percolation of water. The dry well may require minor excavation with gravel fill.

7.1.2 Water Quality

Background water quality parameters measured by AECOS, Inc. for this study found mildly elevated levels of turbidity, total Phosphorus, and Chlorophyll α at the project site. These were one-time samples, and not part of a stochastic series used to generate the mean values required for statutory water quality parameter specification (HDOOH, 2004). Elevated turbidity and nutrient concentrations are not unusual in nearshore environments such as the project site.

While long term effects on water quality due to the project are not likely, there will probably be short term elevations in turbidity and total suspended solids (TSS) during the construction phase of the project. Excavation of the substrate and placement of rock armor stone will likely cause elevated levels of turbidity and TSS from suspension of in-place sediments. This is expected to be a minor effect, as the energetic environment at the site is not conducive to deposition of the fine-grained sediments (silts and clays) that become suspended in the water column.

Additional effects on turbidity during project construction will likely arise during pouring of the concrete footing for the seawall on the harbor side of the breakwater. The footing is necessary to seal the breakwater from wave surges, and provide a base for above-water CRM construction. The footing will be poured using tremie concrete techniques. Although it will be contained by formwork extending above water, some release of material in to the water column is inevitable. Best management practices, including the use of silt curtains will be used during all phases of the breakwater repair to minimize elevated water quality parameters, including turbid plumes.

A water quality monitoring plan to measure the construction effects on water quality at the project site, and ensure that adequate BMP's are in place, is included as an appendix to this report.

7.1.3 Marine and Terrestrial Biology

Sensitive reef areas with high percentage of coral cover will not be directly affected by the project. The project footprint is contained in areas where the energetic environment prevents significant colonization of coral species. Increased armor rock surface area on the seaward side of the breakwater due to the breakwater repair may result in increased habitat for some fish and coral species. Areas and species disturbed by project construction are expected to recover due to re-colonization. The following conclusions are taken from the AECOS, Inc. report:

> "Improvements to the existing Hana Wharf facility include repairs to the boat ramp, the west-facing revetment, and the east-facing revetment. Some marine organisms and their habitat will be impacted during reconstruction of the east-facing revetment, as well as the west-facing revetment. However, no rare or endangered species would be lost in this already disturbed environment. In-water work is not expected to directly impact the extensive coral community to the west of the wharf or that of the large boulder to the east of the wharf with its coral colonies and diverse fish assemblage.
>
> The boat ramp will be resurfaced with concrete, the size and shape of the boat ramp will not be changed. Marine life occurring at the boat ramp is limited to sparse algal growth and transient schools of fish. No loss of habitat is expected here. Algae will re-colonize the new surface and fish will return immediately upon work completion.
>
> The west-facing revetment will be fortified with a 1 m (3 ft) increase in footprint width. The boulder community here includes dense algal growth, cryptic invertebrates, juvenile fishes, and other common sessile invertebrates. Direct impacts will include loss of the existing boulder community, however newly placed revetment boulders will quickly be re-colonized. Sparse coral growth occurs here, however the species are common and will also re-colonize new available habitat.

The east-facing revetment will also be fortified with additional boulders and will have a finished footprint of an additional 5 m (15 ft) of width beyond the existing footprint. Although the width of the revetment will be increased, the length will not be changed. The revetment boulders of the east side are nearly devoid of marine life with only a thin layer of turf algae readily evident and the nearby seafloor is scoured clean by the movement of loose gravel and rubble. No corals occur within the proposed footprint expansion. Direct impacts will include the burial of the existing boulder habitat, however newly placed boulders will quickly be re-colonized. In addition, the available habitat will be increased through the widening of the revetment along with a reduction of the revetment slope.

Improvements will not directly impact two nearby areas of coral growth. These are located beyond the northeast edge of the proposed west-facing revetment expansion and at the north end of the existing revetment below the wharf pier. *Montipora capitata* and *Montipora patula* corals occur along the northeast perimeter and *Porites lobata* and *Cephastrea occelina* corals occur at the end of the wharf revetment below the wharf pier. The proposed revetment footprint is not expected to encroach upon these areas of coral growth, however care should be taken to avoid these areas during in-water work and boulder placement. These above mentioned coral species are common shallow water corals which will re-colonize newly created hard surfaces in the harbor."

7.1.4 Threatened and Endangered Species

No threatened or endangered marine or terrestrial species were encountered during the AECOS, Inc. survey. However, species that could possibly be encountered at the site include the green sea turtle (*Chelonia midas)* – listed as threatened in Hawaiian waters, the hawksbill turtle (*Eretmochelys imbricata*) – listed as endangered (Federal Register 1999 a,b), and the Hawaiian monk seal –listed as endangered (Federal Register, 2001). Procedures should be in place during construction to cease activity if one of these species is in the vicinity.

One native plant was identified in the project area, east of the wharf. The small plant, `A*naunau* (*Lepidium bidentatum* var. *o-waihiense*), is not endangered, but is considered a species of concern. Although construction staging is unlikely to spill over into the terrain where the plant occurs, construction personnel should be informed and aware of the species occurrence and value.

7.2 The Human Environment

7.2.1 Recreational Use

During construction of the breakwater and boat ramp repairs, the area will be not be accessible by the general public. Construction will involve the use of heavy equipment, and exclusion of the public will be necessary for reasons of safety. Construction of the wharf repairs is projected to last 9 months, with closure occurring for about 4 to 6 months. Due to the importance of the boat ramp on the local lifestyle and economy, closure of the ramp is a serious impact. However, during the public meeting at Helene Hall on December 18, 2006, the need for ramp closure was discussed with ramp users and was accepted as an unfavorable, but inevitable consequence of the project.

7.2.2 Reservations or Conservations Areas

Various portions of the project will fall under Federal, State, and County jurisdictions. As outlined in Section 6.3, in order to proceed the project will require permits or permit exemptions from the appropriate government agencies in each jurisdictional area.

7.2.3 Existing Infrastructure

The purpose of the project is to improve the boat ramp infrastructure. Public access, safety, and use of the boat ramp will increase as a direct result of the project. A turnout area dedicated to boat wash-down will result in a re-allocation of a minor portion of parking or road use infrastructure, however this is expected to be viewed as a public benefit and not be a concern.

7.2.4 Historic and Cultural Resources

The project construction and staging area will be confined to the immediate project area at the boat ramp and breakwater. The Native Hawaiian historic areas on Ka’uiki Head and Puukii Island will not be disturbed.

7.2.5 Air and Noise Quality

The project will have no long term effects on air or noise quality at the site. However, both noise levels and air quality will be affected during construction due to the presence of heavy equipment and other machines. The brisk trade winds will rapidly dilute the engine exhaust, and increased noise levels will only be present during the daylight working hours.

8.0 MITIGATION

8.1 Long Term Mitigation

The proposed project will not result in any significant long-term degradation of the environment or loss of habitat.

8.2 Mitigation During Construction

8.2.1 Protection of Endangered Species

Although the project area is not known as an endangered species habitat, the following procedures will be followed to mitigate any possible impact to endangered species.

- A survey of the project area will be performed just prior to commencement or resumption of construction activity to ensure that no protected species are in the project area. If protected species are detected, construction activities will be postponed until the animals voluntarily leave the area.

- If any listed species enter the project area during the conduct of construction activities, all activities will cease until the animals voluntarily depart the area.

- All on-site personnel will be apprised of the status of any listed species potentially present in the project area and the protections afforded to those species under Federal laws. This will include the terrestrial plant species of concern, `A*naunau* (*Lepidium bidentatum* var. *o-waihiense*), see Section 7.1.4.

The most likely endangered animals that may be encountered are sea turtles and monk seals.

8.2.2 Best Management Practices

Best Management Practices (BMPs) for construction operations will be developed to help minimize adverse impacts to coastal water quality and the marine ecosystem. The project specifications will require the Construction Contractor to adhere to environmental protection measures, including, but not limited to, the following:

- The Contractor shall perform the work in a manner that minimizes environmental pollution and damage as a result of construction operations. The environmental resources within the project boundaries and those affected outside the limits of permanent work shall be protected during the entire duration of the construction period.

- Any construction related debris that may pose an entanglement hazard to marine protected species must be removed from the project site if not actively being used and/or at the conclusion of the construction work.

- The Contractor shall submit a Best Management / Environmental Protection Plan for approval prior to initiation of construction. The plan shall include, but not be limited to:

    1. Protection of Land Resources
    2. Protection of Water Resources
    3. Disposal of Solid Waste
    4. Disposal of Sanitary Waste
    5. Disposal of Hazardous Waste
    6. Dust Control
    7. Noise Control

- No contamination (trash or debris disposal, alien species introductions, etc.) of marine (reef flats, lagoons, open oceans, etc.) environments adjacent to the project site shall result from project related activities.

- The Contractor shall confine all construction activities to areas defined by the drawings and specifications. No construction materials shall be stockpiled in the marine environment outside of the immediate area of construction.

- The Contractor shall keep construction activities under surveillance, management and control to avoid pollution of surface or marine waters. Construction related turbidity at the project site shall be controlled so as to meet water quality standards. All water areas affected by construction activities shall be monitored by the Contractor. If monitoring indicates that the turbidity standards are being exceeded due to construction activities, the Contractor shall suspend the operations causing excessive turbidity levels until the condition is corrected. Effective silt containment devices shall be deployed where practicable to isolate the construction activity, and to avoid degradation of marine water quality and impacts to the marine ecosystem.

- Underlayer fills will be protected from erosion with armor units as soon after placement as practicable.

- Waste materials and waste waters directly derived from construction activities shall not be allowed to leak, leach or otherwise enter marine waters.

- Fueling of project related vehicles and equipment should take place away from the water. A contingency plan to control the accidental spills of petroleum products at the construction site should be developed. Absorbent pads, containment booms and skimmers will be stored on site to facilitate the cleanup of petroleum spills.

- The project shall be completed in accordance with all applicable State and County health and safety regulations.

- All construction material shall be free of contaminants of any kind including: excessive silt, sludge, anoxic or decaying organic matter, turbidity, temperature or abnormal water chemistry, clay, dirt, organic material, oil, floating debris, grease or foam or any other pollutant that would produce an undesirable condition to the beach or water quality.

- Any spills or other contaminations shall be immediately reported to the DOH Clean Water Branch (808-586-4309).
- Best management practices shall be utilized to minimize adverse effects to air quality and noise levels, including the use of emission control devices and noise attenuating devices.
- A dust control program shall be implemented, and wind blown sand and dust shall be prevented from blowing offsite by watering when necessary.
- Public safety best practices shall be implemented, possibly including posted signs, areas cordoned off, on-site safety personnel.
- Public access along the shoreline during construction shall be maintained so far as practicable and within the limitations necessary to ensure safety.
- The Contractor shall review all best management practices with the project applicant/representative prior to the commencement of beach nourishment activities.

8.3 Project Monitoring

8.3.1 Water Quality Monitoring

Department of Health (DOH) guidelines state that projects should not introduce objectionable color and turbidity into the water. Water quality monitoring is therefore required before construction begins to document ambient conditions, during construction to monitor impacts during construction, and after construction to determine if there are any lasting effects of the project. Monitoring will consist of visual and photographic documentation of nearshore conditions, and measurement of pH, turbidity, and total suspended solids. A proposed Water Quality Monitoring Plan prepared in accordance with State Department of Health guidelines is presented in Appendix B.

9.0 CONCLUSIONS

The project will restore and improve the boat ramp facilities at Hana Wharf. The breakwater repairs and concrete ramp replacement will result in a structurally sound and long-lasting facility. The new ADA ramp and loading dock will increase accessibility and ease of use. New lighting, paving and renovation of the existing dock are necessary for public safety and facility maintenance. The new washdown area will reduce capital and maintenance expenses for facility users.

The proposed project will result in no long-term degradation of the environment or loss of habitat.

The project area is not known as an endangered or threatened species habitat. There are no known or identified historical or cultural resources at the immediate project site.

Minor impacts due to construction activity will include localized increase in noise, dust formation, equipment emissions, restricted coastal access and ramp use, and possible short term increases in turbidity during in-water construction.

Based on the findings of this environmental assessment, it is reasonable to expect that this project will not result in significant adverse environmental impacts.

10.0 LIST OF PREPARERS

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11.0 PUBLIC AND AGENCY INVOLVEMENT, REVIEW AND CONSULTATION

11.1 Public Meeting, December 18, 2006

A meeting was held on December 18, 2006 at Helene Hall at Hana Beach Park to inform the public on the project scope and to solicit comments and suggestions. The meeting was organized by Shigemura, Lau, Sakanashi, Higuchi, and Associates, Inc. (SLSH), the Prime Consultant for the project. Attendees included Al Satogata, Kevin Ho, Carty Chang, and Miles Lopes from DLNR, Wayne Higuchi from SLSH, Jim Barry from SEI, and State of Hawaii Senator Kalani English. Meeting minutes and attendance record are included in Appendix B.

11.2 Hana Advisory Council Meeting

A presentation was scheduled before the Hana Advisory Council at the Old Hana School Cafeteria on March 20, 2008. This meeting was canceled due to a lack of a quorum. A presentation was then scheduled for April 17, 2008. There was also a lack of a quorum on this date and the meeting never being called to order. However, as project designers had traveled to the meeting place, the presentation was delivered with approximately 25 persons in attendance. The project was well received by persons in attendance, and the Advisory Council planned to discuss the project at the following meeting. A synopsis is included in Appendix B.

12.0 REFERENCES

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APPENDIX A: WATER QUALITY AND BIOLGOGICAL SURVEY REPORT

AECOS, Inc.

AECOS, Inc., *Hana Wharf Improvement Project: Water Quality and Marine Survey of Potential Impact Areas in Hana Harbor, Hana, Maui*

Hana Wharf Improvement Project: Water Quality and Marine Survey of Potential Impact Areas in Hana Harbor, Hana, Maui[1]

February 15, 2007 *AECOS* No. 1121

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Introduction

The State Department of Land and Natural Resources (DLNR), Engineering Division proposes renovations to the deteriorating Hana Wharf facility in Hana Bay, District of Hana, Island of Maui, Hawaii. (Fig. 1). The Hana Wharf facility is located along the southern perimeter of Hana Bay and consists of a large T-shaped concrete pier on pilings, a boat ramp, and a boat dock (Fig. 2). Hana wharf was originally constructed in the 1920's for commercial shipping purposes by the sugar cane industry. The wharf is now primarily used for recreational purposes as past reliance on Hana Harbor for trade subsided with the construction of a paved road between Hana and Kahului Harbor. The facility is managed by DLNR Division of Boating and Ocean Recreation (DOBOR), and was historically managed by the Department of Transportation.

Over the decades since initial construction a small-boat ramp and concrete dock have been added to the protected western side of the original wharf structure. The boat ramp is the

[1] This document has been prepared for Sea Engineering Inc. for inclusion in an Environmental Assessment (EA) entitled "Environmental Assessment for Hana Boat Ramp – Improvements to Rock Revetment and Boat Ramp Landing Dock" and is therefore part of the public record.

only public access point for launching trailered boats in the Hana area and is heavily used by fisherman and recreational boaters. The ramp also provides an entry point for snorkelers and divers for accessing the nearby coral reefs.

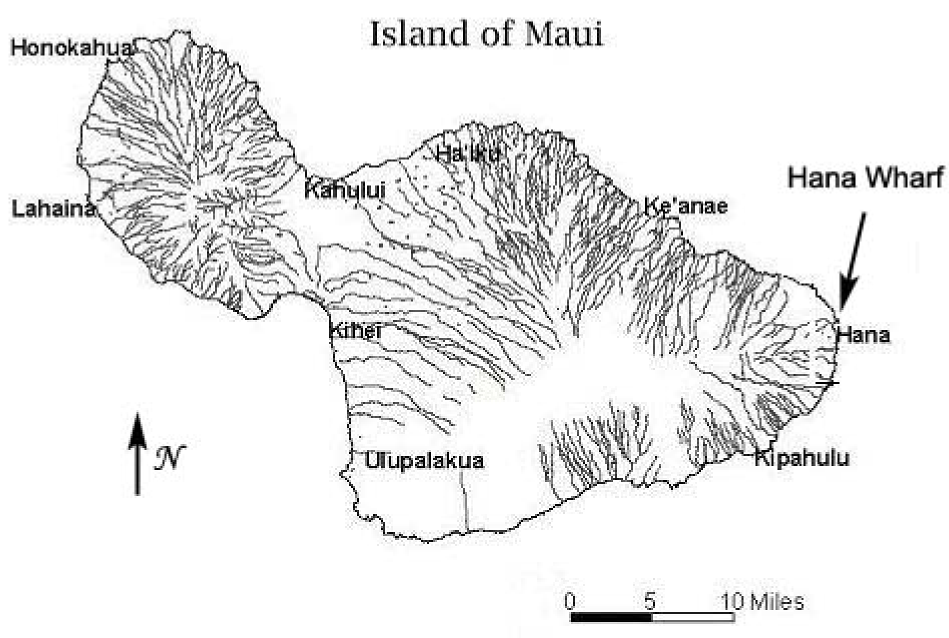

Figure 1. Project location at Hana on the Island of Maui.

Figure 2. Hana Wharf located at southern end of Hana Bay (photo: Kanoa Withington, 2006).

The wharf facility has fallen into various states of disrepair over the years and has undergone numerous temporary repairs (SEI, pers. comm.). The steep-sloped nature of the wharf's windward boulder revetment has lead to unstable conditions with rocks falling away (SEI, pers. comm.). In 2004, the lower concrete slab of the boat ramp, on the leeward side of the wharf, was pushed out of place by unusually high wave conditions (SEI, pers. comm.). The dislocated slab was later lowered back into place and declared operational.

Proposed renovations include stabilization repairs to the boat ramp and the boulder revetment, as well as repairs to the boat dock. The purpose of this report is to identify any sensitive biological resources present in and around the wharf facility that may be affected by the proposed improvements. This report includes results from a marine biological survey, water quality sampling, and a terrestrial plant survey in the potential impact area conducted on June 5, 2006.

Environment Description

Hana (22˚ 13.443" N, 159˚ 26.724" W) is located on the eastern most point of Maui, approximately 60 miles from the population centers of Wailuku and Kahului. Hana, or *Kapueokahi*, "the single owl", is considered one of the most beautiful and historically important areas of Maui (Clark, 1980). Prior to the unification of the Hawaiian Islands by King Kamehameha I in 1802, Hana was used as a staging ground for battles between warring chiefs on Maui and the island of Hawaii. The sugar industry transformed the ecology of Hana beginning in 1860 with the Ka'eleku Sugar Company that formed the backbone of Hana's economy until sugar production ceased in the early 1930s. Paul Fagan bought the sugarcane plantation, converting the area into cattle ranching, and in 1946, built the exclusive Hotel Hana Ranch known today as the Hotel Hana Maui.

Hana Bay faces east toward the open ocean and is bordered to the north by Nanualele Point, a lava outcrop, and to the south by Ka'uiki Head, a crumbling remnant cinder cone which rises 386 ft (118 m) above sea level. Runoff from Kawaipapa Gulch enters the northwest margin of the Bay introducing freshwater and land-derived sediments to the system. The black sand beach at the south end of Hana Bay offers a safe swimming area along an otherwise exposed rocky coastline. During rough conditions, a small shore break and a light longshore current occasionally develop (Clark, 1980). These waters are often murky with fine resuspended sediments. Public facilities at the south end of the bay, in addition to the wharf facility, include, Helene Hall, a community center used for social gatherings and church services, and Hana Beach Park, a one-quarter acre park with access to a black sand beach, parking, restrooms, showers, and a picnic pavilion (Maui County, 2006).

Along the southeast curve of the Bay past Hana Beach Park and Hana Wharf the variable shoreline of Ka'uiki Head offers little to no shoreline access due to steep unstable terrain and impinging waves. The waters beyond the wharf represent oceanic waters blown in by the northeast trade winds and provide snorkelers and divers excellent visibility and a diverse flora and fauna (Clark, 1980). Sea conditions change drastically seaward past Ka'uiki Head and Pu'uki'i Islet with its light house, where strong currents and waves characterize these waters (Clark, 1980).

Water Quality

Basic water quality conditions were assessed through a water quality survey which involved collection of surface water samples (grab samples) at each of four stations surrounding the proposed work area (Fig. 3). **Station 1** was located adjacent to the boat ramp between two large bordering boulders. **Station 2** was located at the step ladder of the boat dock. **Station 3** was located on the east side of the wharf at the base of the boulder revetment. **Station 4** was located west of the wharf over a coral reef. Samples were collected in appropriate sampling containers and placed on ice until they were transported to the *AECOS*, Inc. laboratory on Oahu for analyses (Laboratory Log No. 21816).

Temperature, dissolved oxygen, pH, and salinity were measured with instruments in the field at the time of sample collection. The following parameters were measured in the laboratory on collected water samples: turbidity, total suspended solids, ammonia, nitrate+nitrite, total nitrogen, total phosphorus, and chlorophyll α. All parameters were measured within appropriate hold times. Table 1 lists instrumentation and analytical methods used for field and laboratory water analyses.

No rainfall was measured on June 5, 2006. The tide was rising during the sampling event (11:15 am to noon). A low tide of 0.2 feet LLW (lower low water) was predicted to occur at 4:59 am and the afternoon high tide of 1.5 feet HHW (higher high water) was predicted to occur at 12:24 pm (NOAA/NOS, 2006; for Hana Bay).

The primary purpose of the June 5, 2006 water quality measurements was to characterize the existing marine environment, not to set baseline values or determine compliance with the State Water Quality Standards (HDOH, 2004). In fact, the State criteria for turbidity, chlorophyll α, and all nutrient measurements are based upon geometric mean values and a minimum of three separate samples per station would be required to compute geometric means (HDOH, 2004). Ideally, multiple samplings would encompass a range of typical conditions for the location, such as high tide and low tide periods, wet and dry season, etc. Nonetheless, our results can be evaluated against the water quality criteria for open coastal waters so long as limitations regarding a possible lack of representativeness are realized. The analytical results of the water quality data collected at the project site on June 5, 2006 are presented in Table 2.

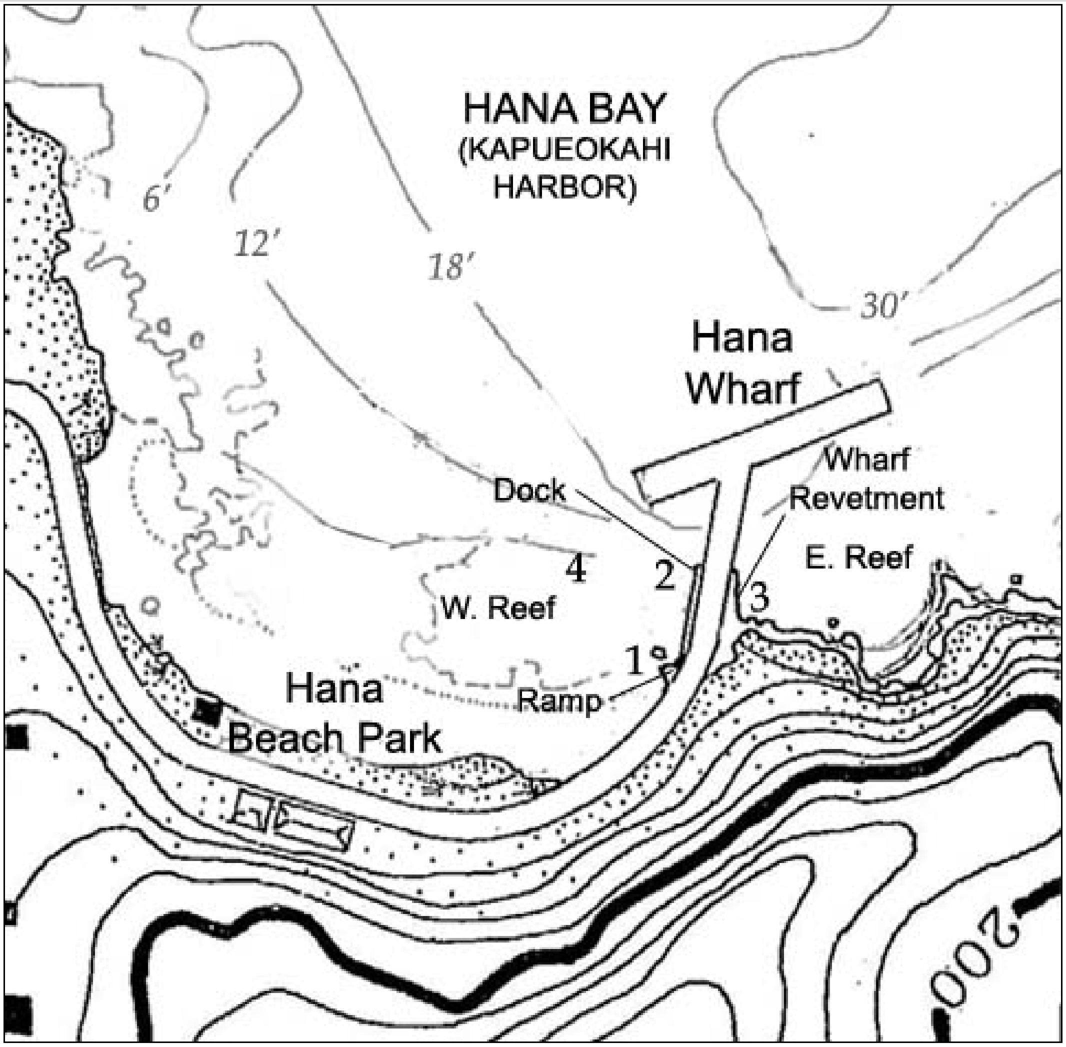

Figure 3. Location of the June 5, 2006 water quality sample stations (1-4) and marine biological survey areas (ramp and dock, west reef, wharf revetment, and east reef) for the Hana Wharf project.
Base map *AECOS*, Inc. (1980).

Table 1. Analytical methods used in the water quality sampling program for the Hana Wharf improvement project.

Analysis	Method	Reference	Instrument
Ammonia	alkaline phenol	Karoleff in Grasshoff et al. (1986)	Technicon AutoAnalyzer II
Chlorophyll α	10200 H	Standard Methods, 18th Edition (1992)	Turner Model 112 fluorometer
Dissolved Oxygen	EPA 360.1	EPA (1979)	YSI Model 550 DO meter
Nitrate + Nitrite	EPA 353.2	EPA (1993)	Technicon AutoAnalyzer II
pH	EPA 150.1	EPA (1993)	SA 250
Salinity	bench salinometer	Grasshoff in Grasshoff et al. (1986)	AGE Model 2100 salinometer
Temperature	Thermister calibrated to NBS cert. thermometer (EPA 170.1)	EPA (1979)	YSI Model 550 DO meter
Total Nitrogen	persulfate digestion/EPA 353.2	D'Elia et al. (1977) / EPA (1993)	Technicon AutoAnalyzer II
Total Phosphorus	persulfate digestion/EPA 365.1	Karoleff in Grasshoff et al. (1986)/EPA (1993)	Technicon AutoAnalyzer II
Total Suspended Solids	Method 2540D (EPA 160.2)	Standard Methods 18th Edition (1992); EPA (1979)	Mettler H31 balance
Turbidity	Method 2130B (EPA 180.1)	Standard Methods 18th Edition (1992); EPA (1993)	Hach 2100P Turbidimeter

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Table 2. Water quality characteristics at Hana Wharf and nearby waters from samples collected on June 5, 2006.

STATION*	Time Sampled	Temp. (°C)	Salinity (‰)	Dissolved Oxygen (mg/l)	Dissolved Oxygen (% sat.)	Tot. Susp. Solids (mg/L)	pH --
Sta. 1 (boat ramp)	1150	25.9	33.11	7.65	113	11.2	8.14

Sta. 2 (boat dock)	1140	26.1	32.54	6.72	100	4.1	8.09
Sta. 3 (wharf revet.)	1115	25.8	33.60	7.66	114	4.3	8.02
Sta. 4 (west reef)	1200	26.3	32.47	5.66	84	8.0	8.14

STATION*	Turbidity (NTU)	Ammonia (µg N/L)	Nitrate + Nitrite (µg N/L)	Total N (µg N/L)	Total P (µg P/L)	Chl α (µg /L)
Sta. 1 (boat ramp)	0.96	< 1	10	148	34	0.71
Sta. 2 (boat dock)	0.84	< 1	18	148	22	0.68
Sta. 3 (wharf revet.)	0.74	< 1	6	139	19	0.81
Sta. 4 (west reef)	0.66	< 1	15	142	20	0.59

Hawaii's Water Quality Standards classify Hana Bay as Class AA open coastal marine waters (HDOH, 2004) with water quality criteria pertaining to wet and dry coastal areas (Table 3). Hana is in a wet coastal area with an average annual rainfall, recorded at the nearby Hana Airport, of 47 inches or 3.9 ft (1.2 m; NOAA/NWS, 2006b. As stated in the water quality regulations (HDOH, 2004), "It is the objective of Class AA waters 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 actions. To the extent practicable, the wilderness character of these areas shall be protected."

Table 3. State of Hawaii water quality criteria for Class AA open coastal marine waters (HAR §11-54-06 (b)(3)).

Geometric mean not-to-exceed criteria

Class AA Open Coastal Marine Waters						
Criteria	Ammonia (µg N/l)	Nitrate + nitrite (µg N/l)	Total N (µg N/l)	Total P (µg P/l)	Chl α (µg/l)	Turbidity NTU
Wet *	**3.50**	**5.00**	**150.0**	**20.00**	**0.30**	**0.50**
Dry **	2.00	3.50	110.0	16.00	0.15	0.20

* Wet criteria apply when the open coastal waters receive more than three million gallons per day of fresh water discharge per shoreline mile.

** Dry criteria apply when the open coastal waters receive less than three million gallons per day of fresh water discharge per shoreline mile.

The following non-specific criteria are applicable during "Wet" and "Dry" conditions.

- pH shall not deviate from 7.6 to 8.6.
- Dissolved oxygen shall not be less than 75% saturation.
- Temperature shall not vary more than 1 °C from ambient.
- Salinity shall not vary more than 10% from natural or seasonal changes.

In general, basic water quality parameters (pH, dissolved oxygen, temperature, and salinity) met state criteria. On the other hand, several parameters (total phosphorus, chlorophyll α, and turbidity) were above the geometric mean not-to-exceed criteria for "wet" conditions and might be considered elevated. The difficulty of making any kind of comparison statement is that by definition, half of the values contributing to a geometric mean will be elevated (above) relative to the mean.

Percent DO saturation ranged from a low of 84% at Sta. 4 to a high of 114% at Sta. 3. ph ranged from 8.02 at Sta. 3 to 8.14 at Sta. 1 and 4. Both of these parameters fell within the acceptable range as defined by the State criterion for "wet" open coastal waters. Temperature ranged from 25.8 °C at Sta. 3 to 26.3 °C at Sta. 4. Salinity fell between 32.47 ppt at Sta. 4 and 33.60 ppt at Sta. 3, indicating some freshwater input. Total suspended solids ranged from a low of 4.1 mg/L at Sta. 2 to a high of 11.2 mg/L at Sta. 1.

The state "wet" geometric mean not to exceed criterion for inorganic nitrogen in the form of ammonia is 5 µg N/L. At all stations ammonia concentrations were below 1 µg N/L. The state "wet" geometric mean not to exceed criterion for inorganic nitrogen in the form of nitrate + nitrite is 20 µg N/L. Nitrate + nitrite levels ranged from a low of 6 µg N/L at Sta. 3 to a high of 18 µg N/L at Sta. 2. The state "wet" geometric mean not to exceed criterion for total nitrogen (inorganic + organic nitrogen) is 150 µg N/L. Total nitrogen levels ranged from a low of 139 µg N/L at Sta. 3 to a high of 148 µg N/L at Sta. 1 and 2. The state "wet" geometric mean not to exceed criterion for total phosphorus is 20 µg P/L. Total phosphorus ranged from a low of 19 µg P/L at Sta. 3 to a high of 34 µg P/L at Sta. 1.

The state "wet" geometric mean not to exceed criterion for chlorophyll α is 0.30 µg/L. Chlorophyll α ranged from a low of 0.59 µg/L at Sta. 4 to a high of 0.81 µg/L at Sta. 3. The state "wet" geometric mean not to exceed criterion for turbidity is 0.50 NTU. Turbidity ranged from a low at Sta. 4 of 0.66 NTU to a high of 0.96 NTU at Sta. 1.

Rainfall at Hana for the month of May was 4.03 inches (10.24 cm) with trace (0.03 in / 0.08 cm) amounts of precipitation measured during the 5 days preceding the sampling event (NOAA/NWS, 2006a). Despite this lack of rainfall, AECOS biologists observed the Schlieren effect, a shimmering appearance to the water produced by density differences between mixing waters, usually fresh and salt waters, as well as cooler water mixing with warmer water, taken as an indication of fresh water intrusion. Fresh water inputs from nearby

Kawaipapa and Holoinawawae Streams as well as groundwater intrusion likely introduce fresh waters to the nearshore system.

Marine Biological Survey

On June 5, 2006 *AECOS* biologists conducted a marine reconnaissance survey by snorkeling the area likely to be affected by the proposed wharf improvement project. The survey areas are shown in Fig. 3 and are referred to as: 1) boat ramp and dock, 2) west reef, 3) east revetment, and 4) east reef and wharf pilings. Area 1, the boat ramp, includes the boat ramp, the concrete dock pilings, and the west side of the boulder revetment out to its terminus. Area 2, west reef, includes the reef adjacent to the boat dock out to a point parallel with the west end of the wharf. Area 3, the east revetment area, includes the revetment boulders on the east side of the wharf and adjacent bottom out to 15 ft (5 m) away. Area 4, the east reef, includes the reef located east of the wharf in about 20 ft (7 m) of water and the concrete wharf pilings out to the 5th set of pilings from shore.

Species of macroalgae and marine animals observed in each of the four areas were recorded and estimates of relative abundances noted. The faunal survey included species of fishes, coral, and other macro-invertebrates. Most specimens encountered were identified in the field based on the experience of the biologists and verified with various published texts: algae were identified using Magruder and Hunt (1979), Abbott (1999), and Abbott and Huisman (2004); coral species were identified using Fenner (2005), macroinvertebrates were identified using Hoover (1998); and fish species were identified using Randall (1996) and Hoover (1993). It should be noted that cryptic and nocturnal species were not likely encountered or noted during this daytime survey. The resulting checklist of aquatic biota observed in the nearshore waters of Hana Wharf is located at the end of this document as Appendix A.

Boat ramp and dock (Area 1)

The concrete boat ramp and dock are located on the leeward side of the wharf revetment and are for the most part shielded from heavy wave action (Fig. 4). This area is dominated by algae rather than coral (Fig. 5). The algal community of the basalt rock revetment is dominated by *Giffordia breviarticulata* and various Rhodophyta (red algae). Cracks and crevices, as well as lower intertidal boulders are encrusted by an abundance of calcareous red algae (*Porolithon onkodes* and *Peyssonnelia rubra*).

Figure 4. Marine biological survey Area 1 includes the boat ramp, boat dock, and west revetment boulders. Area 2 includes the coral reef adjacent to the boat dock in the foreground. Photo by: SEI, Inc.

Figure 5. Marine biological survey Area 1. Algal tangle of the boat ramp boulder revetment. Small coral and coralline red algae colonies.

Exposed areas of the revetment host a variety of fleshy red algae (*Melanamansia glomerata*, *Pterocladiella capillacea*, *Acanthophora pacifica*, *Hypnea cervicornis*, *Plocamium sandvicense*, and *Portieria hornemannii*) including the non-native seaweed, *Acanthophora spicifera*. Green algae (*Caulerpa racemosa*, *Cladophora* sp., *Ulva fasciata/lactuca*) also occur, but are uncommon. Resuspended silt and sand is evident trapped in the algal tangle (Fig. 5). Small colonies of lace coral (*Pocillopora damicornis*), ocellated coral (*Cyphastrea ocellina*), and crust coral (*Leptastrea purpurea*) sparsely dot the rock revetment (Fig. 5). Patches of blue-gray zoanthid (*Palythoa caesia)* are also found. Juvenile fishes find shelter amongst the revetment rocks including: the four-spot butterflyfish (*Chaetodon quadrimaculatus*), blackspot sergeant (*Abudefduf sordidus*), Pacific gregory (*Stegastes fasciolatus*), lavender tang (*Acanthurus nigrofuscus*), convict tang or *manini* (*Acanthurus triostegus*), Hawaiian whitespotted toby (*Canthigaster jactator*), and ambon toby (*Canthigaster amboinensis*).

The submerged surfaces of the boat ramp are coated by a layer of the alga, *G. breviarticulata*. A variety of small fishes can be seen swimming in the boat ramp swash zone: belted wrasse (*Stethojulis balteata*), Christmas wrasse (*Thalassoma trilobatum*), whitesaddle goatfish (*Parupeneus porphyreus*), manybar goatfish (*Parupeneus multifasciatus*), white spotted surgeonfish (*Acanthurus leucopareius*) and bird wrasse (*Gomphosus varius*). The boulders framing the west side of the boat ramp are covered by the red alga, *Ahnfeltia concinna*. The concrete pilings of the boat dock shelter schools of Hawaiian flagtail or *aholehole* (*Kuhlia sandvicensis*) mixed with unidentified clupeids (Fig. 6). A variety of gastropod mollusks adhere to the upper splash zone of the pilings, including black nerites (*Nerita picea*), dotted periwinkles (*Littoraria pintado*), and black-foot limpets (*Cellana exarata*). An abundance of debris, including derelict fishing nets and tires litter the bottom at the end of the dock and amongst the wharf pilings (Fig. 6).

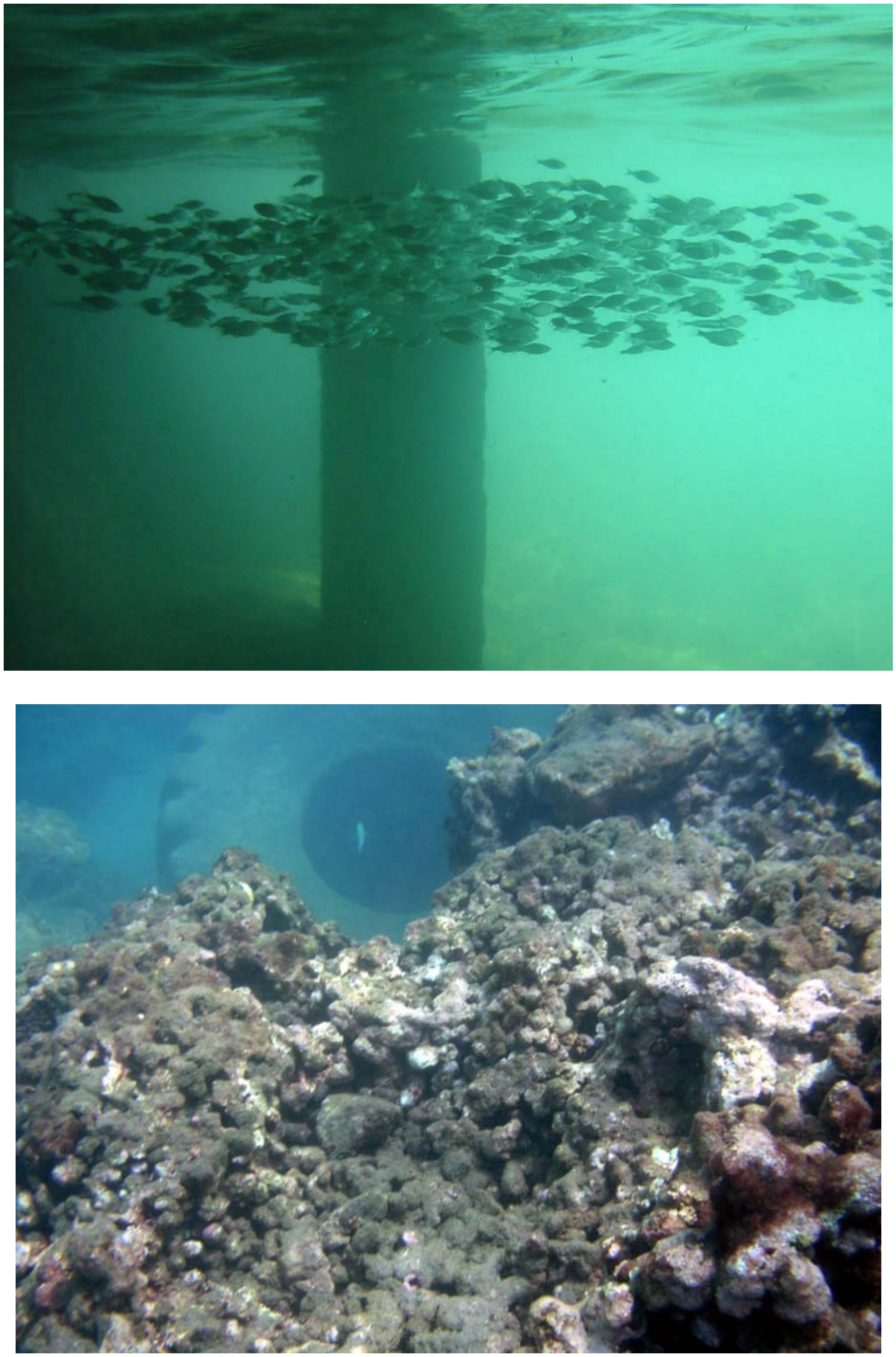

Figure 6. Marine biological survey Area 1. Boat dock pilings and school of aholehole. Compromised coral reef and tire adjacent to boat dock.

West reef (Area 2)

The reef located on the leeward side of the wharf (Fig. 4), adjacent to the boat dock varies in depth from roughly 8 to 25 ft (2.5 to 8 m) deep. The portion of reef nearest to the boat dock is physically compromised by tangles of fishing line with many dead coral colonies. These corals have been encroached on by algae including fleshy and corraline reds. Knobby finger coral (*Porites duerdeni*), noted for large deep calyces, occurs at the lower reaches of this damaged reef. The reef area about 9 ft (3 m) from the dock and at greater depths is more pristine with nearly 50% live coral cover (Fig. 7). Rice coral (*Montipora capitata*), Duerden's coral (*Pavona duerdeni*) and finger coral (*Porites compressa*) dominate the coral community, while lobe coral (*Porites lobata*), cauliflower coral (*Pocillopora meandrina*), spreading coral (*Montipora patula*), and blue rice coral (*Montipora purpurea*) are present, but less common. Petroglyph shrimp (*Alpheus deuteropus*) channels are visible on the surfaces of many *P. lobata* and *M. capitata* colonies. Several other coral species including; corrugated coral (*Pavona varians*), ocellated coral, and lace coral, are found here but are less obvious than those mentioned above. Invertebrates include the blue-black urchin, rock boring urchin, and sea cucumber.

A total of 26 fish species were recorded at the west reef. Adult fish forage and find refuge amongst the coral formations (Fig. 7). The most well-represented families on the reef are the Acanthuridae (surgeonfish) with eleven species, Chaetodontidae (butterflyfish) with seven species, and Labridae (wrasse) with six species. Few fish species are in great abundance; only the whitespotted surgeonfish (*Acanthurus leucopareius*) and lavender tang (*Acanthurus nigrofuscus*) occur in large numbers. Commonly sighted fish include the white saddle goatfish, four-spot butterflyfish, Hawaiian sergeant or *mamo* (*Abudefduf abdominalis*), saddle wrasse (*Thalasoma duperrey*), ring-tail surgeonfish (*Acanthurus blochii*), eye-stripe surgeonfish (*Acanthurus dussumieri*), orangeband surgeonfish (*Acanthurus olivaceus*), manini, goldring surgeonfish (*Ctenochaetus strigosus*), and orangespine unicornfish (*Naso lituratus*). Fish sighted in low numbers (less than 12) include the peacock grouper or *roi* (*Cephalopholis argus*), aholehole, stocky hawkfish (*Cirrhitus pinnulatus*) manybar goatfish, chub, threadfin butterflyfish (*Chaetodon auriga*), raccoon butterflyfish (*Chaetodon lunula*), oval butterflyfish (*Chaetodon lunulatus*), ornate butterflyfish (*Chaetodon ornatissimus*), one-spot butterflyfish (*Chaetodon unimaculatus*), forcepsfish (*Foricipiger flavissimus*), black spot sergeant, blackfin chromis (*Chromis vanderbilti*), Pacific gregory, pearl wrasse (*Anampses cuvier*), Hawaiian cleaner wrasse, bird wrasse, Christmas wrasse, belted wrasse, pale nose parrotfish (*Scarus psittacus*), red-lipped parrotfish (*Scarus rubroviolaceus*), yellowfin surgeonfish (*Acanthurus xanthopterus)*, yellow tang (*Zebrasoma flavescens)*, sailfin tang (*Zebrasoma veliferum*), black durgon (*Melichthys niger)*, ambon toby, and spotted toby.

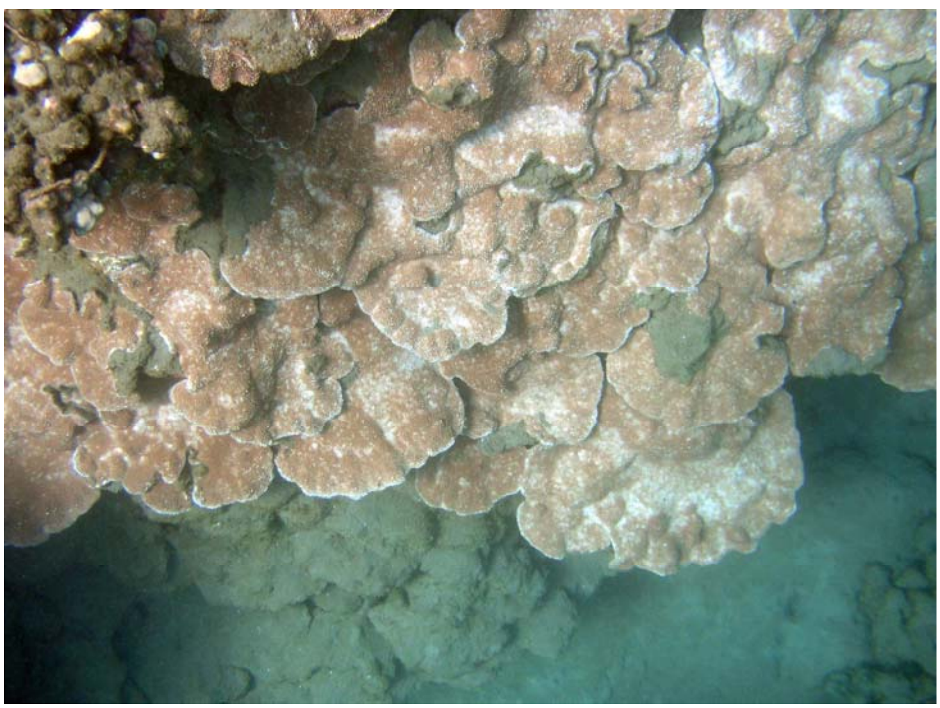

Figure 7. Marine biological survey Area 2. Coral reef located west of wharf. Coral formations at reef crest and reef slope.

East revetment (Area 3)

The boulder revetment on the east side of the wharf faces the open ocean and thus experiences Tradewind driven waves on a regular basis (Fig. 8).

Figure 8. Marine biological survey Area 3, includes the east revetment boulders and adjacent bottom.

Black-foot limpet and black nerite dot boulders above and at the water line, while thin-shelled rock crab (*Grapsus tenuicrustatus*) scramble in the splash zone. The submerged boulders (Fig. 9) are fairly void of macroalgae with only a thin layer of algal turf with scattered patches of calcareous red algae and rice coral. Several small lace coral colonies also adhere to the boulders. The sea floor adjacent to the east revetment is an unconsolidated mixture of red and black gravel, boulders, and coarse sand (Fig. 9). White-spotted sea cucumber and clumpy nudibranch (*Asteronotus cespitosus*) are among the few invertebrates noted here. Fishes observed include the *'ulae* lizardfish (*Synodus ulae*), manybar goatfish, ornate butterflyfish, white-spotted surgeonfish, lavender tang, orangeband surgeonfish, and *manini*. Few fishes were observed along the east revetment, although certainly there is greater overlap of species with the surrounding area than was observed. Below roughly 15 ft (5 m) depth, turf algae adhere to cobbles and rubble, with little sand present.

Figure 9. Marine biological survey Area 3, includes the east revetment boulders and gravel of the adjacent bottom.

At the end of the revetment, where the water depth drops off beneath the wharf, the upper revetment boulders are almost entirely encrusted with red coralline algae (Fig. 10). The lower revetment boulders, on the other hand, support a mixture of coralline algae and mounds of occelated coral. Below the revetment boulders the wall of the dropoff beneath the wharf hosts heads of lobe coral (Fig. 10).

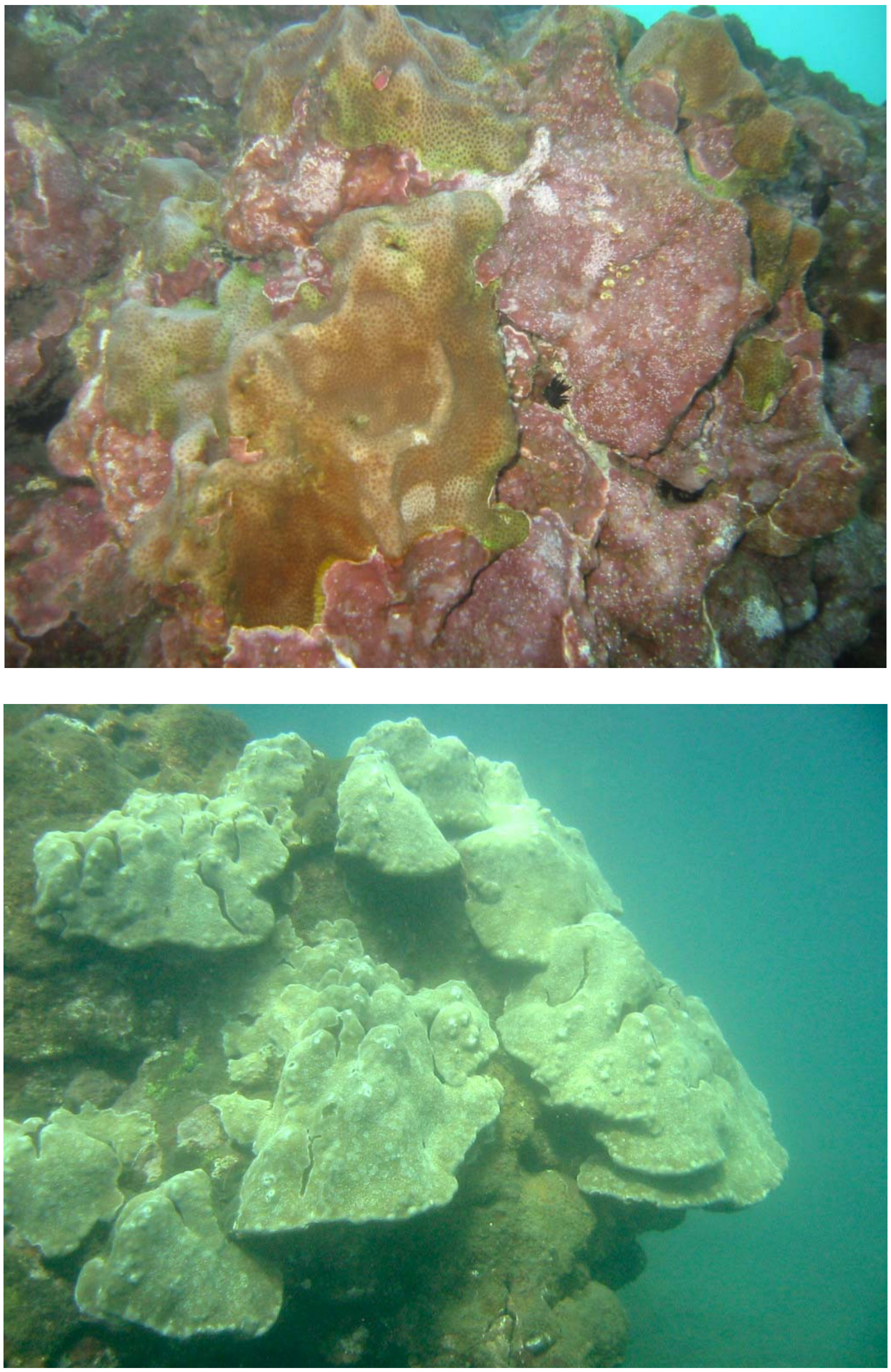

Fig. 10. Marine biological survey Area 3. The revetment end beneath wharf with occelated coral and coralline red algae. Lobe coral at wharf drop off.

East reef and pier pilings (Area 4)

The reef located east or seaward (Fig. 11) form the wharf is made up of several very large boulders amid a field of smaller boulders.

Figure 11. Marine biological survey Area 4, includes reef east of the wharf (in foreground) and first five wharf pilings. Photo by: SEI, Inc.

Atop the large boulders occur cauliflower and rice coral colonies of varying sizes. Macro-invertebrates on the east reef include sea cucumbers, blue-black urchin, rock-boring urchin, and oblong urchin (*Echinometra oblonga*). The east reef has the greatest fish diversity of the four areas, with 41 species observed. Mixed schools of fishes, primarily acanthurid herbivores, swim amongst the large boulders (Fig. 12). The most abundant fishes are the white-spotted surgeonfish accompanied by manini, lavender tang, orangeband surgeonfish, orangespine unicornfish, and goldring surgeonfish or *kole* (*Ctenochaetus strigosus*). Other fish sighted include a variety of butterflyfish: raccoon, oval, ornate, and four-spot butterflyfish. A wide variety of wrasses occur including the commonly sighted saddle wrasse and Christmas wrasse, also occurring but all in low numbers are the pearl wrasse, bird wrasse, yellow striped coris, yellowtail wrasse, Hawaiian cleaner wrasse, and the belted wrasse. Fishes more closely associated with the benthos include the blackspot sergeant, brighteye damsel (*Plectroglyphidodon imparipennis*), Pacific gregory, peacock grouper or roi (*Cephalopholis argus*), and blenny (*Cirripectes* sp.).

Figure 12. Marine biological survey Area 4. Diverse fish assemblage of the east reef.

Several meters beyond the large boulders, where the bottom grades into sand with sparse boulder outcrops, goatfish (blue goatfish [*Parupeneus cyclostomus*], manybar goatfish, and whitesaddle goatfish) scan the soft benthos for prey. Fishes observed in the open include: cornetfish (*Fistularia commersonii*), bluefin trevally or *omilu* (*Caranx melampygus*), green job fish or *uku* (*Aprion virescens*), chub, red-lip parrotfish (*Scarus rubroviolaceus*), and black durgon (*Melichthys niger*).

The pilings located on the east side of the wharf (Fig. 13), out to the fifth piling, are included in the discussion of the east reef and not the east revetment because they are similarly distanced from the revetment and less likely to be impacted than the revetment itself. Between the east reef and wharf pilings, encrusting colonies of rice coral, blue rice coral, lobe coral, and occelated coral are somewhat sparsely situated on a slightly undulating bottom amid silt covered turf algae. Bottom depth increases as it approaches the wharf and lobe coral colony mounds line the face of the drop off associated with the wharf (Fig. 13). The upper parts of the concrete wharf pilings are encrusted with rice coral colonies, whereas the deeper portions are rimmed by plate-like growths of the same.

Figure 13. Marine biological survey Area 4. Wharf pilings with plate-like rice coral colonies

Overall, fleshy macro-algae are uncommon except along the west facing rock revetment adjacent to the boat ramp. Few macro-invertebrates are observed throughout the survey area. The highest coral cover occurs along the reef located to the west of the wharf with the most common corals being rice coral, lobe coral, and Duerden's coral. Herbivorous surgeonfish are the most abundant fish group throughout the area with the most common being the whitespotted surgeonfish, lavender tang, orangeband surgeonfish, manini, and gold-ring surgeonfish. In addition, the saddle wrasse, a carnivore, was equally common. Of the 53 marine fish species recorded, 15% are endemic, meaning they are found only in the Hawaiian Islands and no other geographic region. The areas of greatest fish diversity occur in the coral reef environments on either side of the wharf, each with at least 40 fish species observed. No endangered or threatened species (DLNR, 1998; Federal Register, 2005; USFWS, 2005; USFWS, 2006) were encountered during our marine survey.

Terrestrial Plant Survey

A survey of terrestrial plants was conducted on the uplands adjacent to the wharf and up to a point half way between the wharf and nearby Helene Hall community center. The on-line resource, Plants of Hawaii, aided in the identification of observed plants (Starr and Starr, 2006). Results are presented in Table 4. All but three of the twenty-one plant species recorded in the area are naturalized species, with the exception of croton

(*Codiaeum variegatum*), an ornamental; bridal wreath (*Stephanotis floribunda*), also an ornamental; and ‘*anaunau* (*Lepidium bidentatum* var. *o-waihiense*), an endemic sub-shrub.

Table 4. List of terrestrial plants observed in close vicinity of Hana Wharf, Hana, Maui on June 5, 2006.

- Chinese violet (*Asystasia gangetica*) Acanthaceae – nat
- [1]Asiatic pennywort (*Centella asiatica*) Apiaceae – nat
- [1]Octopus tree (*Schefflera actinophylla*) Araliaceae - nat
- Bridal wreath (*Stephanotis floribunda*) Asclepiadaceae – orn
- [1]Japanese hawks beard (*Youngia japonica*) Asteraceae - nat
- [2] ‘*Anaunau* (*Lepidium bidentatum* var. *o-waihiense*) Brassicaceae - end
- [1]Papaya (*Carica papaya*) Caricaceae - nat
- [2]Ironwood (*Casuarina equisetifolia*) Casuarinaceae – nat
- Sea almond or false *kamani* (*Terminalia catappa*) Combretaceae – nat
- [1]Air plant (*Kalanchoe pinnata*) Crassulaceae – nat
- [1]Nut grass (*Cyperus rotundus*) Cyperaceae – nat
- Kyllinga (*Kyllinga nemoralis*) Cyperaceae - nat
- [1]Garden spurge (*Chamaesyce hirta*) Euphorbiaceae – nat
- Croton (*Codiaeum variegatum*) Euphorbiaceae - orn
- [1]Maunaloa (*Canavalia cathartica*) Fabaceae - nat
- [1]Shoebutton ardisia (*Ardisia elliptica*) Myrsinaceae – nat
- [1]Sword fern (*Nephrolepis multiflora*) Nephrolepidaceae– nat
- [1]Yellow wood sorrel (*Oxalis corniculata*) Oxalidaceae – nat
- Sourgrass (*Digitaria insularis*) Poaceae– nat
- [1]Wire grass (*Eleusine indica*) Poaceae – nat
- [2]Maile scented fern or *lauae* (*Phymatosorus grossus*) Polypodiaceae - nat

KEY TO SYMBOLS:
Orn = ornamental (planted non-native)
Nat = naturalized (non-native)
Pol = Polynesian introduction (technically non-native)
Ind = indigenous (native)
End = endemic (native), unique to the Hawaiian Islands
[1]Also reported in Char (1990) from nearby areas south of Hana.
[2]Also reported in Starr et al. (2006) for nearby PuuKu Islet.

WEBSITES ASSISTING IN IDENTIFICATION:
http://www.hear.org/starr/hiplants/images/index.html
http://www.hear.org/plants/

The hillside bordering the bay is dominated by ironwood (*Casuarina equisetifolia*) with scattered sea almond or false *kamani* (*Terminalia catappa*), octopus tree (*Schefflera actinophylla*), and shoebutton ardisia (*Ardisia elliptica*). The ironwood was likely planted as an erosion control measure for the steep hillside behind the wharf. A variety of plants (Fig.

14) are found in the shaded understory surrounding the ironwood, including maile scented fern (*Phymatosorus grossus*), sword fern (*Nephrolepis multiflora*), bridal wreath, and shoebutton ardisia. Also occurring in the area, but closer to the roadside, are air plant (*Kalanchoe pinnata*), maunaloa (*Canavalia cathartica*), croton, and papaya (*Carica papaya*).

The grass areas on either side of the wharf have a variety of grasses and ruderal weeds including nut grass (*Cyperus rotundus*), Chinese violet (*Asystasia gangetica*), yellow wood sorrel (*Oxalis corniculata*), Asiatic pennywort (*Centella asiatica*), garden spurge (*Chamaesyce hirta*), kyllinga (*Kyllinga nemoralis*), Oriental hawksbeard (*Youngia japonica*), and the endemic ‘*anaunau* (*Lepidium bidentatum* var. *o-waihiense*).

Char (1990) found twelve of these same plant species during a survey conducted in October 1990 at nearby proposed Hana Ranch Country Club golf course. The areas she surveyed were primarily pasture land and mixed shrubland. The report documented 126 vascular plant species, of which 79% were introduced, 8% were considered Polynesian introductions, 13% were indigenous, and none were endemic. Our survey near the wharf documented twenty introduced species and one endemic species.

‘A*naunau* (Fig. 14), the only terrestrial endemic species observed, is considered a species of special concern, an informal term referring to a species that might be in need of conservation action. This may range from a need for periodic monitoring of populations and threats to the species and its habitat, to listing as threatened or endangered. Such species receive no legal protection and use of the term does not necessarily imply that a species will eventually be proposed for listing. A similar term is “a species at risk,” which is a general term for listed species as well as unlisted ones that are declining in population. US Geological Survey biologists identified ‘*anaunau* in the area of Hana Wharf (pers. comm.) and also on the nearby Pu‘u Ku Islet (discussed above as Pu‘u‘iki) in April 2006 (Starr et al., 2006). The areas surveyed around Hana wharf represent disturbed areas of ruderal weeds, ornamental plantings, and an ironwood dominated hillside. No endangered or threatened species (DLNR, 1998; Federal Register, 2005; USFWS, 2005; USFWS, 2006) were encountered during our terrestrial survey.

Figure 14. Terrestrial plant survey. Hillside of *Casuarina* with understory of *lauae* fern and false *kamani*. ‘*Anaunau* found east of wharf.

Assessment

Marine Impacts

Improvements to the existing Hana Wharf facility include repairs to the boat ramp, the west-facing revetment, and the east-facing revetment. Some marine organisms and their habitat will be impacted during reconstruction of the east-facing revetment, as well as the west-facing revetment. However, no rare or endangered species would be lost in this already disturbed environment. In-water work is not expected to directly impact the extensive coral community to the west of the wharf or that of the large boulder to the east of the wharf with its coral colonies and diverse fish assemblage.

The boat ramp will be resurfaced with concrete, the size and shape of the boat ramp will not be changed (to be updated after receipt of plan from SEI). Marine life occurring at the boat ramp is limited to sparse algal growth and transient schools of fish. No loss of habitat is expected here. Algae will re-colonize the new surface and fish will return immediately upon work completion.

The west-facing revetment will be fortified with a 1 m (3 ft) increase in footprint width. The boulder community here includes dense algal growth, cryptic invertebrates, juvenile fishes, and other common sessile invertebrates. Direct impacts will include loss of the existing boulder community, however newly placed revetment boulders will quickly be re-colonized. Sparse coral growth occurs here, however the species are common and will also re-colonize new available habitat.

The east-facing revetment will also be fortified with additional boulders and will have a finished footprint of an additional 5 m (15 ft) of width beyond the existing footprint. Although the width of the revetment will be increased, the length will not be changed. The revetment boulders of the east side are nearly devoid of marine life with only a thin layer of turf algae readily evident and the nearby seafloor is scoured clean by the movement of loose gravel and rubble. No corals occur within the proposed footprint expansion. Direct impacts will include the burial of the existing boulder habitat, however newly placed boulders will quickly be re-colonized. In addition, the available habitat will be increased through the widening of the revetment along with a reduction of the revetment slope.

Improvements will not directly impact two nearby areas of coral growth. These are located beyond the northeast edge of the proposed west-facing revetment expansion and at the north end of the existing revetment below the wharf pier. *Montipora capitata* and *Montipora patula* corals occur along the northeast perimeter and *Porites lobata* and *Cephastrea occelina* corals occur at the end of the wharf revetment below the wharf pier. The proposed revetment footprint is not expected to encroach upon these areas of coral growth, however care should be taken to avoid these areas during in-water work and boulder placement. These above mentioned coral species are common shallow water corals which will re-colonize newly created hard surfaces in the harbor.

Care must be taken to avoid depositing construction materials and related liquids (i.e., gas, oil, paints, solvents, and other noxious chemicals) into the marine environment. Best management practices (BMPs) must be utilized during stabilization repairs to the Hana Boat ramp to reduce the release of fine sediments or other pollutants into the water column. The use of silt curtains may be helpful. However, this area is often murky with suspended sediments and silt curtains tend to be less than satisfactory at containing silt particles where waves are present. In-water maneuvering of machinery or vessels will require care in order to avoid the many shallow coral heads on the west side of the wharf.

Terrestrial Impacts

No roadway improvements are planned, however the placement of heavy machinery and the staging of materials could impact surrounding vegetation. Currently this highly altered area hosts only one native plant, *'anaunau* (*Lepidium bidentatum* var. *o-waihiense*), a small endemic sub-shrub. This species occurs naturally without need for watering or maintenance. No endangered species are present, however *'anaunau* is considered to be a species of concern, identifying that it is a rare plant.

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AECOS APPENDIX A

Appendix A. Checklist of aquatic biota observed in nearshore waters of Hana Wharf, Hana, Maui on June 5, 2006.

PHYLUM, CLASS, ORDER, FAMILY *Genus species*	Common name	Boat Ramp 1	West Reef 2	East Revet. 3	East Reef 4
CHLOROPHYTA	GREEN ALGAE				
Caulerpa racemosa		U			
Cladophora sp.		U	U		
Ulva fasciata/lactuca	sea lettuce	R			
PHAEOPHYTA	BROWN ALGAE				
Giffordia breviarticulata	*hulu ʻilio*	A			
Spatoglossum macrodontum		U			
RHODOPHYTA	RED ALGAE				
Acanthophora spicifera	spiny seaweed	C	U		
Acanthophora pacifica		U			
[1]*Ahnfeltia concinna*	*ʻaki ʻaki*	U			
Halymenia formosa	*lepe ʻahina*	R			
Hypnea cervicornis		U	U		
[1]*Melanamansia glomerata*		A			
Peyssonnelia rubra		A	C	C	R
Plocamium sandvicense		U			
[1]*Porolithon onkodes*		A	C	C	C
Portieria hornemannii		U			
[1]*Pterocladiella capillacea*		A			
CNIDARIA, ANTHOZOA					
ZOANTHINARIA, ZOANTHIDAE, SCLERACTINIA					
Palythoa caesia	*blue-gray zoanthid*	U			
ACROPORIDAE					
Montipora capitata	rice coral		A	U	C
[1]*Montipora patula*	spreading coral		C		C
[1]*Montipora flabellata*	blue rice coral		C		C
AGARICIIDAE					
Pavona duerdeni	Duerden's coral		A		O
Pavona varians	corrugated coral		U		U
FAVIIDAE					
Leptastrea purpurea	crust coral	R			
Cyphastrea ocellina	ocellated coral	U	U		R
POCILLOPORIDAE					
[1]*Pocillopora damicornis*	*lace coral*	R	U		U
[1]*Pocillopora meandrina*	*cauliflower coral*		O	R	O
PORITIDAE					
[1]*Porites lobata*	lobe coral		C		C
Porites compressa	finger coral		C		
Porites duerdeni	knobby finger coral		R		
MOLLUSCA, GASTROPODA	MOLLUSKS				
PATELLIDAE					
Cellana exarata	black-foot limpet, *ʻopihi*	U		U	
NERITIDAE					

PHYLUM, CLASS, ORDER, FAMILY *Genus species*	Common name	Boat Ramp 1	West Reef 2	East Revet. 3	East Reef 4
Nerita picea	black nerite, *pipipi*	O		C	
LITTORINIDAE					
Littoraria pintado	dotted periwinkle	U			
THAIDIDAE					
Drupa sp.	drupe				R
CONIDAE					
Conus ebraeus	Hebrew cone		R		
MOLLUSCA, GASTROPODA, NUDIBRANCHIA					
ASTERONOTIDAE					
Asteronotus cespitosus	clumpy nudibranch			R	
ARTHOPODA, CRUSTACEA, MAXILLOPODA					
CIRRIPEDIA					
Chthamalus proteus	*Caribbean barnacle*	U		U	
ARTHOPODA, CRUSTACEA, DECAPODA					
ALPHEIDAE					
Alpheus deuteropus	petroglyph shrimp		A		C
GRAPSIDAE					
Grapsus tenuicrustatus	thin-shelled rock crab	U		U	
ECHINODERMATA, ECHINOIDAE	SEA URCHINS				
DIADEMATIDAE					
Echinothrix diadema	blue-black urchin		R		R
ECHINOMETRIDAE					
[1]*Echinometra mathaei*	rock-boring urchin		O		O
[1]*Echinometra oblonga*	oblong urchin				O
ECHINODERMATA, HOLOTHUROIDAE SEA CUCUMBERS					
HOLOTHURIIDAE					
[1]*Actinopyga mauritiana*	white-spotted sea cucumber, *loli*	R		R	R
Holothuria sp. 1	sea cucumber		R		R
VERTEBRATA, PICES	FISHES				
FISTULARIIDAE					
Fistularia commersonii	cornetfish				R
SERRANIDAE					
Cephalopholis argus	peacock grouper, *roi*		R		R
SYNODONTIDAE					
Synodus ulae	lizardfish			R	
KUHLIIDAE					
Kuhlia sandvicensis (E)	Hawaiian flagtail, *aholehole*	A	U		
CIRRHITIDAE					
[1]*Cirrhitus pinnulatus*	stocky hawkfish		R		
CARANGIDAE					
[1,2]*Caranx melampygus*	bluefin trevally, *omilu*				R
LUTJANIDAE					

PHYLUM, CLASS, ORDER, FAMILY *Genus species*	Common name	Boat Ramp 1	West Reef 2	East Revet. 3	East Reef 4
Aprion virescens	green jobfish, *uku*				R
MULLIDAE					
Parupeneus cyclostomus	blue goatfish				R
[1,2]*Parupeneus multifasciatus*	manybar goatfish	R	U	R	U
[2]*Parupeneus porphyreus* (E)	whitesaddle goatfish	U	C		U
KYPHOSIDAE					
[1,2]*Kyphosus* sp.	chub	R	U		U
CHAETODONTIDAE					
[1]*Chaetodon auriga*	threadfin butterflyfish		R		
[1]*Chaetodon lunula*	raccoon butterflyfish		R		R
Chaetodon lunulatus	oval butterflyfish		R		R
[1]*Chaetodon ornatissimus*	ornate butterflyfish		R	R	R
[1,2]*Chaetodon quadrimaculatus*	four-spot butterflyfish	R	C		R
[2]*Chaetodon unimaculatus*	one-spot butterflyfish		U		
[1,2]*Foricipiger flavissimus*	forcepsfish		R		
POMOCENTRIDAE					
[1,2]*Abudefduf abdominalis* (E)	Hawaiian sergeant, *mamo*		C		
[1]*Abudefduf sordidus*	blackspot sergeant	R	R		R
[2]*Chromis vanderbilti*	blackfin chromis		R		
[1]*Plectroglyphidodon imparipennis*	brighteye damsel				R
[2]*Stegastes fasciolatus*	Pacific gregory	R	R		R
LABRIDAE					
[1]*Anampses cuvier* (E)	pearl wrasse		R		R
Coris flavovittata	yellow striped coris				R
Coris gaimard	yellowtail wrasse				R
[2]*Gomphosus varius*	bird wrasse, *hinalea*	R	U		R
[1,2]*Labroides phthirophagus* (E)	Hawaiian cleaner wrasse		R		R
[1,2]*Stethojulis balteata* (E)	belted wrasse	R	U		R
[1,2]*Thalassoma duperrey* (E)	saddle wrasse		C		C
[1,2]*Thalassoma trilobatum*	Christmas wrasse	R	U		C
SCARIDAE					
Scarus psittacus	pale nose parrotfish		U		U
Scarus rubroviolaceus	red-lip parrotfish		R		R
BLENNIIDAE					
Cirripectes sp.	blenny	R			R
ACANTHURIDAE					
[1,2]*Acanthurus blochii*	ring-tail surgeonfish		O		O
Acanthurus dussumieri	eye-stripe surgeonfish		O		O
[1]*Acanthurus guttatus*	white-bar surgeonfish				R
[1,2]*Acanthurus leucopareius*	whitespotted surgeonfish	U	A	R	A
Acanthurus nigricans	goldrim surgeonfish				R
[2]*Acanthurus nigrofuscus*	lavender tang	R	A	R	C

PHYLUM, CLASS, ORDER, FAMILY *Genus species*	Common name	Boat Ramp 1	West Reef 2	East Revet. 3	East Reef 4
[1,2]*Acanthurus olivaceus*	orangeband surgeonfish		C	U	C
[1]*Acanthurus triostegus*	*manini*	U	C	U	C
[1]*Acanthurus xanthopterus*	yellowfin surgeonfish		U		U
[1,2]*Ctenochaetus strigosus*	goldring surgeon		C		C
[1]*Naso lituratus*	orangespine unicornfish		C		O
[1]*Naso unicornis*	unicornfish, *kala*				R
Zebrasoma flavescens	yellow tang		R		
Zebrasoma veliferum	sailfin tang		U		O
BALISTIDAE					
[1]*Melichthys niger*	black durgon		R		R
MONOCANTHIDAE					
[2]*Cantherhines dumerilii*	barred filefish		R		
OSTRACIIDAE					
[1,2]*Ostracion meleagris*	spotted boxfish				R
TETRAODONTIDAE					
Canthigaster amboinensis	ambon toby	R	R		
[1,2]*Canthigaster jactator* (E)	Hawaiian whitespotted toby	R	U		U

KEY TO SYMBOLS USED IN TABLE 2:
Location:
1 – West wharf revetment, including boat ramp and cement platform pilings
2 – Reef area west of wharf
3 – Reef to the east of wharf including wharf pilings, out to 5th piling.
4 – East facing wharf revetment
Abundance categories:
R - Rare - Only one or two individuals observed in area.
U - Uncommon - Three to no more than a dozen individuals seen in area.
O - Occasional – Seen irregularly and always in small numbers; more than a dozen individuals in area.
C - Common – Seen regularly, although generally in small numbers.
A - Abundant - Found in large numbers and widely distributed.
Other symbols and categories:
E – Endemic – Found in Hawaii and nowhere else.
[1]Also reported in AECOS (1992) in nearshore waters south of Hana Bay.
[2]Also recorded by Hawaii Department of Land and Natural Resources Division of Aquatic Resources at Hana Pier, Hana, Maui on February 6, 2003 (pers. comm., Skippy Hau).

QC:

Animals were identified in the field on June 5, 2006 by K. Laing and L. Bremer. Photographs were taken for further identification and verification. Algae were identified in the laboratory by C. Linebaugh and L. Bremer.

APPENDIX B: PUBLIC MEETINGS

1. Public Meeting, Helene Hall, December 18, 2006

2. Hana Advisory Council Meeting, April 17, 2008

Meeting Minutes

SHIGEMURA, LAU, SAKANASHI, HIGUCHI & ASSOCIATES, INC.

CONSUL
STRUCT
ENGINEE

Re: Hana Boat Ramp – Improvements to Rock Revetment and Boat Ramp Loading Dock

Meeting Date:	Dec. 18, 2006
Location:	Helene Hall, Hana, Hawaii
Time:	4:40 pm
Project No.	05H047
By:	Wayne Higuchi/Jim Barry

Present at meeting: See attendance sheet. Also present: Miles Lopes (DLNR)

The meeting began at about 1640. Introductory remarks were made by Carty Chang (DLNR) and Senator English, welcoming the attendees and introducing the project. Senator English cautioned the audience that the current project is just to repair the breakwater and build a new loading dock and ADA access ramp. Other issues, such as repairing or replacing the pier, would have to be addressed by another project.

Wayne Higuchi presented the project summation: existing conditions, plans for repair, and the project schedule. In the middle of that presentation, Jim Barry presented the design wave analysis, and a case study for the November 20-23 2003 high wave event that caused serious damage to the breakwater, and asked for feedback from the audience. At the conclusion of his presentation, Wayne Higuchi asked for questions from the audience.

Q: How long will the ramp be closed during construction. A: Approximately 4 to 6 months.

Q: The turnaround area for boat trailers is very tight and should not be closed (note: This will likely be part of the work area and storage area for the construction).

Q: Boats that get stuck in Hana overnight due to weather conditions or other emergencies moor in the inside corner of the pier. The boaters use the pier to access land. Can there be a gate with keyed access between the pier and wharf that only authorized boaters would be allowed to use? A: Carty said that due to liability issues, the answer would be no. Access between the pier and wharf will be blocked by the fence.

Questions to the audience. Audience often talked among themselves before coming to agreement.

Q: What is the largest boat in use? A: 28 to 30 feet

Q: What should the deck elevation of the loading dock be? A: General agreement that the present dock (at +5ft MLLW) is about 1 ft too high. When questioned about surge and high tide on a dock that is too low, agreement that too low an elevation is undesirable. Nevertheless, the new dock should be somewhat lower than existing. Audience agreed to pay attention to conditions of existing dock and so come up with a more refined answer to this question. They suggest looking in to the elevation of the new small boat loading dock at Kahului Harbor.

Q: Does the design wave height (8 feet) seem right given conditions during the November 20-23 wave event? A: The wave height seems about right; it is possible that larger waves were seen.

Q: Is existing area lighting adequate? A: Yes.

Q: Will temporary closure of the ramp affect the Fire Department's efforts (question directed at Fire Department representative)? A: No, Fire Department can launch their jet skis elsewhere so closure of the ramp will not have an impact on their operations.

Then followed a general discussion monitored by Carty Chang. The discussion focused on two issues, replacing the boat ramp and adding fresh-water washdown at the ramp. The audience stressed that one section of the ramp had been thrown up out of the water during the November 20-23 event, and then replaced "like a piece of a jig-saw puzzle". Water and air surges under that section during wave surges, and it is likely that another large wave event will again move the section. The design team will look into the possibility of fixing or replacing the ramp.

The audience was in agreement for the need for freshwater washdown facilities. The lack of such facilities means that they cannot wash down until they reach home. This causes the saltwater to dry and causes premature corrosion damage to their trailers. Carty Chang expressed the difficulties that the Department of Health (Clean Water Branch) may have regarding run-off into the harbor, and that this could be a difficult
permitting issue. There may also be issues with easements necessary to bring a water line out to the ramp. The design team was asked to prepare a conceptual layout of a washdown area and a cost estimate for the work. It was noted that if including the design of the washdown area into the project scope would

significantly affect the project schedule, construction of the washdown area may have to be done under a separate design project in the future.

Wayne Higuchi had noted in his presentation that there appeared to be a shortfall between the current cost estimate and available funds. Senator English closed the meeting by stressing that his goal was to get the project fully funded during the approaching legislative session.

Meeting was adjourned at approx. 5:45 pm.

ATTENDANCE SIGN-IN SHEET

HANA BOAT RAMP – IMPROVEMENTS TO ROCK REVETMENT
AND BOAT RAMP LOADING DOCK

Helene Hall, Hana, Maui
December 18, 2006

	Name	Organization	E-mail Address	Telephone No.
1	Al Satogata	DLNR	alvin.n.satogata@hawaii.gov	(808) 587-0271
2	Kevin Ho	DLNR	kevin.k.ho@hawaii.gov	(808) 587-3256
3	Carty Chang	DLNR	carty.s.chang@hawaii.gov	(808) 587-0122
4	Wayne Higuchi	Shigemura, Lau…	whiguchi@lava.net	(808) 942-9100
5	Jim Barry	Sea Engineering	jb@seaengineering.com	(808) 259-7966
6	Haunani Collins	HanaBayCharters	rafting@hanabaycharters.com	(808) 248-4999
7	Mark Collins	Sustainable Fish	hanafishco@wave.hicv.net	(808) 248-4879
8	J. Kalani English	Senate	senenglish@capitol.hawaii.gov	587-7225
9	SAM Aiia	HANA FISHING		248-8931-or 760
10	D. CORNELSON	" "	dougie-c@hawaii.rr.com	248-7694
11	Chester Pua	" "		248-8988
12	JOHN Kiambao			2488-451

ATTENDANCE SIGN-IN SHEET

HANA BOAT RAMP – IMPROVEMENTS TO ROCK REVETMENT AND BOAT RAMP LOADING DOCK

Helene Hall, Hana, Maui
December 18, 2006

	Name	Organization	E-mail Address	Telephone No.
13	SAM AKOI	HANA FISH	HANA, MAUI, HI P.O. BOX 614	2485614
14	[illegible]	Hana Fishing	[illegible]	248-7591
15	NORMAN PERRY	Hana	NKPERRY@NWLINK.COM	248-8230
16	CARL BERTELMANN			2487082
17	Kamuela Mercurio			6787441
18	Kenly Nakamura	HANA	PO BOX 437 HANA HI	248-7848
19	[illegible]	Hana		2488300
20	[illegible]		PO Box 763	248-8374
21	Dawn Lono	Hana Council Services Office	P.O. Box 495 96713	248-7513 - OCS 248-8049
22	DON [illegible]	MFD		248-7525
23	[illegible]	KEANAE	HC1 Box 48	248-7708
24				

Hana Advisory Council Meeting, April 17, 2008

Note: This meeting was never called to order due to the lack of a quorum. However a presentation of the project was made by Wayne Higuchi of Shigemura, Lau, Sakanashi, Higuchi & Associates, Inc., and Mr. Kevin Ho of DLNR-DOBOR, and questions were fielded. Following are unofficial transcriptions of some of the comments and responses. Some responses have been further clarified for this document.

1. Comment: Was it possible to keep the launch ramp open during most of the construction period as some persons use the ramp for their livelihood.
Response: For reasons of safety, primarily, the ramp would likely be closed during most or all of the construction period.

2. Comment: Why fix the fence between the parking area and the abandoned pier since people will just find a way to get around the fence.
Response: Project designers were tasked to repair the fence to discourage people from entering onto the pier.

3. Comment: Why not patch the holes in the old pier?
Response: Repairs to the pier were not in the scope for the project; there are apparently no plans to repair the pier.

4. Comment: Most of the damage occurred from one large storm. The impression is that the condition of the revetment had deteriorated over time but that this is not the case.
Response: There are many repairs in the existing structure. Damage likely occurs from extreme but infrequent events.

5. Comment: How long will the new revetment last?
Response: Oceanographic design parameters were events with a return period of 50-years. Structures are designed to withstand such events with minimal damage.

6. Comment: Will in-water debris be cleaned up?
Response: Debris that interferes with construction or ramp operations will be removed.

APPENDIX C: WATER QUALITY MONITORING PLAN

SEA ENGINEERING, INC.

Draft
Water Quality Monitoring Plan
Hana Ramp Improvements
Maui, Hawaii

Note: Subject to change pending approval by State of Hawaii Department of Health, Clean Water Branch

Sea Engineering, Inc.
April, 2008

Introduction and Project Description

This document is a water quality monitoring plan (WQMP) for a project in Hana Maui to repair the Hana Boat Ramp facility, and is part of an application to the State Department of Health for a Section 401 Water Quality Certification Project. An Environmental Assessment for the project, *Draft Environmental Assessment for Hana Ramp - Improvements to Rock Revetment and Boat Ramp Loading Dock , Maui*, accompanies this WQMP. Hana Bay is located on the east side of the island of Maui. Hana Wharf and boat ramp facilities are located on the south side of the bay, somewhat protected by a natural rock headland. The boat ramp facility is in the lee of the short but massive breakwater. Hana Breakwater is a large masonry and rubble mound structure that forms a narrow salient on the southeast end of Hana Bay. The salient provides modest protection from prevailing trade wind waves for the launch ramp and existing loading dock. The breakwater transitions to Hana Wharf, a large concrete pile-supported pier. The wharf is in a state of extreme disrepair and is not considered safe.

This project is to repair and improve the existing boat ramp facility at Hana, Maui. Anticipated improvements will consist of:

1. Repair of the existing breakwater,
2. Addition of a new loading dock that is compatible with the Americans with Disability Act of 1990 (ADA),
3. Renovation of the concrete launch ramp,
4. Establishment of a boat wash-down area,
5. Miscellaneous minor improvements including:
    - Renovation of the existing loading dock
    - New security fencing and lighting
    - Reconstruction of the asphalt concrete pavement.

The project elements that will require in-water construction and placement of fill include breakwater repair and renovation or replacement of the launch ramp. The new loading dock will also require placement of supporting piles.

Breakwater Repair (Rubblemound)

The proposed repair will be a combination seawall and rubblemound revetment. The inshore, or leeward side of the breakwater is protected from direct wave action and has lateral extents constrained by the boat ramp approach and surrounding shallow water areas. A seawall structure is therefore proposed for this side of the breakwater. The windward side of the breakwater has fewer constraints on lateral extents and faces direct breaking wave action. A rubble-mound structure is therefore proposed for this side of the breakwater.

The rubblemound structure will be constructed from two layers of 6,000-lb to 10,000-lb armor stone. The toe of the structure will be reinforced with a toe stone at least 10,000 lbs in weight. A layer of smaller rock, 250 lbs to 1,000 lbs in weight will be used as an underlayer for the structure. The underlayer will rest on a dressed slope formed from the existing breakwater structure.

The bottom fronting the proposed rubblemound on the windward side of the breakwater is primarily composed of basalt boulders. To minimize the lateral extent of the structure, as well as the need for excavation, an extra large stone, or toe stone, with a weight 1.25 to 1.50 times the nominal W50 stone weight, will lock the armor stone in place at the base of the structure. Some excavation will be necessary to meet the lines and grade of the breakwater design, and ensure proper toe construction. The clean rock material to be excavated will likely be useful in the project construction as, for example, underlayer material or as extra toe mounding (i.e. material piled seaward of the rubblemound toe stone to help key the toe stone into the bottom). A preliminary conservative estimate of material that may be excavated in this way is approximately 150 cu yds. Construction techniques may vary, but it is likely that some clean excavated material may be stockpiled at the project site prior to re-use. Stockpiled material will conform to BMP's to prevent unrestricted runoff.

The crest of the existing rubblemound structure will also need to be modified by grading and excavation to meet the design grade lines required for construction. Based on a preliminary site assessment, much of the rock material can likely be re-used in the reconstruction project. Unused material will be disposed of at on-land sites. Up to 190 cy of material may be excavated above the MHHW level, and about 160 cy of material below the MHHW level.

The following fill quantities are based upon the cross-section and layout plans in the EA and assume a conservative stone packing density of 70% (30% porosity).

Armor Stone: 440 cu yds total; 265 cu yds below the high tide line (MHHW)

Underlayer Stone: 160 cy yds total; 110 cu yds below the high tide line (MHHW)

Material quantities are summarized in Table C-1.

Breakwater Repair (Seawall)

The inshore portion of the breakwater will be repaired using a cemented rubble masonry (CRM) wall resting on a poured concrete footing wall. The footing will rise above the water line, enabling mostly above-water construction with CRM. The footing will be constructed of tremie-poured concrete. Formwork will extend above water to minimize exchange with ambient waters. Silt curtains will also be used to contain turbidity from the concrete tremie pour as part of the standard BMP's.

Some excavation will be required to ensure a good footing foundation. Much of the excavated material will be rock and rubble and may be stockpiled for use in the breakwater repair. Material that is not used in the repair will be stockpiled on-site for evaporation and on-land disposal. Stockpiled material will conform to BMP's to prevent unrestricted runoff. Material to be excavated is conservatively estimated to be 240 cu yds.

The following quantities are based upon the project Construction Plans.

Concrete Footing: 550 cu yds concrete

CRM: 195 cu yds total; 75 cu yds below the high tide line (MHHW)

Material quantities are summarized in Table C-1.

Boat Launch Ramp

A total of approximately 50 cu yds of material including pre-cast concrete panels, gravel bedding and riprap or concrete side rails will be placed below the high tide line.

Material Quantities Summary

Table C-1 is a summary of the quantities of fill and excavation materials being used for the various design elements of the project.

Table C-1. Material Quantities Summary for Excavation and Fill

Source	**Composition**	**Quantity**	**Duration**
Breakwater Repair (Rubblemound)			Permanent
Underlayer Stone	Basalt Boulder	110 cy	
Armor Stone	Basalt Boulder	265 cy	
Misc. Turbidity	Fine Silt	unknown	Temporary (hours)
Breakwater Repair (CRM Seawall)			
Tremie Concrete Footing and Seawall	Concrete	550 cy	Permanent
CRM	Basalt Rock and Grout	75 cy	Permanent
Forms for Concrete Footing	Wood	20 cy	Temporary (2 months)
Rebar	Steel		Permanent
#7		350 ft	
#8		3,000 ft	
#9		2,760 ft	
#10		7,778 ft	
Misc. Turbidity	Fine Silt	unknown	Temporary (hours)
Boat Launch Ramp			
Concrete Panels and Bedding	Pre-Cast Concrete and Gravel Bedding	50 cy	Permanent
Leveling Frame	6-inch Galv. Steel Pipe	112 ft	Permanent
Sacked Concrete	Concrete-filled bags	42 bags (1cy)	Permanent
Scour Protection	Grout-Filled Mattress	6.7 cy	Permanent
Misc. Turbidity	Fine Silt	unknown	Temporary (hours)
New Boat Dock			
Bearing Piles	Concrete	(6) 26" x 26"x 30ft (5.2 cy)	Permanent
Pile Caps	Concrete	6 (1.25 cy)	Permanent
Plastic Lumber	Plastic	8.6 cy	Permanent
Silt Curtains	Fabric	1800sq ft	Temporary (9 months)

Need for Water Quality Monitoring Plan

The proposed project will entail construction and placement of fill material (concrete and rock) within the jurisdictional waters of the United States, defined as the mean higher high water line

(+2.5 feet MLLW). Best Management Practices (BMP's) for construction operations will be used to help minimize adverse impacts to coastal water quality, including but not limited to:

- Development of an Environmental Protection Plan for protection of water resources,
- Surveillance, management and control practices to avoid pollution of surface or marine waters.
- Completion of the project in accordance with all applicable State Department of Health water quality regulations.
- Use of clean materials free of earthen material or any contaminants.
- Suspension of construction activities should monitoring indicate that turbidity standards are being exceeded due to construction activities until the condition is corrected.
- Effective silt containment devices shall be deployed where practicable to isolate the construction activity.
- Curtailment of in-water construction during sea conditions that are sufficiently adverse to render water quality controls ineffective.

This Water Quality Monitoring Plan (WQMP) has been prepared to accompany the Environmental Assessment (EA) for the project, and the Section 401 Water Quality Certification application. This Plan has been prepared in accordance with water quality regulations promulgated in Hawaii Administrative Rules (HAR) Chapter 11-54 (HDOH, 1992) and the General Monitoring Guideline for Section 401 Water Quality Certification Projects found on the State of Hawaii, Department of Health (HDOH) web site. The intent of the WQMP is: 1) to ascertain that the BMP's for the project are adequate to comply with State water quality standards; 2) in the event that the BMP's prove inadequate, to promptly determine such, so that modification's of the BMP's can be implemented in a timely manner to bring the activity into compliance: and 3) to serve as a basis for self-compliance, so that construction can proceed within the parameters required by State water quality standards.

Parameters to be Measured

Receiving water quality parameters to be measured are those listed in the General Monitoring guideline for Section 401 Water Quality Certification Projects (HDOH, April 7, 2000). These include monitoring for pH, turbidity and total suspended solids (TSS). Visual observations of the physical characteristics of the project area, the weather and sea conditions, and the construction activities at the time of sampling will be recorded. Photographs will also be taken of the sampling locations and the construction activities.

Sampling Locations

Sampling locations1 through 4, shown on Figure C-1, correspond to water quality survey stations used by AECOS (2007) to characterize water quality conditions at the site during a biological and water quality field survey. These will be used for further baseline sampling and will be monitored during construction. In addition to the four regular sampling stations, a water sample shall be collected immediately inside and one outside of any silt curtains deployed around areas of active construction. The outside sample shall be taken downdrift of wind or current induced water movement, and within 5 feet of the outboard side of the silt curtain. One of the regular sample stations may be used as the outside sample if it meets the above criteria. The location of each monitoring station shall be located and mapped. All samples shall be taken between 1 ft and 3 ft of the surface.

Sampling Frequency

Preconstruction
Prior to construction, at least 10 sets of baseline water quality samples will be obtained and analyzed from the primary sampling locations over a time period of at least two weeks.

During Construction
The in-water construction work is estimated to take about nine months to complete. The HDOH monitoring matrix indicates that monitoring should be conducted three times weekly for 5-month projects, and twice monthly for 1-year projects. The project site is remote, and access by both road and air can be uncertain. Monitoring the project once per week is considered a reasonable schedule.

Post Construction
Post-construction monitoring will be performed twice per month for three months following completion of in-water construction work. However, if there are no observable water quality impacts, then reduction or waiving of the post-construction monitoring may be requested from the Department of Health Clean Water Branch.

Sampling and Analytical Methods / Quality Assurance

A specific water quality Principal Investigator (PI) or qualified firm shall be designated who can demonstrate training and knowledge in the sampling and analysis methodology to be used in the conduct of the work. The PI shall review and approve the sampling and testing methodology to be used, shall supervise the conduct of the work, and shall review and approve all reports. An EPA approved water quality laboratory shall be utilized for all testing. Selection of the PI or qualified firm will be done by the Contractor. The collection of samples at each station shall be performed consistently with respect to location and depth, so that individual samples and sample sets represent replicates suitable for statistical analysis. Tide stage, weather conditions, wave action, wind direction, and construction activity during collection of the water samples shall be recorded. All water quality parameters will be measured from grab samples collected by the testing laboratory's field technicians or an individual assigned by the contractor and trained by laboratory personnel. Unless otherwise indicated by the PI or qualified firm, water samples and parameter measurements will be collected at mid-depth at each station.

Table C-2 (from AECOS, 2007) shows standard water quality testing parameters with references to approved EPA testing techniques and the instruments used for initial water quality testing as reported in AECOS, 2007 and SEI, 2007. All samples shall be analyzed for pH, turbidity and total suspended solids using the methodology indicated in Table C-1 and as per instructions in DOH General Guidelines. Other water quality testing parameters are also shown in Table 1 for reference if required for optional testing. Turbidity and total suspended solids are thought to be the critical parameters that will be affected by the project construction. Although nutrient levels may increase slightly due to excavation, the increase should be minimal and transient due to the coarse sediment and rock substrate.

Analysis shall include any necessary instrument calibration, analysis of laboratory blanks, quality control samples, or other mandates of the specified methods. The testing laboratory will retain records of the analytical procedures used and relevant QA/QC and instrument calibration information pertaining to the specific analysis. All analytical results and field notes will be entered into a notebook or file established for this purpose, and provided in a final report prepared for the monitoring program.

Table C-2. Analytical methods used in the water quality sampling programfor the Hana Wharf improvement project (AECOS 2007).

Analysis	Units of Measure	Method	Reference	Instrument
pH	**N/a**	**EPA 150.1**	**EPA (1993)**	**SA 250**
Total Suspended Solids	mg/l	**Method 2540D (EPA 160.2)**	**Standard Methods 18th Edition (1992); EPA (1979)**	**Mettler H31 balance**
Turbidity	**NTU**	**Method 2130B (EPA 180.1)**	**Standard Methods 18th Edition (1992); EPA (1993)**	**Hach 2100P Turbidimeter**
Salinity*	0/00	bench salinometer	Grasshoff in Grasshoff et al. (1986)	AGE Model 2100 salinometer
Temperature*	°C	Thermister calibrated to NBS cert. thermometer (EPA 170.1)	EPA (1979)	YSI Model 550 DO meter
Dissolved Oxygen*	mg/l	EPA 360.1	EPA (1979)	YSI Model 550 DO meter
Total Nitrogen*	µg N/L	persulfate digestion/EPA 353.2	D'Elia et al. (1977) / EPA (1993)	Technicon AutoAnalyzer II
Total Phosphorus*	µg P/l	persulfate digestion/EPA 365.1	Karoleff in Grasshoff et al. (1986)/EPA (1993)	Technicon AutoAnalyzer II
Ammonia*	µg N/l	alkaline phenol	Karoleff in Grasshoff et al. (1986)	Technicon AutoAnalyzer II
Chlorophyll α*	µg /l	10200 H	Standard Methods, 18th Edition (1992)	Turner Model 112 fluorometer
Nitrate + Nitrite*	µg N/l	EPA 353.2	EPA (1993)	Technicon AutoAnalyzer II

* Optional parameters

D'Elia, C.F., P.A. Stendler, & N. Corwin. 1977. *Limnol. Oceanogr.* 22(4): 760-764.

EPA. 1979. Methods for Chemical Analysis of Water and Wastes. U.S. Environmental Protection Agency, EPA 600/4-79-020.

EPA. 1993. Methods for the Determination of Inorganic Substances in Environmental Samples. EPA 600/R-93/100.

EPA. 1994. Methods for Determination of Metals in Environmental Samples, Supplement 1. EPA/600/R-94/111. May 1994.

Grasshoff, K., M. Ehrhardt, & K. Kremling (eds). 1986. Methods of Seawater Analysis (2nd ed). Verlag Chemie, GmbH, Weinheim.

Standard Methods. 1992. Standard Methods for the Examination of Water and Wastewater. 18th Edition. 1992. (Greenberg, Clesceri, and Eaton, eds.). APHA, AWWA, & WEF. 1100 p.

Reports

Results of each sample testing will be made available to HDOH, Clean Water Branch, via facsimile or email upon completion of the analysis, usually within 24 to 48 hours for all measurements. A brief letter report for submittal to HDOH will be prepared within one week of sample testing. Each of these reports shall list the date of sample collection, the date of analysis, the name of the laboratory/person performing the analysis, a brief statement concerning the observed degree of compliance or noncompliance with State water quality standards, as indicated by the analysis results and associated field data (and the apparent reason(s) if known, for any observed violation), and the signature of the preparer. The analysis results for each sample shall be tabulated and shall include the sample number, station number, water depth of sample, time of collection, analyzed amount and unit of measure, and any relevant associated data or observations. In reaching conclusions concerning the degree of compliance with State water quality standards and cause(s) of apparent violations, the investigator shall conduct and consider the results of appropriate quantitative comparisons between the current monitoring data and the pre-construction baseline data. The methods to be used in conducting such comparisons shall include generally accepted statistical methods or other methods selected by the investigator to be those that in his professional judgment are most appropriate for the purpose of ascertaining the degree of compliance with the water quality standards. The method(s) used and results considered shall be described.

A written final summary report shall be prepared and submitted to HDOH, Clean Water Branch, within 60 days of the final sample testing. This report shall contain the following information:

a) An introduction, which includes a statement of purpose and objectives and a brief description of the monitoring program.
b) A description of the methods employed in collecting, transporting, and analyzing the water samples.
c) Copies of all analysis reports in an appendix.
d) A discussion summarizing the results of the sampling and analysis.
e) Summary conclusions regarding the degree of compliance or noncompliance with State water quality standards, and the probable causes of any violations.

References

1. Draft Environmental Assessment, for Hana Boat Ramp Repairs, Island of Maui, March, 2007.

2. Hawaii Department of Health. 1992. Hawaii Administrative Rules, Title 11, Chapter 54, Water Quality Standards.

3. Code of Federal Regulations (CFR), Title 40, Chapter 1 (EPA), Part 136 - Guidelines Establishing Test Procedures for the Analysis of Pollutants.

4. Hawaii Department of Health. April 7, 2000. General Monitoring Guideline for Section 401 Water Quality Certification Projects (see HDOH website).

5. Standard Methods. 1992. Standard Methods for the Examination of Water and Wastewater. 18th Edition.

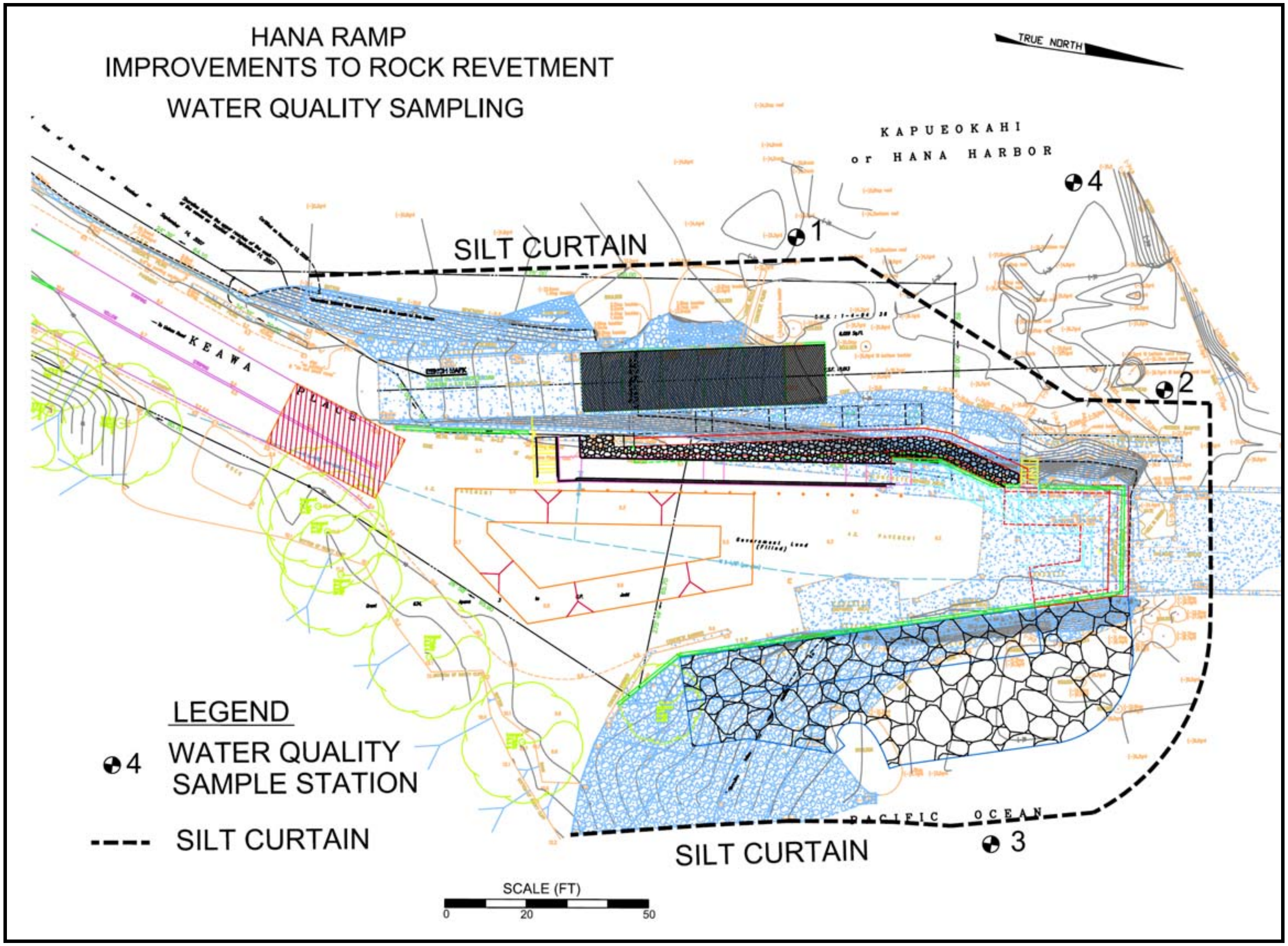


Figure C-1. Location of Water Quality Sample Stations (1-4) at Hana Wharf

APPENDIX D: COMMENT AND RESPONSE LETTERS

CHARMAINE TAVARES
Mayor

JEFFREY K. ENG
Director

ERIC H. YAMASHIGE, P.E., L.S.
Deputy Director

DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
200 SOUTH HIGH STREET
WAILUKU, MAUI, HAWAII 96793-2155
www.mauiwater.org

March 27, 2008

Mr. Thorne Abbott, Staff Planner
Department of Planning
County of Maui
250 South High Street
Wailuku, Hawaii 96793

Re: I.D.: SM1 2006/0033
TMK: (2) 1-4-004:036
Project Name: Hana Wharf Improvements

Dear Mr. Abbott:

Thank you for the opportunity to comment on this Draft Environmental Assessment (DEA). We have the following comments:

Source Availability and Consumption
The DEA should identify sources and potable and non-potable demand for the proposed expansion. The project area is served by the Hana System. The main sources of water for the Hana system is the Kawaipapa aquifer. The property is served by a 5/8" meter. Current consumption for this property is approximately 180 GPD.

System Infrastructure
There is a 3-inch waterline running along the south and east side of the property line. No hydrants are close to the lot. The applicant will be required to provide for water service and fire protection in accordance with system standards.

Conservation
To alleviate demand on the Hana system, we recommend that the following conservation measures be included in the project design or noted in the DEA:
Use Non-potable Water: Use brackish or reclaimed water for landscaping and other non-potable purposes when available. Reclaimed water or brackish water should be used for dust control and landscaping during construction.
Use Climate-adapted Plants: We recommend limiting turf areas and using native climate-adapted

"By Water All Things Find Life"

plants for all landscaping. The project is located in Plant Zone 5. Native plants adapted to the area conserve water and protect the watershed from degradation due to invasive alien species.
Maintain Fixtures to Prevent Leaks: A simple, regular program of repair and maintenance can prevent the loss of hundreds or even thousands of gallons a day. Owners should establish a regular maintenance program.
Utilize Low-Flow Fixtures and Devices: Maui County Code Subsection 16.20A.680 requires the use of low-flow water fixtures and devices in faucets, showerheads, water closets, and hose bibs.

Should you have any questions, please contact our Water Resources and Planning Division at 808-244-8550.

Sincerely,

Jeffrey K. Eng, Director
mlb

cc: engineering division

Attachments:
Plant Brochure: "Saving Water in the Yard"

Sea Engineering, Inc.

Makai Research Pier • 41-305 Kalanianaole Hwy • Waimanalo, Hawaii 96795-1820
Phone: (808) 259-7966 • FAX (808) 259-8143 • E-mail: sei@seaengineering.com • Website: www.seaengineering.com

May 22, 2008

Mr. Jeff K. Eng, Director
County of Maui, Department of Water Supply
200 South High Street
Wailuku, Maui, 96793-2155

Re: I.D. SM1 2006/0033
TMK: (2) 1-4-004:036
Project Name: Hana Wharf Improvements

Dear Mr. Eng,

Thank you for you letter of March 27, 2008 offering comments on the Draft Environmental Assessment for the above project. The project will provide the community of Hana with a new boat ramp that includes ADA-compatible access. The ramp will be protected by a renovated revetment and seawall. The project will also provide a needed wash-down area roughly 300 feet from the boat ramp. Two new hose bibs are planned at the wash down area to be connected to a 1-inch service line. No new water lines are planned at the boat ramp itself. The project does not involve a new subdivision.

Thank you for your review and helpful comments

Sincerely,

J. Barry

James H. Barry, P.E
Coastal Engineer

APPENDIX E: MISCELLANEOUS ITEMS

1. Affidavit of Publication, Maui News, December 21, 2007

'08 JAN - 4 RECD

AFFIDAVIT OF PUBLICATION

STATE OF HAWAII, } ss.
County of Maui.

Terri Yip-Komoda being duly sworn deposes and says, that she is Advertising Sales of the Maui Publishing Co., Ltd., publishers of the MAUI NEWS, a newspaper published in Wailuku, County of Maui, State of Hawaii; that the ordered publication as to

NOTICE OF APPLICATION

SPECIAL MANAGEMENT AREA USE PERMIT

of which the annexed is a true and corrected printed notice, was published 1 times in the MAUI NEWS, aforesaid, commencing on the 21st day of December, 2007, and ending on the 21st day of December, 2007, (both days inclusive), to-wit:

December 21, 2007

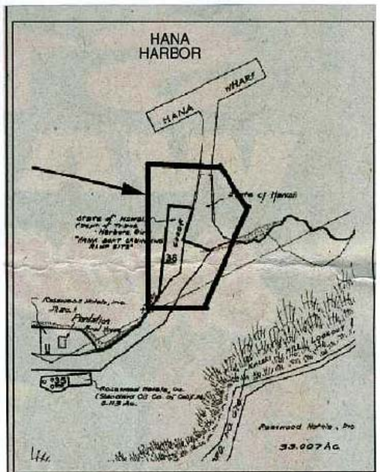
and that affiant is not a party to or in any way interested in the above entitled matter.

Subscribed and sworn to before me this 21st day of December A.D. 2007.

Notary Public, Second Judicial Circuit, State of Hawaii.

LEILA ANN L. LEONG
My commission expires 11-23-11

LEILA ANN L. LEONG NOTARY PUBLIC STATE OF HAWAII



NOTICE OF APPLICATION SPECIAL MANAGEMENT AREA USE PERMIT

Please be advised that the undersigned has filed an application for a Special Management Area Use Permit with the County of Maui Planning Department for the following parcel(s):

1. Tax Map Key: 2-1-4-004:36 (See Attached Location Map)
2. Location: (Street Address): Hana Wharf
3. Existing Land Use Designations:
   a. State Land Use District: Urban
   b. Community Plan Designation: Park
   c. County Zoning: PK-2
4. Description of the Existing Uses on Property: Public Boat Ramp Facility
5. Description of the Proposed Development on Property: Improvements and Repair to Existing Facility

****

BY:

State of Hawaii DLNR - DOBOR	Sea Engineering, Inc.
(Owner/Applicant)	(Agent)
Edward Underwood	James Barry
(Signature)	(Signature)
333 Queen Street, Suite 300; Honolulu 96813	Makai Research Pier, Waimanalo HI
(Address)	(Address)
587-1966	259-7966
(Telephone)	(Telephone)

(MN: Dec. 21, 2007)