Draft Environmental Assessment

PROPOSED SHORELINE PROTECTION IMPROVEMENTS AT TMK 2-6-009:005 AND 021, KUAU, MAUI

Prepared for:

James P. Argyropoulos and Gary Goetzman

Approving Agency:

Maui Planning Commission

April 2009

MUNEKIYO & HIRAGA, INC.

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Executive Summary

Project Name:	Proposed Shoreline Protection Improvement
Type of Document:	Draft Environmental Assessment
Legal Authority:	Chapter 343, Hawai`i Revised Statutes
Agency Determination:	Anticipated Finding of No Significant Impact (FONSI)
Applicable Environmental Assessment review "trigger"	Use of State Land Use Within the State Conservation District Use Within the Shoreline Setback Area
Location:	TMK 2-6-009:005 and 021 Kuau Island of Maui
Landowners:	James P. Argyropoulos Gary Goetzman
Applicants:	Stanton Cohen, on behalf of James P. Argyropoulos Dawn Wilson, on behalf of Gary Goetzman
Accepting Authority:	Maui Planning Commission 250 S. High Street Wailuku, Hawai`i 96793 Contact: Jeffrey S. Hunt, Planning Director Phone: (808) 270-7735
EA Preparer:	Munekiyo & Hiraga, Inc. (Under contract to Stanton Cohen) 305 High Street, Suite 104 Wailuku, Hawai`i 96793 Contact: Mich Hirano, AICP Phone: (808) 244-2015

I. PROJECT OVERVIEW

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A. BACKGROUND

During an undetermined time period prior to 1982, two (2) concrete rock mound seawalls were constructed fronting two (2) adjacent shore fronting properties identified by TMK 2-6-009:005 and 021 ("Parcel 5" and "Parcel 21"), located in Kuau, Pa`ia, Hawai`i. See **Figure 1** and **Figure 2**. Portions of the seawall structures appear to be located on State land. Over the years, the seawall structures have been severely damaged by wave action during strong winter storms. The subsequent failure of the seawall structures has resulted in considerable erosion of the properties upland of the shoreline. On Parcel 5, the erosion is undermining an approximate 20 foot high bank and poses potential danger to the public using the shoreline. See **Figure 3**. On Parcel 21, the top bank of the property is rapidly eroding. The existing single-family residence on Parcel 21 is setback approximately 20 feet from the top of the bank. There is severe wave wash reaching the house during heavy storms and potential for damage to the property from erosion and flooding. See **Figure 4**.

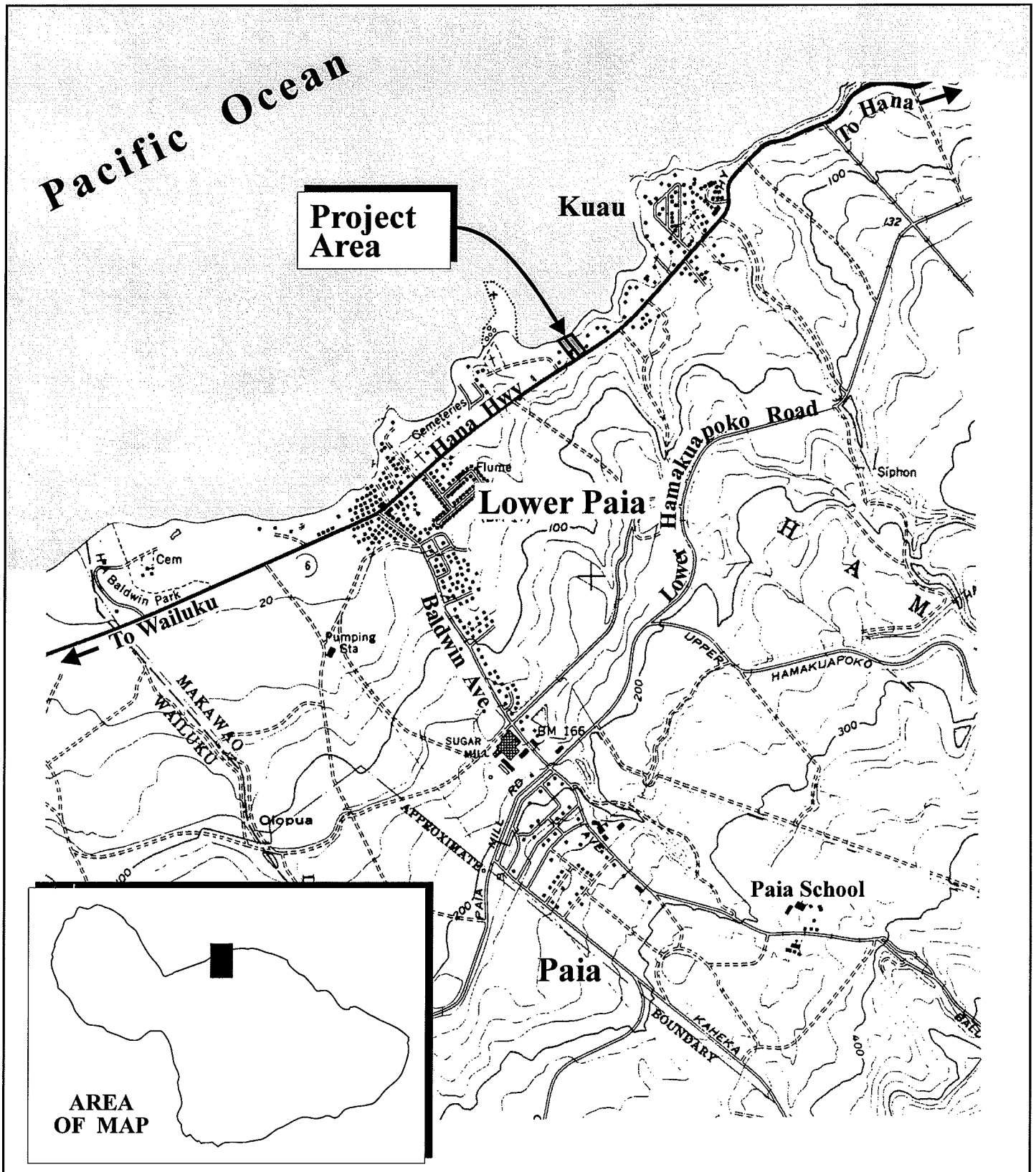
B. PROPERTY LOCATION, EXISTING USE, AND LAND OWNERSHIP

Identified by Tax Map Parcel (2) 2-6-009:005 and 021, the properties are shore-fronting and located within an area of residential uses and public/quasi-public recreational uses. Single-family residential uses are immediately adjacent to the east and west, while agricultural lands lie to the south and the Pacific Ocean lies to the north. Downtown Pa`ia is located further west and the community of Kuau further east.

The subject properties include existing single-family residences and accessory structures. See **Figure 5**. Parcel 5 is owned by Mr. James P. Argyropoulos and Parcel 21 is owned by Mr. Gary Goetzman.

C. PROPOSED ACTION

The owners of the subject properties are proposing to remove the debris from the remaining rock mound seawall and build a new engineered hybrid shoreline structure. To protect their property from further erosion and minimize impacts on the shoreline, the structure will



Source: U.S. Geological Survey

Figure 1 Proposed Shoreline Protection at TMKs 2-6-009:005 and 021

Regional Location Map

0 500 1000 2000 Feet

Prepared for: Argyropoulos/Goetzman

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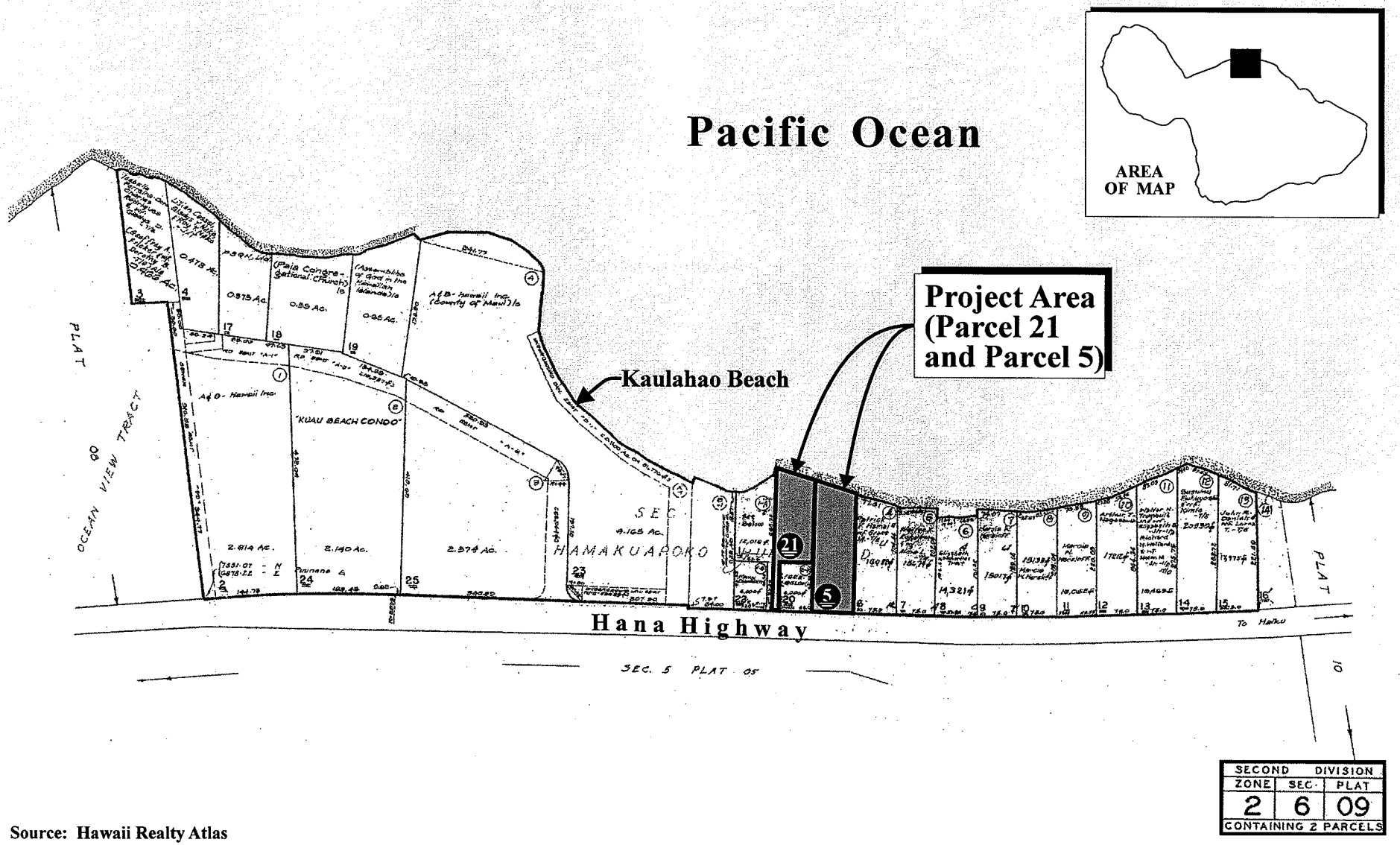
Cohen\KuauShoreline\Regional Location



Source: Hawaii Realty Atlas

Figure 2

Proposed Shoreline Protection at TMK 2-6-009:005 and 021

Property Location Map

NOT TO SCALE

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Prepared for: Argyropoulos/Goetzman

Cohen/kuaushoreline/propertyloca

View West From Parcel 5 Towards Parcel 21

View of Wall Debris on Parcel 5

Source: Munekiyo & Hiraga, Inc.

Figure 3 Proposed Shoreline Protection at TMKs 2-6-009:005 and 021
Site Photos of Erosion at Parcel 5

Prepared for: Argyropoulos/Goetzman

MUNEKIYO & HIRAGA, INC.

Cohen\KuauShoreline\SitePhoto

View East From Parcel 21 Towards Parcel 5

View East Towards Parcel 21 from Kaulahao Beach

Source: Munekiyo & Hiraga, Inc.

Figure 4 Proposed Shoreline Protection at TMKs 2-6-009:005 and 021
Site Photos of Erosion at Parcel 21

Prepared for: Argyropoulos/Goetzman

MUNEKIYO & HIRAGA, INC.

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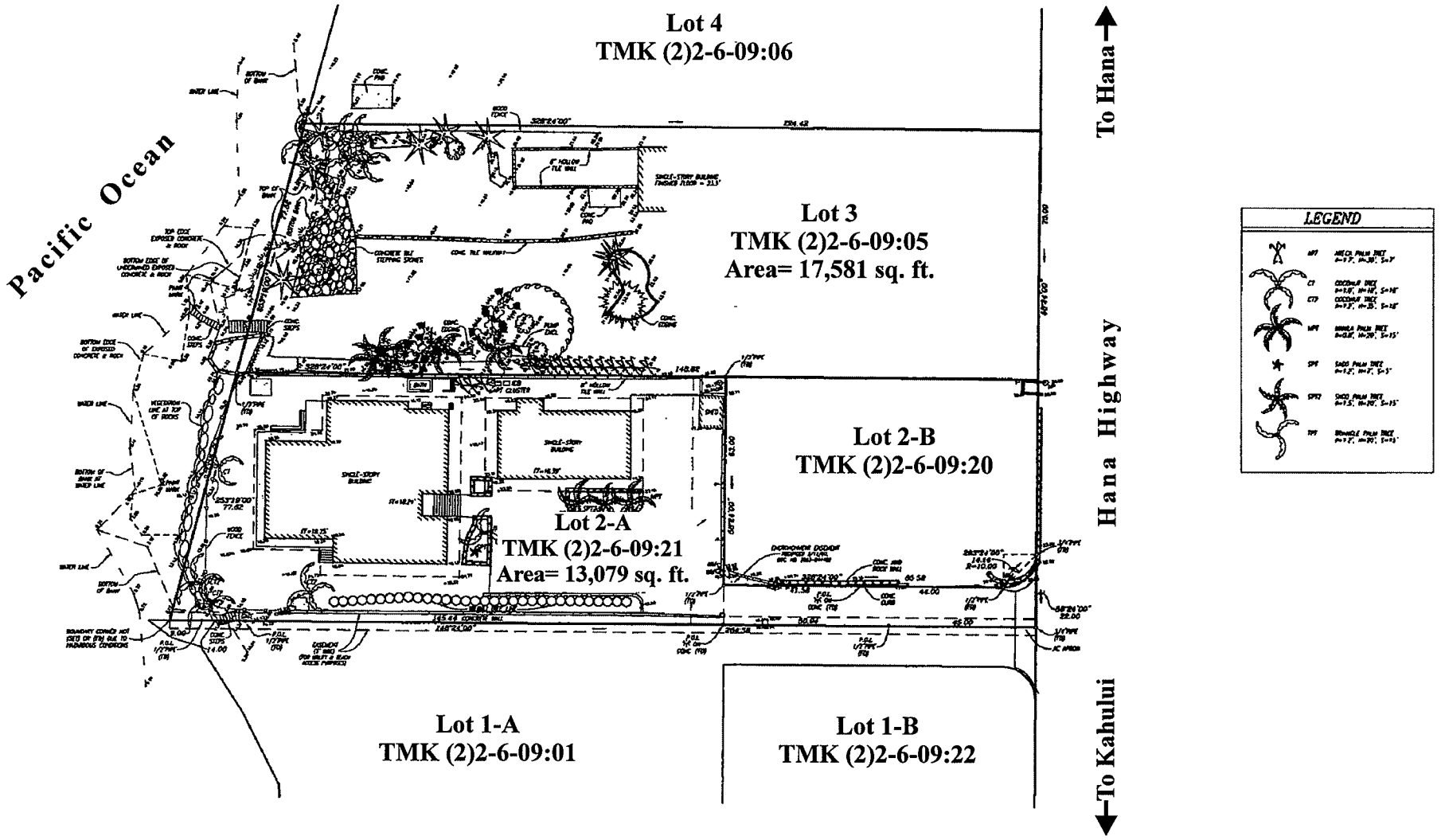


Source: Akamai Land Surveying, Inc.

Figure 5

Proposed Shoreline Protection at TMKs 2-6-009:005 and 021

Site Plan

NOT TO SCALE

Prepared for: Argyropoulos/Goetzman

MUNEKIYO & HIRAGA, INC.

Cohen/KuauShoreline/siteplan

consist of a lower revetment with an approximate 4 ft. wide lateral accessway above the revetment and a seawall structure behind the revetment. The design of the structure was modified in accordance with recommendations received from UH Sea Grant Extension Service, Maui County Department of Planning and State of Hawai`i, Department of Land and Natural Resources, Office of Conservation and Coastal Lands. See **Figure 6** and **Figure 7**. Structures to dissipate wave energy and reduce wave runup will also be incorporated into the design. The east end of the revetment is proposed to wrap around and tie into the rock and rubble slope protection fronting the adjacent property to the east of Parcel 5. The west end of the revetment would tie into the shoreline protection structure which is currently proposed by the owners of Parcel 1 located adjacent and to the west of Parcel 21.

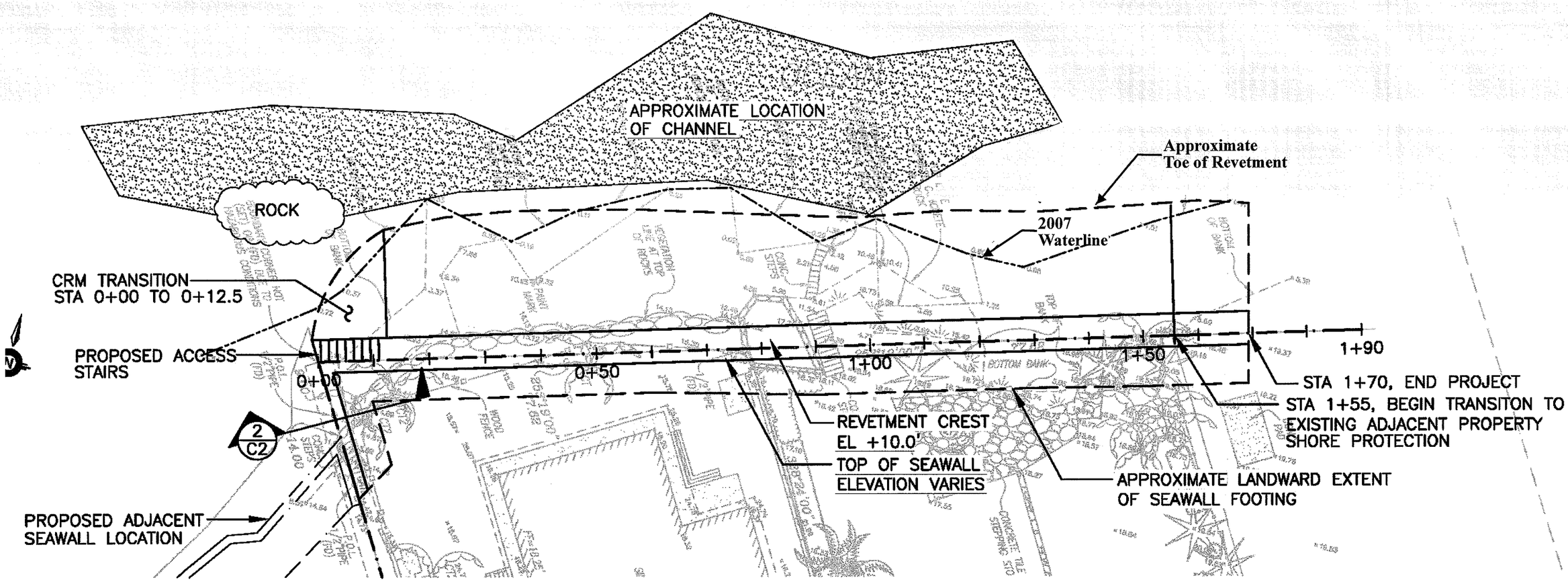
D. REGULATORY CONTEXT AND CHAPTER 343, HAWAI`I REVISED STATUTES

The existing rock mound seawall constitutes an apparent encroachment on State owned Conservation District lands. The disposition of this apparent encroachment will need to be resolved through the acquisition of easements from the State. The proposed hybrid shoreline protection structure will require a Conservation District Use Permit (CDUP) and Grant of Easement from the State of Hawai`i, Department of Land and Natural Resources, Office of Conservation and Coastal Lands and Land Management Division, respectively. The proposed hybrid shoreline protection structure on Parcels 5 and 21 will also require a County of Maui Special Management Area (SMA) Use Permit, Shoreline Setback Assessment, Shoreline Setback Variance, and applicable construction permits. It will also require a Department of Health Section 401 Water Quality Certification and NPDES permit, as well as a Department of Army (DA) permit from the Department of Army Corps of Engineers.

Due to the work on State lands as well as in the Conservation District and the shoreline setback area, the processing of an Environmental Assessment (EA) pursuant to Chapter 343, Hawai`i Revised Statutes (HRS) will be required. This Environmental Assessment is being prepared pursuant to both HRS, Chapter 343 and Chapter 200 of Title 11, Department of Health Administrative Rules, Environmental Impact Statement Rules. Accordingly, this document (prepared for the approving agency, the Maui Planning Commission) addresses the project's technical characteristics, environmental impacts and alternatives, and advances findings and conclusions relative to the significance of the proposed action.

Further, the Environmental Assessment addresses the Office of Environmental Quality Control (OEQC) "Guidelines for Assessing Shoreline Alteration and Hardening Projects". These guidelines were used in the preparation of the coastal engineering assessment. The

Pacific Ocean



Source: Sea Engineering, Inc.

Figure 6

Proposed Shoreline Protection at TMK 2-6-009:005 and 021

Proposed Revetment

NOT TO SCALE

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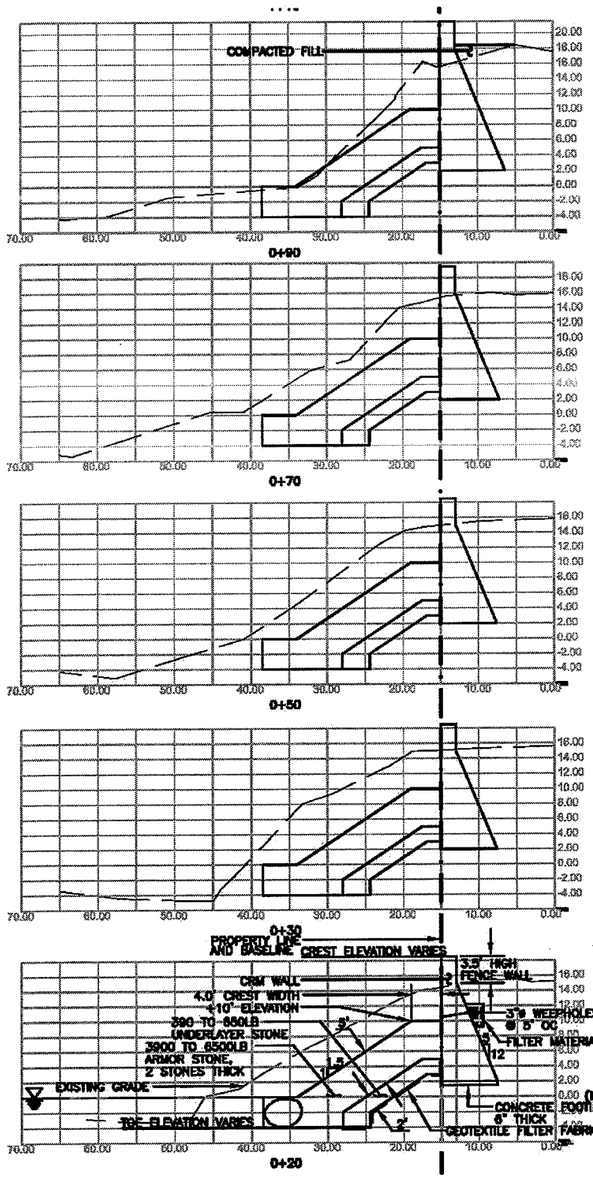
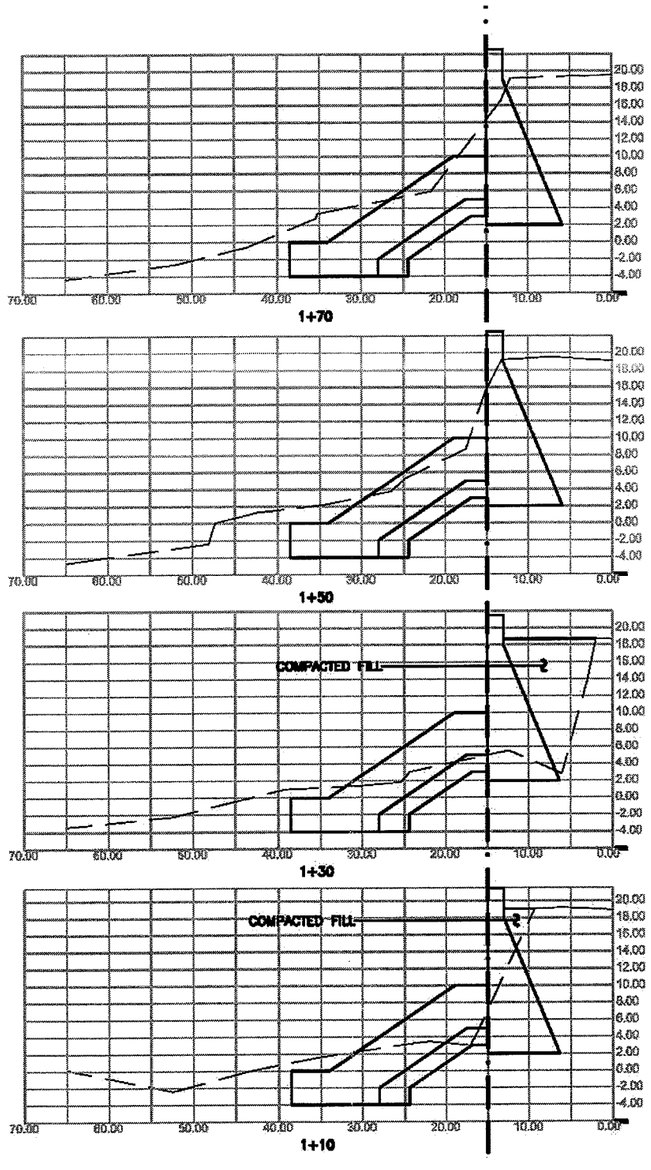
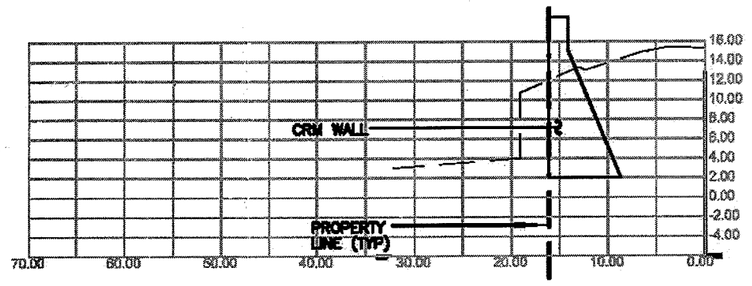
Prepared for: Argyropoulos/Goetzman

CohenlKuauShoreline\CrossSections





Cross Sections



CRM Wall Only Section

Source: Sea Engineering, Inc.

Figure 7

Proposed Shoreline Protection at
TMK 2-6-009:005 and 021
Cross Sections of Proposed Revetment

NOT TO SCALE

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Prepared for: Argyropoulos/Goetzman

CohenlKuauShoreline\CrossSections

OEQC guidelines recommend that coastal assessments include the following:

1. Historical shoreline analysis of coastal erosion and accretion rates
2. Shoreline description
3. Site maps
4. Beach profiles
5. Existing structure analysis
6. Description of improvements
7. Coastal hazard history
8. Wave, current, and sediment pattern analyses
9. Thirty-year erosion hazard
10. Photographs
11. Alternatives; and
12. Professional Engineer seal

E. ESTIMATED PROJECT COST AND CONSTRUCTION CONSIDERATIONS

The project is estimated to cost approximately $892,800.00 as specified in **Table 1** below:

Table 1: Cost Analysis

Item	Unit	Quantity	Cost/Unit (dollars)	Total Cost (dollars)
CRM Wall	LF	180	$3,000.00	$540,000.00
Revetment	LF	155	$1,200.00	$186,000.00
Compacted Fill	CY	100	$30.00	$3,000.00
Mobilization	EA	1	$15,000.00	$15,000.00
			Subtotal	$744,000.00
			Contingency (20%)	$148,000.00
			Total	$892,000.00
Source: Sea Engineering, Inc.				

An important consideration in the design of coastal structures is the feasibility and general constructability of the project. While the construction methodology of each contractor can be expected to differ, certain issues pertaining to the physical condition of the site must be given some forethought.

Access to the site is a primary concern. At present, the most likely site access will be obtained from Parcel 5. In order to access the shoreline, one option is to construct a graded ramp down. This ramp, assuming a 2H:1V slope, would extend approximately 35ft. to the southeast of the current erosion scarp and could be centered between the eastern and western boundaries of Parcel 5. Once access to the shoreline is obtained, limited lateral access to Parcel 21 is possible.

Access to Parcel 21 can be accomplished by removal of approximately 30 feet of the wall between Parcel 21 and Parcel 5. Due to concerns regarding slope stability, this cross property access will most likely not be attempted until the wall and revetment fronting Parcel 5 are completed. Access to Parcel 21 could be achieved from Parcel 1 to the west if the owners of this parcel deem this acceptable. For this reason, concurrent construction on the three (3) parcels proposing hybrid revetment/ seawalls would be desirable.

Construction equipment will most likely include multiple excavators between 5 and 50 tons. At least one of these will work from the lower shoreline area in order to construct the revetment toe and CRM wall foundation. Additional equipment could include front-end loaders, concrete pump trucks, dump trucks, and flatbed trucks. All of these would be limited

to operation at the finish grades of the properties.

A fraction of the armor and underlayer stone will most likely be obtained from dismantling the existing revetment fronting Parcel 21. The majority of stone materials, as well as the wall backfill, will be brought in from off-site. This material will probably be trucked in via Parcel 5, and moved vertically and laterally by appropriate equipment.

The footing of the proposed vertical CRM wall, at its nearest point, comes within 5 feet of the northeastern corner of the existing house on Parcel 21. Additional measures and precautions will be necessary during construction of this portion of the vertical CRM wall. Shoring measures such as sheet piles may be necessary, and rapid construction during this phase is desirable.

II. DESCRIPTION OF EXISTING CONDITIONS, POTENTIAL IMPACTS AND MITIGATION MEASURES

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A. PHYSICAL SETTING

1. Surrounding Land Uses

a. Existing Conditions

The subject properties are located in Kuau, a residential community just east of Pa`ia, a historic plantation town that has become a thriving, residential and commercial community in recent years. The center of Pa`ia lies to the west of the subject properties, with shops and restaurants, and where a country town-business environment prevails. Single-family residences lie immediately adjacent and to the east of the properties and beyond. A single-family residence is located immediately west of Parcel 21 and a sandy public beach known as Kaulahao Beach is located beyond. To the south of the subject properties is Hana Highway and agricultural lands beyond. The shoreline of the Pacific Ocean is located to the north of the subject properties. Refer to **Figure 2**.

b. Potential Impacts and Mitigation Measures

The proposed shoreline protection improvements are designed to dissipate wave energy and are anticipated to have the least impact on surrounding land uses and shoreline processes. Based on recommendations from the UH Sea Grant Extension Service, Maui County Department of Planning, and Department of Land and Natural Resources, Office of Conservation and Coastal Lands, the hybrid shoreline protection structure has been deemed to have the least adverse effect on the shoreline. The proposed revetment is designed to provide safe lateral access across the top of the revetment portion of the structure and will improve lateral shoreline access from existing conditions.

2. Climate, Topography and Soils Conditions

a. Existing Conditions

Like most areas of Hawai`i, Maui's climate is relatively uniform year-round. The region's tropical latitude, its position relative to storm tracts and the surrounding ocean combine to produce a stable climate. Variation in climate on the island is largely left to local terrain.

Average temperatures at nearby Kahului Airport range from the mid-60's in February to the high 80's in August. Rainfall averages approximately 18.6 inches per year (Maui County Data Book, 2007).

Winds in the region are predominantly out of the north to northeast.

Underlying the project area are soils belonging to the Pulehu-Ewa-Jaucas association. See **Figure 8**. This soil association is characteristically deep and well-drained and located in alluvial fans and basins. The soil type specific to the project area is of the Pa`ia Silty Clay classification (PcB) with 3 to 7 percent slopes. A portion of Parcel 5 fronting Hana Highway is classified Paia Silty Clay classification (PcC) with 7 to 15 percent slopes. See **Figure 9**. These soils of dark, reddish-brown clay are mildly alkaline and moderately permeable, with slow runoff and slight erosion hazard. They are commonly found on gently sloping lands of 3 to 7 percent slopes.

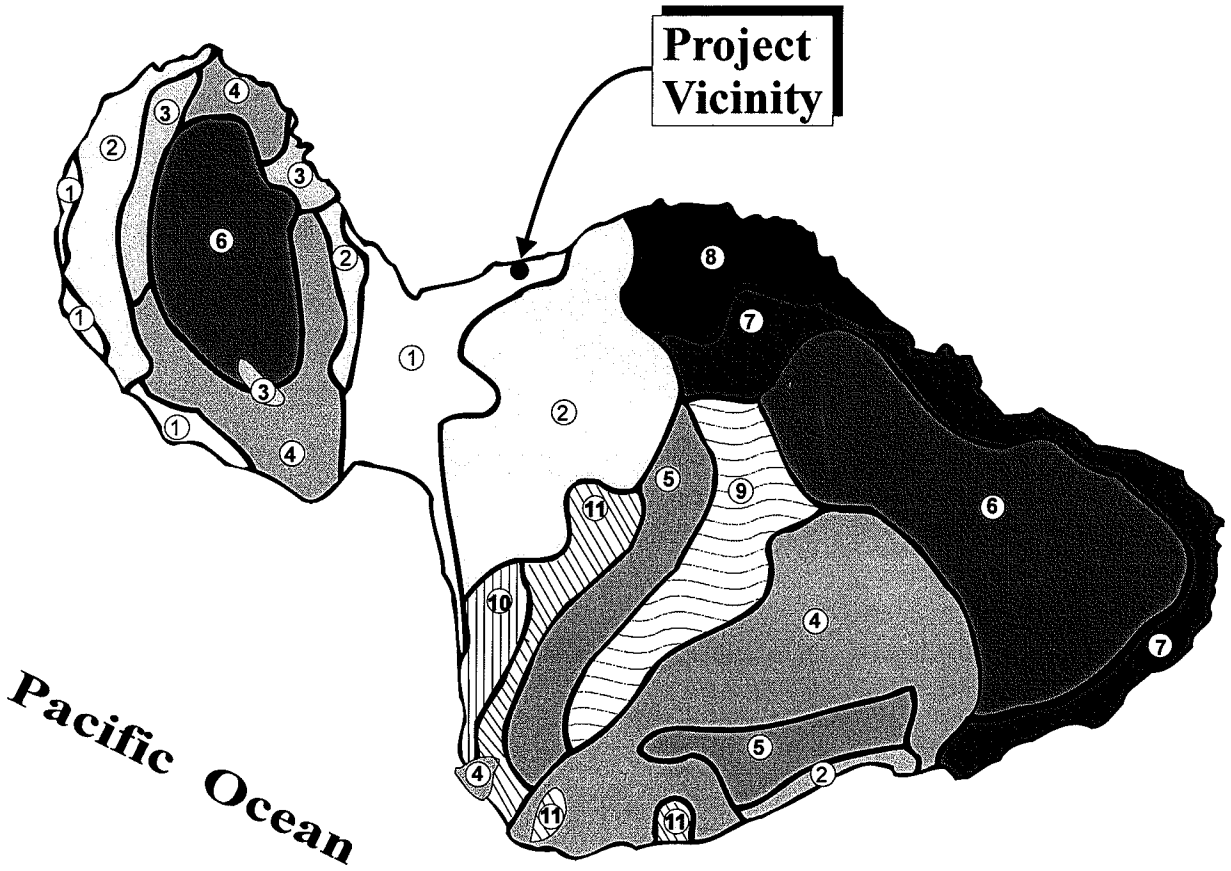
The typical elevations of the seaward lawns of the subject properties is 16 to 20 feet above mean lower low water (MLLW). The shoreline at these parcels faces approximately northwest and high escarpments are found at the seaward limits of the properties (Kuau Shore Protection Coastal Engineering Evaluation and Basis of Design, January 2009).

b. Potential Impacts and Mitigation Measures

The subject properties were previously graded in connection with the completion of the existing single-family residences and landscaping. The construction of the proposed shoreline protection improvements will require further ground disturbances.

LEGEND

- ① Pulehu-Ewa-Jaucas association
- ② Waiakoa-Keahua-Molokai association
- ③ Honolua-Olelo association
- ④ Rock land-Rough mountainous land association
- ⑤ Puu Pa-Kula-Pane association
- ⑥ Hydrandepts-Tropaquods association
- ⑦ Hana-Makaalae-Kailua association
- ⑧ Pauwela-Haiku association
- ⑨ Laumaia-Kaipoipoi-Olinda association
- ⑩ Keawakapu-Makena association
- ⑪ Kamaole-Oanapuka association



Map Source: USDA Soil Conservation Service

Figure 8 Proposed Shoreline Protection at TMKs 2-6-009:005 and 021

Soil Association Map

NOT TO SCALE

Prepared for: Argyropoulos/Goetzman

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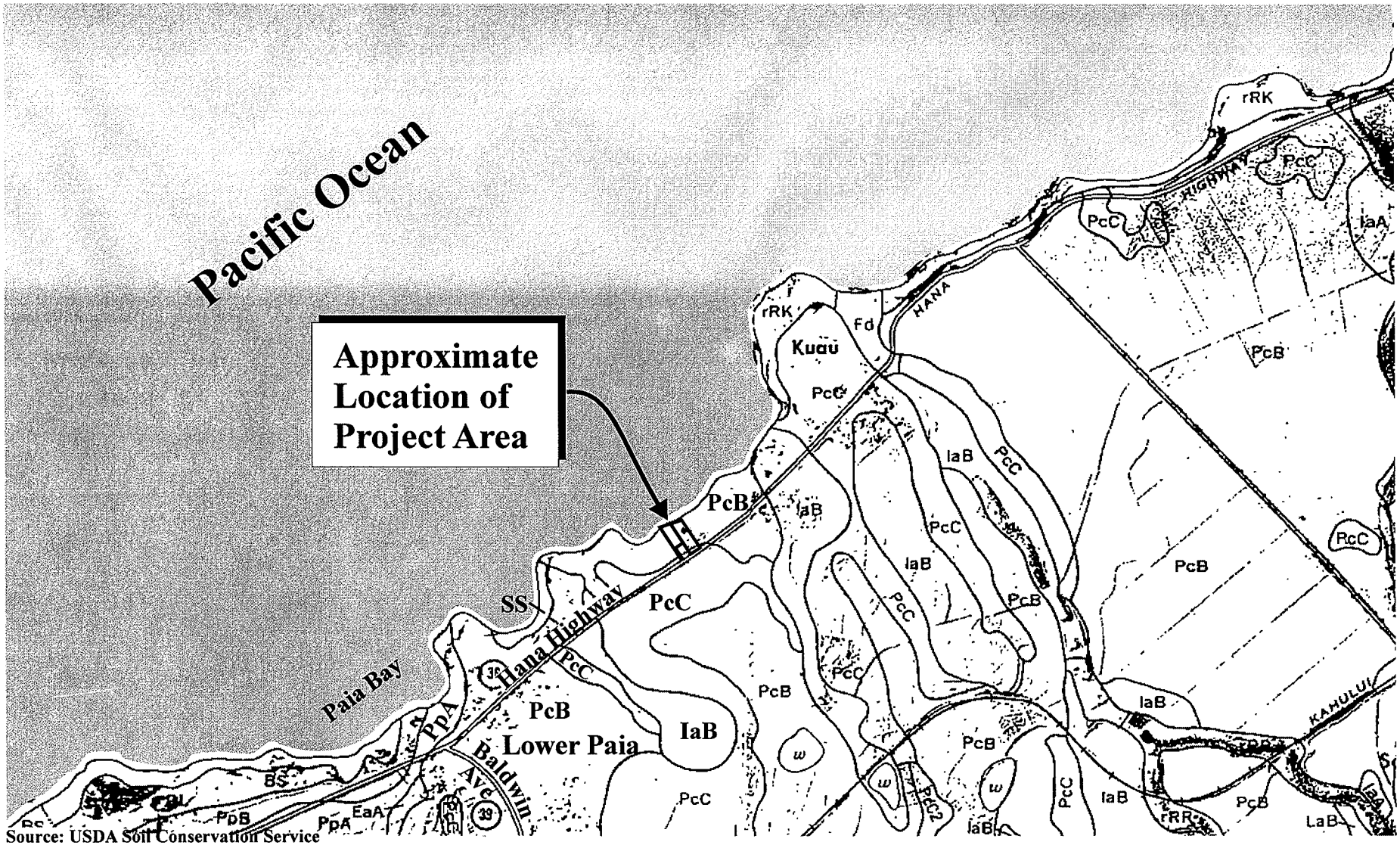
Cohen/KuauShoreline/SOILS



Source: USDA Soil Conservation Service

Figure 9

Proposed Shoreline Protection at TMK 2-6-009:005 and 021

Soil Classification Map

NOT TO SCALE

Prepared for: Argyropoulos/Goetzman

MUNEKIYO & HIRAGA, INC.

Coben/KuauShoreline/SOILCLAS

3. Flood and Tsunami Hazard

a. Existing Conditions

According to Panel Number 1500030183D of the Flood Insurance Rate Map (FIRM), the majority of the subject properties are located in an area designated as Flood Zone C, an area of minimal flooding. A portion along the shoreline is in Flood Zone "VE", an area representing coastal flood with velocity hazard (wave action) and with base elevations to be determined. There are no streams or wetlands in the vicinity of the subject properties. See **Figure 10**.

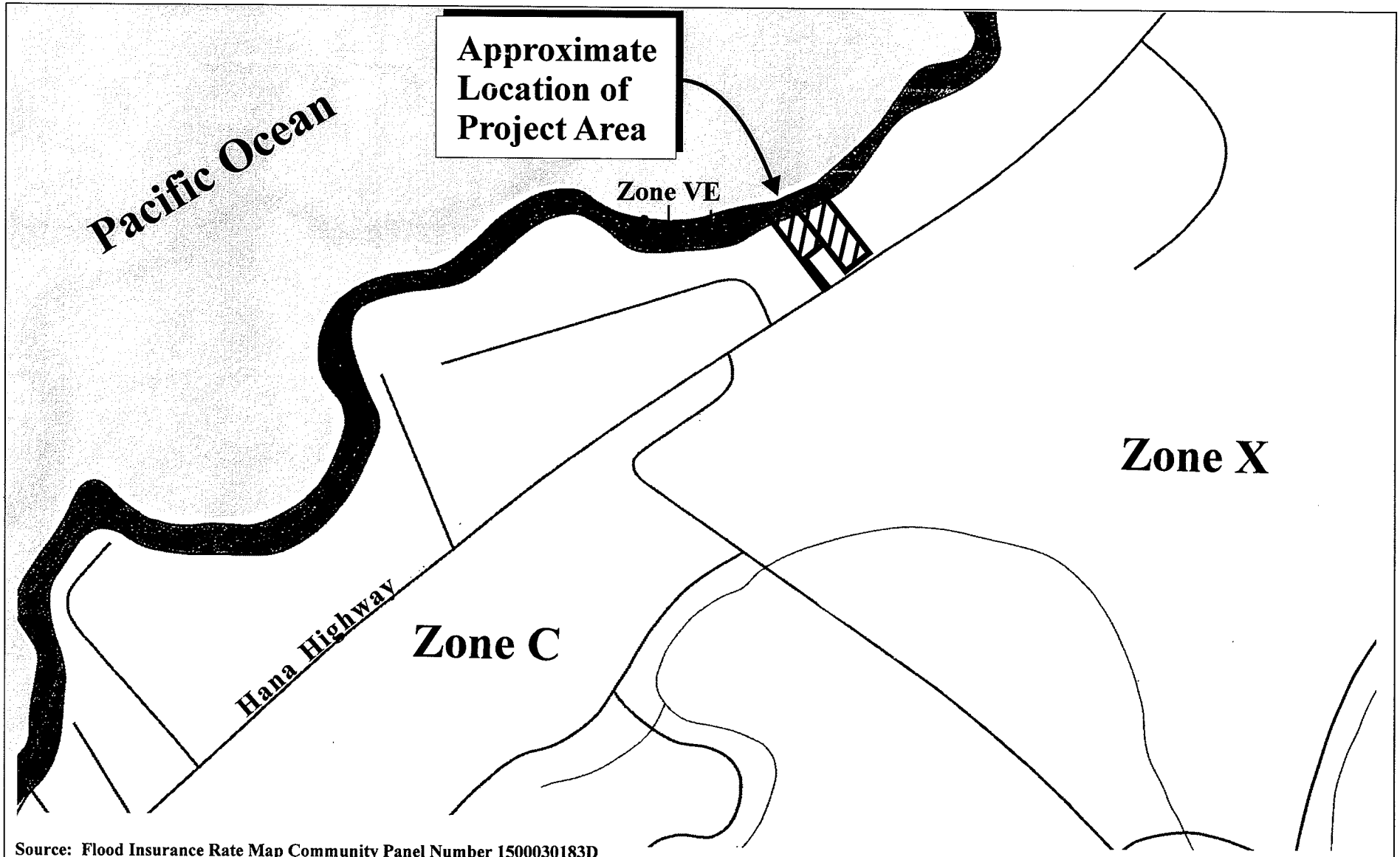
The north coast of Maui has been impacted by severe tsunami wave runup. Measured tsunami runup elevations (Loomis, 1976) in the immediate vicinity of the project site were 17 feet (relative to sea level) during the 1946 tsunami, 10 feet during the 1957 tsunami, and 11 feet during the 1960 tsunami. Refer to **Appendix "A"**.

b. Potential Impacts and Mitigation Measures

No adverse impacts to existing drainage conditions or downstream properties are anticipated in connection with the development of the proposed project. The proposed improvements will occur within the Flood Zone "VE" portion of the subject properties and will be designed in compliance with Special Flood Hazard Area (SFHA) permitting requirements.

Further, an analysis of wave and storm conditions was conducted to determine design wave height and water level prior to design of the hybrid revetment/seawall structures. The process involved analyzing available historical extreme event frequency and data, as well as modeling results for both extreme and prevailing waves.

The project site is exposed to north swell that regularly exceeds deepwater wave heights of 20 feet, and therefore the shore protection must be designed to withstand an extreme north swell wave. Wave hindcast data from the U.S. Army Corps of Engineers' Wave Information Studies (WIS) data set was used in the analysis. The annual highest waves from the WIS 101 data set were obtained ranging from 19.6 feet to 31.9 feet in height and the



Source: Flood Insurance Rate Map Community Panel Number 1500030183D

Figure 10

Proposed Shoreline Protection at TMK 2-6-009:005 and 021

Flood Insurance Rate Map

0 500 Feet
250 1000

Prepared for: Argyropoulos/Goetzman

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Cohen/KuauShoreline/FIRM

corresponding wave periods ranging from 14.8 seconds to 19.9 seconds. To obtain design wave heights and wave period, the 25-year wave was selected as representative of a severe storm condition and a wave period of 18 seconds was chosen as the corresponding wave period. The hybrid revetment/seawall structure has been designed to withstand an extreme north swell wave. Refer to **Appendix "A"**.

4. Flora and Fauna

a. Existing Conditions

The existing residential sites are landscaped. Plant species on the properties are cultivated and include introduced species such as plumeria trees and shrubs. Fauna found at the site are typical of the Kuau area and include such introduced species as mongoose, rats, mynahs, and francolins.

b. Potential Impacts and Mitigation Measures

The removal of existing non-native landscaping from the property due to the proposed project is not anticipated to present negative impacts on flora or fauna parameters.

5. Near Shore Environment

a. Existing Conditions

The coastline between Kahului and Kuau consists of a series of narrow sand beaches separated by low-lying rocky headlands. A fringing reef, varying in width from 2,000 to 5,000 feet, lies off this six-mile long coastal sector. The reef is a few feet deep near the shoreline and slopes gradually to depths of 10 to 30 feet at its seaward edge.

The project site is located on Kuau Bay near the town of Pa`ia, Maui. Kuau Bay is bordered by Tavares Bay to the east and the two (2) bays are a combined 2,400 feet wide. The reef is located 1,500 to 2,000 feet from shore and contains the surf break referred to as "Tavares Bay". The reef is less than three (3) feet deep in some places.

The nearshore bathymetry includes a protected channel parallel to shore that

is frequented by users such as surfers, paddlers, and swimmers. Offshore there is an existing sand channel and fringe reef. A rock bench formation is also located about 60 feet offshore of the revetment fronting Parcel 21 rising to an elevation of up to +2 feet Mean Sea Level (MSL). The rock bench creates a protected area that is used by beach users.

The water level for high prevailing conditions is found from the Coastal Data Information Program (CDIP) buoy data as wave height 9 feet and period 16 seconds. This wave represents the high prevailing condition - 90 percent of the waves on record have lower wave heights and shorter periods. This deepwater wave would have a breaking height of 14.9 feet, which would produce a wave setup of 1.7 feet. The high prevailing water level is found to be 4.5 feet, as shown in **Table 2.**

Table 2. Stillwater Level Rise Components

Component	Extreme Event	High Prevailing Event
Astronomical Tide	2.3 ft.	2.3 ft.
Wave Setup	6.0 ft.	1.7 ft.
Super-elevation (eddy)	0.5 ft.	0.5 ft.
Total Water Level Rise (MLLW*)	8.8 ft.	4.5 ft.
* MLLW is mean lower low water.		
Source: Sea Engineering, Inc.		

b. Potential Impacts and Mitigation Measures

During high wave conditions, the nearshore water level may be elevated above the tide level by the action of breaking waves offshore. This water level rise, termed wave setup, is typically 10 percent to 13 percent of the breaker height. Thus, the water level could be elevated by several feet during severe storm wave conditions. During hurricane conditions, an additional water level rise due to wind stress and reduced atmospheric pressure can occur. Collectively termed "storm surge," this can potentially add another 1 to 2 feet to the stillwater level.

The possible stillwater level rise at the project site is an important design parameter because in coastal areas protected by shallow reefs, the size of the waves impacting the shoreline depends on the water depth, which includes

the stillwater level rise due to tides, wind and wave setup, and atmospheric pressure effects. Data on still water level rise is available from actual NOAA water level measurements, as well as from wave transformation calculations. Still water level rise will, therefore, increase the size of nearshore waves.

At lower water levels, the wave energy is dissipated when the waves break offshore and the energy reaching the shoreline is quite small. Higher water levels result in higher wave energy reaching the shoreline, and therefore, increased wave runup and wave forces on the structures. The highest prevailing water level condition would be a mean higher high water (MHHW) tide plus wave setup caused by the design breaking wave. Wave setup is a function of the breaking wave height, period, and bottom topography. The project site is exposed to waves from northwest through northeast. While all of these waves would lose some energy through refraction, a wave approaching with a deepwater direction from the north-northwest would experience the least refraction. For design purposes, the design wave is considered to approach from the north-northwest, which will yield a more conservative result.

The design water level at the project site would be MHHW plus wave setup caused by the extreme design wave. MHHW was presented as 2.26 feet at Kahului Harbor and the 25-year wave, which is the selected extreme design wave height, breaks with a height of 48.8 feet. Wave setup for the case of a 48.8-foot high breaking wave with a period of 18 seconds is 6.0 feet (Shore Protection Manual, 1984). The extreme water level is, therefore, taken to be 8.8 feet above MLLW, as shown in **Table 2**.

The recommended hybrid shoreline protection structure will be designed to accommodate the anticipated storm waves for the area as well as provide for the least wave reflection during the majority of wave conditions. By limiting the height of the revetment portion to about half of the overall height of the hybrid structure, the horizontal extant can be limited to the existing footprint, and the sand channel will not be impacted. Refer to **Appendix "A"**.

6. Archaeological Resources

a. Existing Conditions

The subject properties are developed and located in a residential area in the community of Kuau. The project site has been extensively altered from

previous construction activity involving the existing deteriorated seawall. An archaeological inventory survey has not been conducted for the project due to developed conditions of the subject properties.

There are no records of previous archaeological work within or adjacent to the project area. However, a number of archaeological studies were conducted on Parcel 23 (Kaulahao Beach) to the west of the project site. The Kaulahao Site (50-50-05-1064) encompasses a 120 meter-long section of the shoreline. The easternmost known extant of the Kaulahao Site is approximately 800 feet west of Parcel 1. The finds were primarily burials located along the shoreline within the exposed face of the sea cliff. In 1983, 21 burial pits were documented along the exposed face of the sea cliff as well as intact fireplaces and habitation midden. Between 1983 and 1997 a total of 42 exposed and/or disturbed burials were recovered from the site. Since 2001, the site has been under relatively continuous monitoring by the County of Maui, over 20 additional burials have been recovered from the shoreline (Draft Environmental Assessment Blue Tile Beach House Coastal Erosion Mitigation Plan, October 2008).

An inventory conducted on the mauka former sugar cane field inland of the Kaulahao site found no subsurface features or habitation deposits. Based on these previous surveys it appears that the Kaulahao Site is confined to the coastal sand dune formation. Archaeological records indicate that the shoreline area of Kaulahao was the setting for permanent habitation during the pre-contact era, and was a preferred location for burial during both the pre-contact and early historic through modern eras. In areas where past habitation occurs, it is within the upper soil layers, in sandy alluvial silt or aeolian sand deposits. Cultural layers have not been identified within the silty clay subsoil present in the project location area.

b. <u>Potential Impacts and Mitigation Measures</u>

Due to the proximity of the project area to the shoreline, as well as the documentation of traditional Native Hawaiian burial internments and cultural layers in the vicinity of the subject properties particularly near the shoreline at the western end of Kaulahao Beach, ground-disturbing activities for the proposed improvements will be monitored. Therefore, an archaeological monitoring plan will be submitted to the State Historic Preservation Division

(SHPD) for review and approval prior to initiation of ground altering activities. Should any archaeological remains or cultural materials be encountered during construction and excavation activities, work in the vicinity of the find will cease and the SHPD will be contacted to establish appropriate mitigation measures in accordance with Chapter 6E, Hawai`i Revised Statutes.

7. Historic and Cultural Resources

a. Cultural Perspectives

As part of the cultural assessment, three (3) informants (Kama`aina) interviews were conducted to gain an understanding of likely cultural practices which occurred in the vicinity of the subject properties.

(1) Raymond Kokubun

Mr. Kokubun is a former Director of the Department of Personnel Services who has lived in the Kuau area since he was seven (7) years old. He lives west of Kaulahao Beach and the subject properties, on the lot of his childhood home between Holo Place and Lae Place. The property two (2) parcels east of parcel 21 was formerly owned by his uncle and later by his father.

Mr. Kokubun recalls being able to walk along the entire coastline from Kaulahao Beach to Kuau at Tavares Bay. He used to be able to walk on the hard clay to his uncle's property and used to be able to walk up from the beach to his uncle's house.

Mr. Kokubun recalls there was a natural small pond that formed in front of these properties between the nearshore reef and the hard clay. The hard clay used to extend almost to the reef. He recalls enjoying scraping the crust that formed on the hard clay after it rained and throwing it into the pond. He and his cousins would watch the crust form a kaleidoscope of color as it sank.

Mr. Kokubun recalls using the area for fishing. His father used to lay his net on the point east of Kaulahao Beach. They also used the area

for torching.

Mr. Kokubun remembers that when you walked along the shoreline on Kaulahao Beach you were able to see the bones that got unearthed. He remembers there used to be a cemetery in the area.

Although Mr. Kokubun is aware of the erosion in the area, he is against seawalls. He believes once something is gone you cannot get it back. According to Mr. Kokubun seawalls are known to affect adjacent neighbors. He is concerned that the neighbors should be informed of the plans for a seawall.

(2) Juanita "Queenie" Hokoana

Ms. Hokoana's family has lived in the Kuau area since 1947. Her brother Alfredo Villanueva and her sister-in-laws continue to live in the area behind the Kuau Store. The Hokoana family once owned much of the land in Kuau and members of the family continue to reside in the area.

Ms. Hokoana remembers they used to swim from the area near Mama's Fish House to Kaulahao Beach. The area was good for swimming, surfing (near Tavares Bay) and fishing. Her family continues to use the area.

She recalls the sandy beach once extended from Kaulahao Beach to Tavares Bay. You could walk along the shoreline on the beach and hard clay. When she lived in Kuau the clay embankment was not as steep as it is today and you were able to walk from the beach up to the properties.

Ms. Hokoana recalls the nearshore reef fronting the properties that were ideal for young children because it was protected from the waves. She believes the reef still exists.

Ms. Hokoana recalls that at Kaulahao Beach the old road access used to come from the beach right-of-way driveway and curve along the

shoreline towards the point (west). She remembers on the curve there used to be an old cemetery. She believes the cemetery was on the ocean side of the road. The Kaulahao Beach area was known to have burials.

Ms. Hokoana voiced concerns over the erosion in the area. Her family owns property on the shoreline in Paia that is having the same problems where the house is about 20 ft. from the shoreline. She indicated that if she could afford to build a seawall she would probably do it to protect her property.

(3) <u>Allen Shishido</u>

Mr. Shishido works for the Department of Parks and Recreation and lived in the Kuau area as a child from 1952 to 1958 when his family moved to Honolulu. His father owned the property two lots east of parcel 21. It was later sold in 1958 to his uncle, Raymond Kokubun's father.

Mr. Shishido also recalled there was a sandy beach from the reef fronting the subject properties to Tavares Bay. The sandy beach extended 25 ft. or more from the properties. You were able to walk down the slope from the property to the beach.

He recalls that the fishing was amazing when he lived in the area. His family would gather food from the ocean. He remembers when he and his older brother went diving for food his mother would tell them what kind of fish she wanted, how big and how many. If she asked for kumu, forty-five minutes later they would come back with the fish she wanted.

The waters were clear and the coral reefs were alive. He believes it was because in the Maliko Gulch area the rock pebbles in the stream bed acted as a filter that removed the dirt from the storm runoff. But over the years people removed the rock pebbles from the gulch and today after heavy rains you can now see a film of muddy water from Maliko to Kahului Harbor.

Mr. Shishido recalls that around 1954 there was a tidal wave in the area. As the water receded he and his brother rushed down the bank to gather all the fish that were flapping on the beach. His father watched for the wave and when the wave started coming in yelled for them to get out. He remembers running up the bank before the wave hit. He recalls the tidal wave came up the bank but did not reach over the embankment.

He remembers that beside fishing he liked to paddle out in a tin boat with the Okuda family. Unfortunately, one day the boat sank and was never recovered.

Mr. Shishido indicated that he neither supports nor objects to building seawalls. The erosion problem in this area was already happening in 1958 when the rocks were dumped along the bank fronting the property. He felt it is unfortunate that people were allowed to build on the ocean side of Hana Highway. He predicts that within the next 50 years a number of houses will be gone due to the ongoing erosion.

Although the fishing is not as good, he continues to dive in the area. He uses the access on Kaulahao Beach to get to the ocean and would like to see improved beach parking.

b. <u>Impacts and Mitigation Measures</u>

Cultural informants expressed their concern for public access to the ocean. The area continues to be used for recreation and fishing and the public should continue to have access to the ocean. The inclusion of the proposed lateral access path along the revetment was seen as a positive measure.

One of the informants felt more homes will be impacted by the shoreline erosion and that it was unfortunate that there was not the foresight to prohibit use of the beach properties and keep it in open space. Because these properties are developed, the owners must seek the necessary permits to build a shoreline protection structure to reduce the erosion of the property and protect the existing structures on the parcels.

Based on the accounts presented by the interviewees, the proposed action is

not anticipated to have an adverse effect on cultural practices, provided access to the ocean continues.

8. Air Quality and Noise Characteristics

a. Existing Conditions

Air quality in the Kuau area is considered good as non-point sources of emissions, such as automobiles, do not generate problematic high concentrations of pollutants. The relatively high quality of the air can also be attributed to the region's constant exposure to the tradewinds which quickly disperse concentrations of emissions. This rapid dispersion is evident during the sugar cane burning operations in the fields surrounding Pa`ia.

Traffic noise generated by vehicles traveling along Hana Highway is the most notable source of background noise in the vicinity. The other major source is the Pacific Ocean, located to the north of the subject properties. The former HC&S Pa`ia Sugar Mill, located just above Pa`ia Town and a major source of air and noise emissions in the past, is no longer operational.

b. Potential Impacts and Mitigation Measures

Air quality impacts attributed to the project will include dust generated by short-term construction related activities. Site work, such as removal of existing structures and clearing and grubbing, for example, will generate air-borne particulates. Best Management Practices (BMPs) incorporating various dust control measures, such as regular watering and sprinkling, will be implemented, as necessary, to minimize wind-blown emissions.

Ambient noise conditions will be temporarily impacted during the construction of the proposed development. Construction equipment such as bulldozers, front-end loaders, and trucks/trailers would be the dominant source of noise during the construction period. To reduce disturbance to neighboring properties, construction activities would be limited to normal daylight working hours.

There are no significant long-term air quality or noise impacts anticipated as a result of the proposed project.

9. Water Quality

a. Existing Conditions

From observation, during storm periods the turbidity in the area has a temporary impact on water quality due to the movement of sand from Kaulahao Beach and erosion of the clay escarpments. At present there are no water quality data for the area. The applicants will obtain a consultant to obtain base line water quality for the area prior to the initiation of construction. Refer to **Appendix "B"**.

b. Potential Impacts and Mitigation Measures

The following Best Management Practices will be adhered to during construction:

1. The contractor shall perform the work in a manner that minimizes environmental pollution and damage as a result of construction operations. Environmental resources outside the limits of construction shall be protected during the construction period.

2. The contractor shall confine all construction activity to areas defined by the construction plans. No construction material shall be placed or stockpiled outside of the immediate area of construction.

3. All construction materials shall be free of contaminants or pollutants. No debris, petroleum products, or other construction-related substances or materials will be allowed to flow, fall, leach, or otherwise enter the coastal waters. No construction equipment shall operate in the water.

4. A dust control program will be implemented and windblown dust shall be prevented from blowing into the water by watering when necessary. All excavated material will be placed on the land behind the excavation and contained within soil or sandbag berms to prevent any runoff back into coastal waters.

5. No discharge of dewatering effluent back into coastal waters will be permitted.

6. 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.

7. 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.

The applicants will hire a consultant to prepare and implement a water quality monitoring program for the project. The program will include collection of base line water quality data prior to the initiation of construction in order to measure any degradation of water quality that may be attributable to the construction activity. Refer to **Appendix "B"**.

10. Scenic and Open Resources

a. Existing Conditions

The subject properties are situated adjacent to the shoreline. Looking west, the northern reaches of the West Maui Mountains are visible. To the southeast, Haleakala rises above Kuau. The subject properties are currently developed with existing residences that obstruct any views to the shoreline from the coastal highway, Hana Highway. The project area is not located in a scenic view corridor.

b. Potential Impacts and Mitigation Measures

The proposed action is limited to construction of a shoreline protection structure, a portion of which will extend seaward of the existing residences on the properties. The proposed structure will not adversely affect the surrounding view planes to the ocean due to the existing obstructions.

B. SOCIO-ECONOMIC ENVIRONMENT

1. Regional Land Use and Community Character

a. Existing Conditions

The Kuau area is considered part of the Pa`ia Community. The community of Pa`ia is one of mixed commercial and residential uses. Kahului lies to the west and is the island's center of commerce. The expanding residential communities of Kuau and Ha`iku lie to the east. The Pa`ia-Ha`iku region is largely agricultural and rural in character. The primary agricultural activity is sugar cane cultivation.

Although Pa`ia is a primary urban center within the region, it retains a "small town" scale and nature. The Pa`ia commercial town core is situated around the intersection of Hana Highway and Baldwin Avenue. Existing residential development is generally concentrated around the commercial core, between Pa`ia Town and Kuau, and along Baldwin Avenue to Skill Village, above the former Pa`ia Mill.

b. Potential Impacts and Mitigation Measures

The proposed action is anticipated to have a positive economic effect during the construction phase of development as expenditures for construction and related support services are made. In the longer term, the proposed structure will protect existing single-family residences and maintain the viability of the lots for residential purposes.

2. Population

a. Existing Conditions

Maui County has experienced strong growth in recent years. The resident population increased approximately 18.7 percent in the 10-year span from 1995 to 2005, from 117,895 to 139,995 (Maui County Data Book, 2006). Growth in the County is expected to continue with the resident population projected to increase to 151,300 by 2010 and 174,450 by 2020 (Socio-Economical Forecast, The Economic Projections for the Maui County

General Plan 2030 prepared for the Maui County Planning Department, June 2006).

The population of the Pa`ia-Ha`iku region increased at greater rates than the County as a whole. In the 10-year span from 1990 to 2000, the population of the Pa`ia-Ha`iku region grew by 52 percent, from 7,788 to 11,866 persons. The regional population is projected to grow to 13,662 in 2010, and 14,594 in 2015 (Socio-Economical Forecast, The Economic Projections for the Maui County General Plan 2030 prepared for the Maui County Planning Department, June 2006).

b. Potential Impacts and Mitigation Measures

The proposed action is not anticipated to have significant adverse impacts on population. No increase in dwelling units are being proposed.

3. Economy

a. Existing Conditions

Pa`ia Town is the primary urban center of the region. The existing residential development that supports the town is generally concentrated around the commercial core, between Pa`ia Town and Ku`au, and along Baldwin Avenue to Skill Village above the Pa`ia Mill. Over the past ten (10) years, windsurfing has grown into a major sport, adding to other traditional activities in this North Shore area. The primary agricultural activity is sugar cane cultivation.

In January 2009, Maui County and the island of Maui unemployment rates were 7.4 percent and 7.3 percent, respectively (Labor and Occupational Information Hawai`i, State Department of Labor and Industrial Relations, 2009). Maui County's unemployment rate is above the statewide unemployment rate of 6.1 percent. The Maui island unemployment rate in January 2009 is 4.4 percent above the January 2008 unemployment rate of 2.9 percent.

b. Potential Impacts and Mitigation Measures

On a short-term basis, the project will support construction and construction-related employment. Accordingly, the project will have a beneficial impact on the local economy during the period of construction.

From a long-term perspective, the proposed project will protect existing single-family residences and maintain the viability of the lots for residential purposes.

C. PUBLIC SERVICES

1. Police and Fire Protection

a. Existing Conditions

The County of Maui's Police Department is headquartered in the Wailuku Station. There are three (3) patrol divisions on the island of Maui. These are the Wailuku, Lahaina, and Hana divisions. The Wailuku division covers Central Maui, Pa`ia-Ha`iku, Kihei-Makena, and Upcountry Maui.

Fire prevention, suppression, and protection services for the project area are provided by the County Department of Fire and Public Safety. The Pa`ia Fire Station, which serves the region, is located along Hana Highway within close proximity to the project area. The Makawao and Kahului Fire Stations lend additional fire fighting support to the Pa`ia region and are situated approximately 11.1 miles and 6.4 miles away from Pa`ia Town, respectively.

b. Potential Impacts and Mitigation Measures

The proposed action is not anticipated to have a significant impact on police and fire protection services. In addition, the existing operational limits of these services are not expected to be extended or affected.

2. Medical Facilities

a. Existing Conditions

Maui Memorial Medical Center services the Pa`ia-Ha`iku region and is considered the major medical facility on the island. Acute, general, and emergency care services are provided by the approximately 231-bed facility located in Wailuku. Numerous privately operated medical/dental clinics and offices including the Kaiser Permanente facilities are located in Kahului, approximately 7 miles away from subject properties.

b. Potential Impacts and Mitigation Measures

The proposed action is not anticipated to adversely affect medical services in the area.

3. Solid Waste

a. Existing Conditions

Single-family solid waste collection is provided by the County of Maui, on a once-per-week basis. Residential solid waste collected by County crews are disposed at the County's Central Maui Landfill, located four (4) miles southeast of the Kahului Airport. In addition to County-collected refuse, the landfill accepts commercial waste from private collection companies.

b. Potential Impacts and Mitigation Measures

A solid waste management plan will be developed for the disposal of materials resulting from the site and construction activities, as appropriate. Once completed, no additional solid waste is anticipated from the project, and is not expected to affect County services or infrastructure capacities for solid waste.

4. Recreational Facilities

a. Existing Conditions

Situated west of the project is a County beach park known as Kaulahao Beach

or "Blue Tile" beach park. Kaulahao Beach is a sandy beach that is experiencing beach erosion, at a rate of approximately 1 ft. (Transect 16) to 1.8 ft. (Transect 7) annually (Maui Shoreline Atlas, North Shore).

The area fronting the subject properties contains a narrow channel between the shoreline and an offshore reef outcropping that is used by recreational users. Except for a small portion fronting Parcel 21, most of the shoreline fronting the subject properties are made up of a hard clay embankment and rocks.

b. Potential Impacts and Mitigation Measures

The proposed shoreline protection improvements have been designed to reduce wave action that will create further erosion problems to the small pocket of sand west of Parcel 21. Further, the subject properties are separated from the larger Kaulahao Beach west of the properties by TMK (2) 2-6-009:001 (Parcel 1). The owner of Parcel 1 is also proposing a shoreline protection structure and is undergoing a separate environmental assessment and permitting process. The applicant is aware of these plans and has been in discussions with the adjacent property owner to coordinate their shoreline protection measures. In response to comments from Ms. Zoe Norcross-Nu'u, UH Sea Grant Extension Service, the State of Hawai`i and the County of Maui, the applicant revised its plans to incorporate the recommendations for a hybrid revetment/seawall structure in order to reduce the potential impacts from wave reflection on the narrow channel fronting the properties. The hybrid revetment/seawall includes an approximate four (4) ft. wide lateral accessway on top of the revetment portion of the structure. Based on the redesign of the structure, it is not anticipated that the structure will have an adverse impact on recreational resources.

5. Educational Facilities

a. Existing Conditions

The State Department of Education operates the Pa`ia and Ha`iku Elementary Schools (Grades K through 5). Private schools in the immediate area include the Doris Todd Memorial School (pre-K to Grade 8) in Pa`ia and the Horizons Academy in Ha`iku (Grades K through 8).

b. Potential Impacts and Mitigation Measures

The proposed action will not increase local population. The proposed action is not anticipated to affect existing educational facilities or resources.

D. INFRASTRUCTURE

1. Roadways

a. Existing Conditions

The subject property is bordered on the south by Hana Highway, a two-lane, two-way, State facility.

Access to the project properties are provided via existing driveways off of Hana Highway. Hana Highway is a State of Hawai`i roadway generally oriented in the east-west direction that serves as the primary access road along the northern coastline of Maui from Kahului to Hana.

b. Potential Impacts and Mitigation Measures

There will be construction related impacts on traffic during the construction phase involving the removal of debris and transport of construction materials to the site. Traffic monitors will be used at times when construction equipment and materials enter or leave the project area to maintain the orderly flow of traffic on the highway. Once construction is completed, additional traffic impacts are not anticipated.

2. Water

a. Existing Conditions

Fire and domestic water service for the Pa`ia-Haiku region is provided by the County of Maui, Department of Water Supply's (DWS) Central Maui Water System which is serviced by the Mokuhau Wells located in Wailuku.

An existing 12-inch waterline along Hana Highway fronting the project area currently services the domestic water and fire flow requirements of the

subject properties.

b. Potential Impacts and Mitigation Measures

The proposed structure will not require additional water and is not anticipated to adversely impact the County's water system.

3. Wastewater

a. Existing Conditions

The county's wastewater collection and transmission system and the Wailuku-Kahului Wastewater Treatment Plant (WKWTP) accommodate the region's wastewater needs. The WKWTP is located in Kahului. The cumulative wastewater flow currently allocated to the WKWTP is approximately 7.9 million gallons per day (MGD). Presently, it treats an average of approximately 5.5 MGD with the total allocation, including projects already permitted, of approximately 6.9 MGD.

Wastewater from the subject properties are currently conveyed to an existing sewer line on Hana Highway. The 8-inch sewer line on Hana Highway is part of the sewer system that conveys wastewater flows generated by Pa`ia town to the WKWTP.

b. Potential Impacts and Mitigation Measures

The proposed project is not anticipated to impact existing County wastewater collection and treatment facilities. No wastewater will be generated by the proposed project.

4. Drainage

a. Existing Conditions

Stormwater runoff currently sheet flows across Hana Highway, through the subject properties and eventually into the ocean. There are no drainage improvements along Hana Highway fronting the subject properties.

b. Potential Impacts and Mitigation Measures

Ground altering work for the project is limited to the area along the shoreline. During construction appropriate BMPs identified in **Appendix "A"** will be implemented to reduce erosion and degradation of the nearshore waters. Upon completion of construction, the drainage pattern through the property should remain unchanged.

5. Electric, Telephone and Cable TV

a. Existing Conditions

The existing electrical, telephone, and cable TV distribution systems in the vicinity of the subject properties are located overhead along Hana Highway. Service to the existing residence is from these facilities.

b. Potential Impacts and Mitigation Measures

The proposed project does not involve connection to existing services and no impacts to the electric, telephone, and cable TV facilities are anticipated.

E. CUMULATIVE AND SECONDARY IMPACTS

Cumulative impacts are defined as impacts on the environment which result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions.

The proposed project is not part of a larger action, nor would it occur within the context of such actions. There are no direct community growth impacts resulting from or occurring with the project. There are no other infrastructure projects anticipated within the project context. The scope of the proposed project is limited to the construction of shoreline protection involving a hybrid rock revetment and seawall.

Secondary impacts are those which have the potential to occur later in time or farther in distance, but are still reasonably foreseeable. They can be viewed as actions of others that are taken because of the presence of the project. Secondary impacts from highway projects, for example, can occur because they can induce development by removing one of the impediments to growth-transportation access.

There are no foreseeable secondary impacts associated with the proposed shoreline protection project. It is not considered a generating component for population, nor will it place additional burden upon infrastructure or the environment.

III. RELATIONSHIP TO LAND USE PLANS, POLICIES AND CONTROLS

III. RELATIONSHIP TO LAND USE PLANS, POLICIES AND CONTROLS

A. STATE LAND USE DISTRICTS

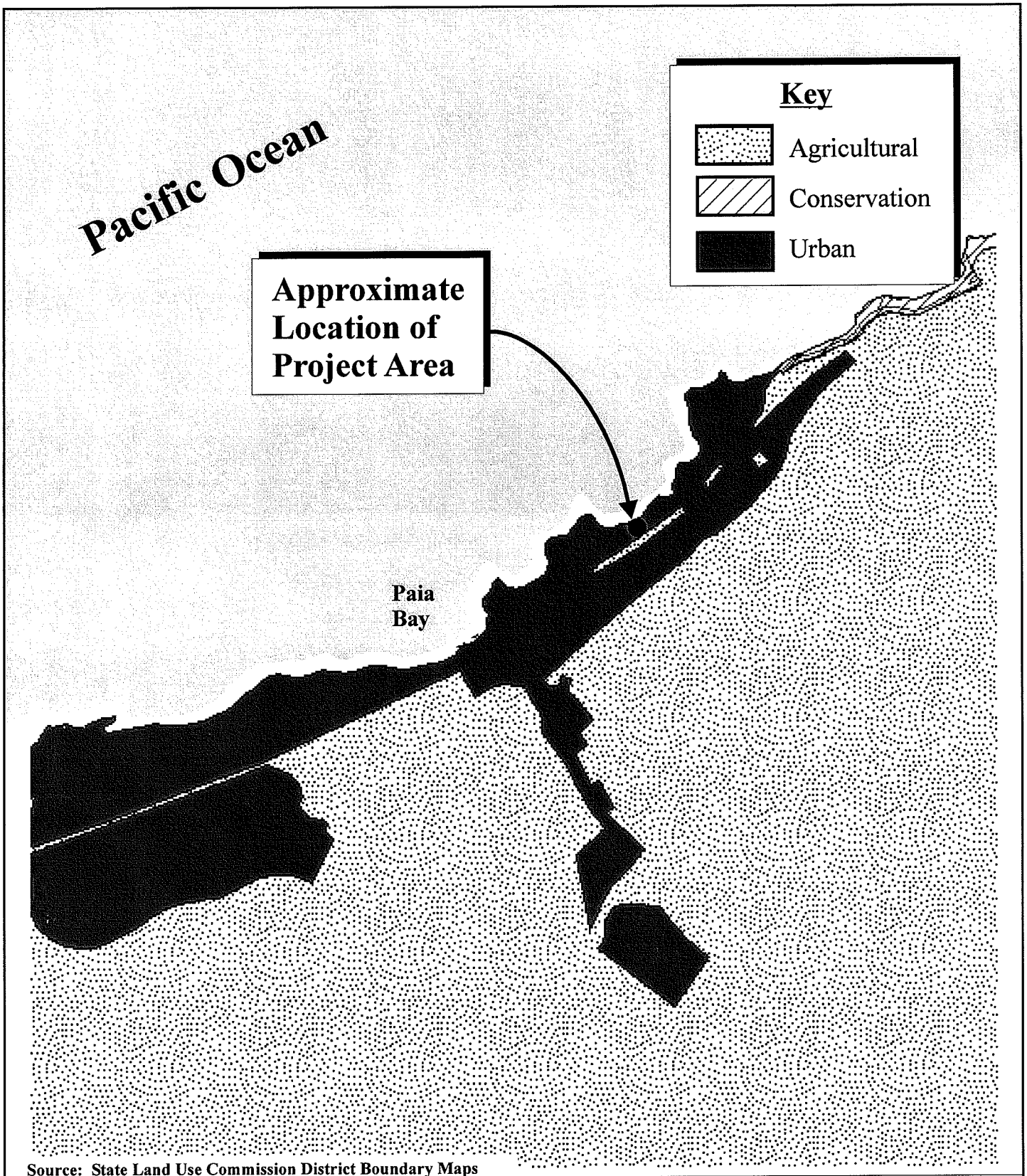
Chapter 205, Hawai`i Revised Statutes, relating to the Land Use Commission, establishes four (4) major land use districts in which all lands in the State are classified. These districts are designated as "Urban", "Rural", "Agricultural", and "Conservation". The subject properties are located within the "Urban" district and the existing residential uses on the property are permitted. See **Figure 11**. Portions of the proposed shoreline structure will be located on State lands seaward of the properties. The State lands are located in the "Conservation" district.

Pursuant to Section 13-5-13 of the Department of Land and Natural Resources Hawai`i Administrative Rules, the Resource subzone includes "*Lands and state marine waters seaward of the upper reaches of the wash of waves, usually evidenced by the edge of vegetation or by the debris left by the wash of waves on shore to the extent of the state's jurisdiction, unless placed in a (P) or (L) subzone*". The proposed shoreline protection structure will be located on State lands seaward of the upper reaches of the wash of waves and will be located in the Resource subzone. Uses permitted in the Protective and Limited subzones are also permitted in the Resource subzone. Seawalls, shoreline protection devices, and shoreline structures are identified as permitted uses in the Limited subzone subject to a permit from the Board of Land and Natural Resources. The applicant is seeking a Conservation District Use Permit from the Board for the proposed shoreline protection structure, as well as a Grant of Lease for the use of state lands.

The proposed shoreline protection structure meets the objective of the Resource subzone. In addition to protecting the subject properties from further erosion, it will enhance public access along the shoreline and eliminate an existing hazardous condition while sustaining the continued use of the natural resources of the area.

B. MAUI COUNTY GENERAL PLAN

The Maui County General Plan (1990 Update) sets forth broad objectives and policies to help guide the long-range development of the County. As stated in the Maui County Charter:



Source: State Land Use Commission District Boundary Maps

Figure 11 Proposed Shoreline Protection at TMKs 2-6-009:005 and 021
State Land Use District Classifications

NOT TO SCALE

Prepared for: Argyropoulos/Goetzman

MUNEKIYO & HIRAGA, INC.

Cohen/KuauShoreline/SLUC

The general plan shall indicate desired population and physical development patterns for each island and region within the county; shall address the unique problems and needs of each island and region; shall explain the opportunities and the social, economic, and environmental consequences related to potential developments; and shall set forth the desired sequence, patterns and characteristics of future developments. The general plan shall identify objectives to be achieved, and priorities, policies, and implementing actions to be pursued with respect to population density, land use maps, land use regulations, transportation systems, public and community facility locations, water and sewage systems, visitor destinations, urban design, and other matters related to development.

The Maui County General Plan contains five (5) major Themes. Theme No. 3 states "Protect Maui County's Shoreline and Limit Visitor Industry Growth". The proposed shoreline protection will protect existing dwellings from storm wave action that have steadily eroded an existing hard clay embankment located along an essentially rocky shoreline and undermined existing structures that limit lateral shoreline access. The protection of the shoreline from further erosion will maintain the viability of the lots for residential purposes and meet the housing objectives. The applicant proposes to include provisions for lateral shoreline access on top of the revetment portion of the shoreline protection structure.

The proposed action is in keeping with the following General Plan objective and policies:

ENVIRONMENT

Objective:

2. To use the County's land-based physical and ocean-related coastal resources in a manner consistent with sound environmental planning parameters.

Policies:

a. Preserve, enhance and establish traditional and new environmentally sensitive access opportunities for mountain and ocean resources.

d. Discourage all types of shoreline development that impact on traditional community or native activities which include food gathering, religions and recreational uses.

CULTURAL RESOURCES

Objective:

1. To preserve for present and future generations the opportunity to know and experience the arts, culture and history of Maui County.

Policies:

b. Encourage the recordation and preservation of all cultural and historic resources, to include culturally significant natural resources.

C. PA`IA-HAIKU COMMUNITY PLAN

Within Maui County, there are nine (9) Community Plan regions. From a General Plan implementation standpoint, each region is governed by a Community Plan which sets forth desired land use patterns, as well as goals, objectives, policies, and implementing actions for a number of functional areas including infrastructure-related parameters. The subject properties are located within the Pa`ia-Haiku Community Plan region.

The subject parcels are located on lands currently designated as "Single-Family Residential" in the Paia-Haiku Community Plan. See **Figure 12**.

The proposed action is consistent with the following goals, objectives and policies of the Pa`ia-Haiku Community Plan:

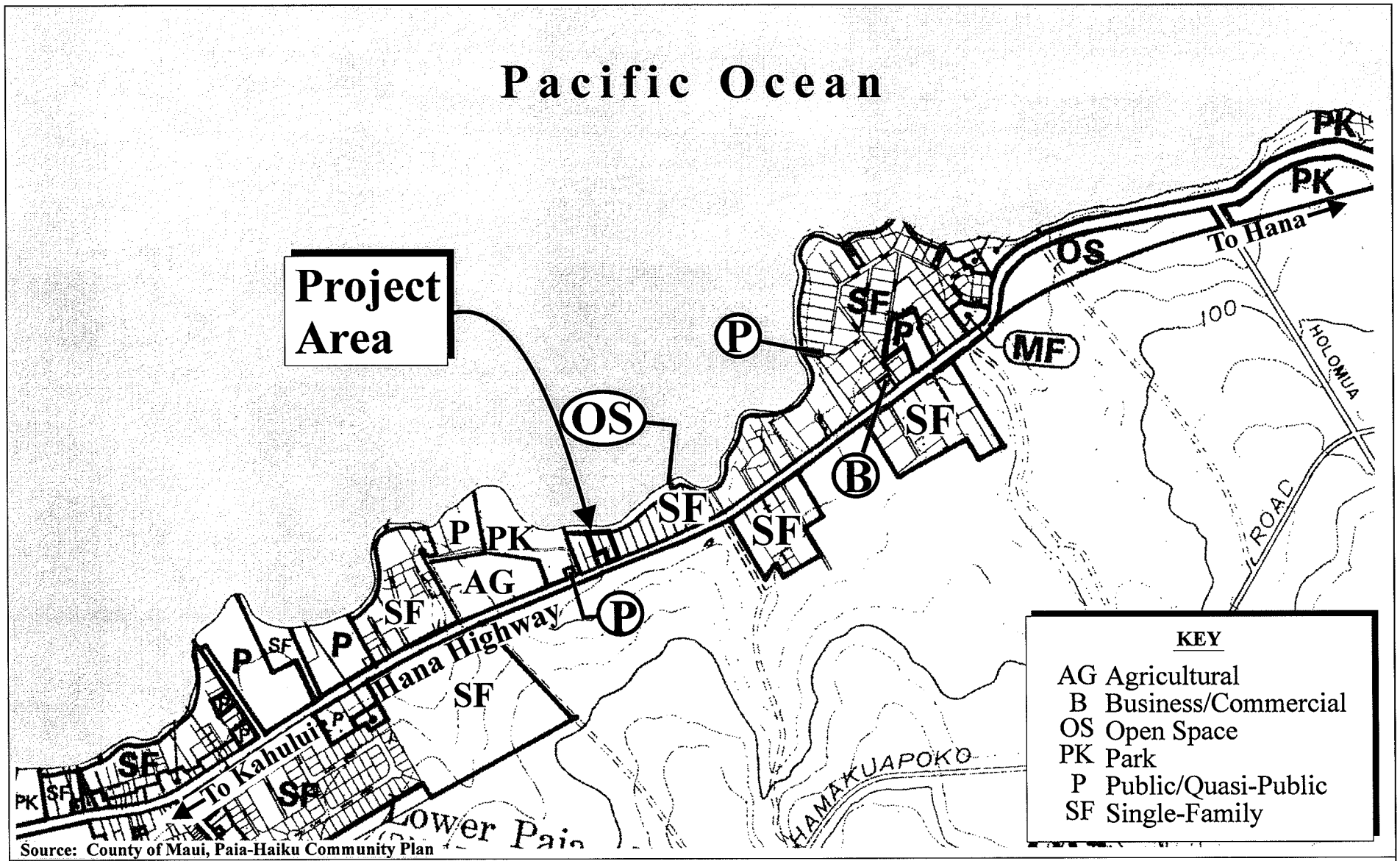
Land Use (Goal):

A well-planned community that preserves the region's small town ambiance and rural character, coastal scenic vistas, and extensive agricultural land use, and accommodates the future needs of residents at a sustainable rate of growth and in harmony with the region's natural environment, marine resources, and traditional uses of the shoreline and mauka lands.

Objectives and Policies:

1. Protect the marine environment and quality of the offshore waters.

2. Preserve important scenic vistas and shoreline resources of the region.



Source: County of Maui, Paia-Haiku Community Plan

Figure 12

Proposed Shoreline Protection at TMKs 2-6-009:005 and 021

Pa`ia-Ha`iku Community Plan Designations Map

0 500 Feet
250 1000

Prepared for: Argyropoulos/Goetzman

MUNEKIYO & HIRAGA, INC.

Cohen/KuauShoreline/Paia-Haiku Community Plan

ENVIRONMENT

Goal

The preservation and protection of the natural environment, marine resources and scenic vistas to maintain the rural and natural ambiance and character of the region.

Objectives and Policies

1. Preserve and protect scenic vistas along Hana Highway.

2. Preserve the shoreline sand dune formations throughout the planning region. These topographic features are a significant element of the natural setting and should be protected from any actions which would detract from their scenic, cultural or ecological value.

8. Protect and maintain the quality of the nearshore and offshore waters and marine environment. Ensure that storm water runoff and siltation from the proposed development will not adversely affect the marine environment and nearshore and offshore water quality. Open culverts which empty directly into nearshore waters should be avoided.

CULTURAL RESOURCES

Goal

Identification, protection, preservation, enhancement and appropriate use of cultural resources, cultural practices and historic sites that provide a sense of history and define a sense of place for the Pai'a-Haiku region.

Objectives and Policies

1. Encourage and protect traditional mauka and makai accesses, cultural practices and rural lifestyles. Protect traditional hunting, fishing and gathering.

2. Prevent the desecration of ancient and historic burial sites.

PHYSICAL INFRASTRUCTURE

Drainage

Goal

Improvements to the storm drain system which provide for a high standard in preventing flooding and property damage while not adversely affecting the marine environment and

nearshore and offshore water quality.

Objectives and Policies

1. Ensure that storm water runoff and siltation from proposed development will not adversely affect the marine environment and nearshore and offshore water quality. Open culverts which empty directly into nearshore waters should be avoided.

D. COUNTY ZONING

The subject properties are currently zoned "R-1 Residential" by the County of Maui. The proposed seawall structure is designed to protect the residential lots and is ancillary to the existing residential use of the property.

E. SPECIAL MANAGEMENT AREA OBJECTIVES AND POLICIES

The proposed project site is located within the County of Maui's Special Management Area (SMA). Pursuant to Chapter 205A, Hawai`i Revised Statutes, and the SMA Rules and Regulations for the Maui Planning Commission, actions proposed within the SMA are evaluated with respect to SMA objectives, policies and guidelines. This section addresses the proposed action as related to applicable coastal zone management considerations, as set forth in Chapter 205A and the Rules and Regulations of the Maui Planning Commission.

(1) Recreational Resources

Objective:

Provide coastal recreational opportunities accessible to the public.

Policies:

(A) Improve coordination and funding of coastal recreational planning and management; and

(B) Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by:

(i) Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas;

(ii) Requiring replacement of coastal resources having significant

recreational value including, but not limited to, surfing sites, fishponds, and sand beaches, when such resources will be unavoidably damaged by development; or requiring reasonable monetary compensation to the state for recreation when replacement is not feasible or desirable;

(iii) Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value;

(iv) Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation;

(v) Ensuring public recreational uses of county, state, and federally owned or controlled shoreline lands and waters having recreational value consistent with public safety standards and conservation of natural resources;

(vi) Adopting water quality standards and regulating point and non-point sources of pollution to protect, and where feasible, restore the recreational value of coastal waters;

(vii) Developing new shoreline recreational opportunities, where appropriate, such as artificial lagoons, artificial beaches, and artificial reefs for surfing and fishing; and

(viii) Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the land use commission, board of land and natural resources, and county authorities; and crediting such dedication against the requirements of Section 46-6, HRS.

Response: The subject properties are shore-fronting properties. The area fronting the properties has limited lateral shoreline access due to the existing steep hard clay embankment and rocky shoreline conditions. The design of the structure includes provisions for lateral access that will allow access from the nearby Kaulahao Beach and adjacent westerly property. Further, the design of the structure was modified in accordance with the recommendations of the UH Sea Grant Extension Service, State of Hawai`i, and County of Maui to minimize wave reflection into the narrow channel fronting the properties to maintain the recreational use of the channel by surfers and kayakers.

(2) **Historic Resources**

Objective: Protect, preserve and, where desirable, restore those natural and manmade historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture.

Policies:

(A) Identify and analyze significant archeological resources;

(B) Maximize information retention through preservation of remains and artifacts or salvage operations; and

(C) Support state goals for protection, restoration, interpretation, and display of historic resources.

Response: The subject properties have undergone extensive ground altering work completed during construction of the existing residences. However, due to its location near the shoreline, archaeological monitoring will be conducted during ground altering activities. Appropriate archaeological monitoring protocols will be followed to protect historic and cultural resources.

(3) **Scenic and Open Space Resources**

Objective: Protect, preserve and, where desirable, restore or improve the quality of coastal scenic and open space resources.

Policies:

(A) Identify valued scenic resources in the coastal zone management area;

(B) Ensure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural landforms and existing public views to and along the shoreline;

(C) Preserve, maintain, and, where desirable, improve and restore shoreline open space and scenic resources; and

(D) Encourage those developments that are not coastal dependent to locate in inland areas.

Response: The project area is not located within a significant coastal view corridor. Although a shore-fronting property makai of Hana Highway, the proposed action is

not anticipated to result in adverse impacts to shoreline views or open space resources. The views to the shoreline are already obstructed by existing development on the properties.

(4) Coastal Ecosystems

Objective: Protect valuable coastal ecosystems, including reefs, from disruption and minimize adverse impacts on all coastal ecosystems.

Policies:

(A) Exercise an overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources;

(B) Improve the technical basis for natural resource management;

(C) Preserve valuable coastal ecosystems, including reefs, of significant biological or economic importance;

(D) Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses, recognizing competing water needs; and

(E) Promote water quantity and quality planning and management practices that reflect the tolerance of fresh water and marine ecosystems and maintain and enhance water quality through the development and implementation of point and nonpoint source water pollution control measures.

Response: To limit adverse impacts to coastal ecosystems, appropriate Best Management Practices (BMPs) and water quality monitoring will be carried out during construction activities.

(5) Economic Uses

Objective: Provide public or private facilities and improvements important to the State's economy in suitable locations.

Policies:

(A) Concentrate coastal dependent development in appropriate areas;

(B) Ensure that coastal dependent development such as harbors and ports, and

coastal related development such as visitor facilities and energy generating facilities, are located, designed, and constructed to minimize adverse social, visual, and environmental impacts in the coastal zone management area; and

(C) Direct the location and expansion of coastal dependent developments to areas presently designated and used for such developments and permit reasonable long-term growth at such areas, and permit coastal dependent development outside of presently designated areas when:

(i) Use of presently designated locations is not feasible;

(ii) Adverse environmental effects are minimized; and

(iii) The development is important to the State's economy.

Response: The project will provide employment opportunities during construction of the shoreline protection improvements. There are no significant long-term economic impacts associated with the proposed action. The protection of the shoreline properties will maintain the economic viability of the lots for residential purposes.

(6) Coastal Hazards

Objective: Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence and pollution.

Policies:

(A) Develop and communicate adequate information about storm wave, tsunami, flood, erosion, subsidence, and point and nonpoint source pollution hazards;

(B) Control development in areas subject to storm wave, tsunami, flood, erosion, hurricane, wind, subsidence, and point and nonpoint pollution hazards;

(C) Ensure that developments comply with requirements of the Federal Flood Insurance Program; and

(D) Prevent coastal flooding from inland projects.

Response: According to the Flood Insurance Rate Map for the area, the proposed seawall improvements will occur within Flood Zone "VE", an area subject to coastal flooding from storm wave action. Special Flood Hazard Area Permit requirements will be addressed for the project, as applicable. The proposed action is not

anticipated to increase the region's susceptibility to coastal hazards. The purpose of the project is to reduce the susceptibility of the properties to coastal erosion and protect existing residential structures.

(7) Managing Development

Objective: Improve the development review process, communication, and public participation in the management of coastal resources and hazards.

Policies:

(A) Use, implement, and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development;

(B) Facilitate timely processing of applications for development permits and resolve overlapping of conflicting permit requirements; and

(C) Communicate the potential short and long-term impacts of proposed significant coastal developments early in their life cycle and in terms understandable to the public to facilitate public participation in the planning and review process.

Response: The Hawai`i Revised Statutes, Chapter 343, environmental review and approval processes described in Chapter I, Section D of this report provides opportunities for public review and participation. Additional public review and participation will occur during the various permitting requirements for the project.

(8) Public Participation

Objective: Stimulate public awareness, education, and participation in coastal management.

Policies:

(A) Promote public involvement in coastal zone management processes;

(B) Disseminate information on coastal management issues by means of educational materials, published reports, staff contact, and public workshops for persons and organizations concerned with coastal issues, developments, and government activities; and

(C) Organize workshops, policy dialogues, and site-specific mediations to

respond to coastal issues and conflicts.

Response: As previously noted, public awareness of the project is being promoted through the HRS, Chapter 343 environmental review and the various permitting requirements for the project. The proposed project is not contrary to the objectives of public awareness, education and participation.

(9) Beach Protection

Objective: Protect beaches for public use and recreation.

Policies:

(A) Locate new structures inland from the shoreline setback to conserve open space, minimize interference with natural shoreline processes, and minimize loss of improvements due to erosion;

(B) Prohibit construction of private erosion-protection structures seaward of the shoreline, except when they result in improved aesthetic and engineering solutions to erosion at the sites and do not interfere with existing recreational and waterline activities; and

(C) Minimize the construction of public erosion-protection structures seaward of the shoreline.

Response: The proposed shoreline protection structure will protect the subject properties. The structure has been designed to allow improved lateral shoreline access from Kaulahao Beach. An approximate four (4) ft. wide accessway is incorporated above the revetment portion of the structure and provides for safer lateral access opportunities for the public.

Portions of the structure is located seaward of the shoreline due to the existing physical constraints on the properties. To reduce encroachment seaward and in accordance with recommendations of the State, County and UH Sea Grant Extension Service, the structure was redesigned as a hybrid structure consisting of a revetment at the lower portion of the structure and a seawall behind the revetment. It is anticipated that the redesign reduces impacts on the shoreline, especially on recreational users utilizing the narrow channel fronting the properties.

(10) Marine Resources

Objective: Promote the protection, use, and development of marine and coastal resources to assure their sustainability.

Policies:

(A) Ensure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial;

(B) Coordinate the management of marine and coastal resources and activities to improve effectiveness and efficiency;

(C) Assert and articulate the interests of the State as a partner with federal agencies in the sound management of ocean resources within the United States exclusive economic zone;

(D) Promote research, study, and understanding of ocean processes, marine life, and other ocean resources in order to acquire and inventory information necessary to understand how ocean development activities relate to and impact upon ocean and coastal resources; and

(E) Encourage research and development of new, innovative technologies for exploring, using, or protecting marine and coastal resources.

Response: To protect coastal marine resources, Best Management Practices (BMPs) and water quality monitoring will be implemented during all construction activities.

In addition to the foregoing objectives and policies, SMA permit review criteria pursuant to Act 224 (2005) provides that:

No special management area use permit or special management area minor permit shall be granted for structures that allow artificial light from floodlights, uplights, or spotlights used for decorative or aesthetic purposes when the light:

(1) Directly illuminates the shoreline and ocean waters; or

(2) Is directed to travel across property boundaries toward the shoreline and ocean waters.

Response: The proposed shoreline protection measures will not involve or result

in direct illumination of the shoreline or ocean waters, nor direct light across property boundaries towards the shoreline.

F. SHORELINE SETBACK RULES

The subject properties are shore-fronting parcels. The portion of the proposed shoreline protection structure located landward of the shoreline is subject to the Shoreline Setback Rules of the Maui Planning Commission. Pursuant to §12-203-15, Shoreline Setback Rules of the Maui Planning Commission:

> *...a shoreline area variance may be granted for a structure or activity otherwise prohibited by this chapter, if the commission finds in writing, based on the record presented; that the proposed structure or activity is necessary for or ancillary to:*
>
> *(9) Private facilities or improvements that may artificially fix the shoreline; provided that, the commission also finds that shoreline erosion is likely to cause hardship to the applicant if the facilities or improvements are not allowed within the shoreline area; and provided further, that; the commission imposed conditions to prohibit any structure seaward of the existing shoreline unless it is clearly in the public interest;*

The shoreline of the subject properties are currently fixed with an existing un-documented partially grouted rock wall that was constructed prior to the current property ownership. A portion of the rock wall and a stairway may be encroaching seaward into lands owned by the State of Hawai`i. The rock wall is in disrepair, portions of the rock wall and stairway have been severely undermined by wave action and it is currently a structural hazard in the shoreline area (State of Hawai`i lands). Refer to **Figure 3** and **Figure 4**. The existing rocks along the shoreline prevent safe lateral access from nearby Kaulahao Beach located west of the properties. During high tide the area along the shoreline fronting the subject properties is impassable. See **Figure 13**.

Although construction of a new shoreline protection structure will continue to artificially fix the shoreline, it will provide an improved engineering solution to the advancing erosion problem along this coastline. In accordance with recommendations of the UH Sea Grant Extension Service, State of Hawai`i and County of Maui, a hybrid structure is proposed. The hybrid structure consists of a lower rock revetment with a seawall behind the revetment portion of the structure. Also, a four (4) ft. wide lateral shoreline accessway will be provided

Source: Sea Engineering, Inc.

Figure 13

Proposed Shoreline Protection at TMK 2-6-009:005 and 021

Shoreline Photo Looking East Toward Parcel 5 from Parcel 21

Prepared for: Argyropoulos/Goetzman

MUNEKIYO & HIRAGA, INC.

Cohen/KuauShoreline/Viewlookeast

along the top of the revetment portion of the structure.

On Parcel 21 the erosion has advanced to approximately 20 ft. from the existing single-family residence. Without a new shoreline protection structure, the existing rock wall and stairway between the two (2) parcels will continue to fail and increase the hazards from falling debris. Without the new shoreline protection structure, the erosion on Parcel 21 will continue to advance toward the existing slab on grade dwelling until it is also threatened with structural failure.

Although the structures on Parcel 5 are further away from the shoreline, a comprehensive approach to the problem is being sought rather than waiting until said structures are threatened. Waiting for the structures on Parcel 5 to be threatened increases the threat of flank erosion on the eastern boundary of Parcel 21 if the shoreline boundary is allowed to recede. Flank erosion will not occur on the western boundary of Parcel 21 since the adjacent westerly parcel has filed a separate application for shoreline protection measures. The proposed shoreline protection structure fronting the subject properties will tie into the adjacent proposed seawall. The transition or tie in to the adjacent property will depend on the design of the structure ultimately approved by the State of Hawai`i and County of Maui.

The engineering solution has sited the shoreline protection structure on Parcel 21 as landward as possible, as recommended by the structural engineer to maintain the structural integrity of the existing residence. Although the adjacent Parcel 5 does not have the same physical constraints as Parcel 21, offsetting the shoreline protection structure landward is not shown. During the Draft EA process, further discussion shall be conducted with the UH Sea Grant Extension Service, Maui Planning Department, and State Department of Land and Natural Resources to determine the best alignment of the hybrid structure and its transition with the adjacent properties.

Failure to approve an improved shoreline protection structure will create a potential public hazard from falling debris as the existing rock wall and stairway deteriorate and existing trees fall into the ocean. Removal of the existing structure without replacing it with an improved structure will create other problems, such as degradation of water quality from the soils behind the existing wall which will continue to erode from wave action.

Undue hardship will result to the property owners if a new shoreline protection structure is not allowed. On Parcel 21 the existing dwelling will be in jeopardy from continuing shoreline erosion to a point where the home may no longer be habitable. Similarly, if

shoreline erosion is allowed to continue, the residence on Parcel 5 will eventually experience the same hazard as Parcel 21. Parcel 5 is already experiencing erosion that is undermining the existing trees on the shoreline that is in danger of falling into the ocean and increasing the potential hazard to the public.

The Shoreline Setback Rules contains provisions where a structure or activity may be granted a variance upon grounds of hardship if it meets the following criteria:

(1) *The applicant would be deprived of reasonable use of the land if required to fully comply with the shoreline setback rules*;

Preliminary calculations of the shoreline setback line indicate the setback for Parcel 21 is approximately 40 ft. which is greater than the existing distance of the dwelling from the shoreline. Parcel 5 has a setback of approximately 59 feet and does not experience the same constraints.

(2) *The applicant's proposal is due to unique circumstances and does not draw into question the reasonableness of the shoreline setback rules; and*

The unique circumstance is the existing hazard from the ongoing deterioration of the existing rock wall and stairway and threat of the existing trees falling into the ocean. The ongoing shoreline erosion will endanger the existing residences that were constructed in compliance with the Shoreline Setback Rules applicable at the time. This circumstance and condition is not as severe in surrounding properties. It is noted that the blue tile house west of Parcel 21 is undergoing a separate application for shoreline protection and this unique circumstance extends to the adjacent property.

(3) *The proposal is the practicable alternative which best conforms to the purpose of the shoreline setback rules.*

Allowance for the construction of an improved shoreline protection structure will remove an existing hazard, protect property, and create safe lateral shoreline access that will enhance the public enjoyment of the ocean. The hybrid shoreline protection structure was recommended by the UH Sea Grant Extension Service, Maui Planning Department, and Department of Land and Natural Resources, Office of Conservation and Coastal Lands to have the least impact on the shoreline.

IV. ALTERNATIVES TO THE PROPOSED ACTION

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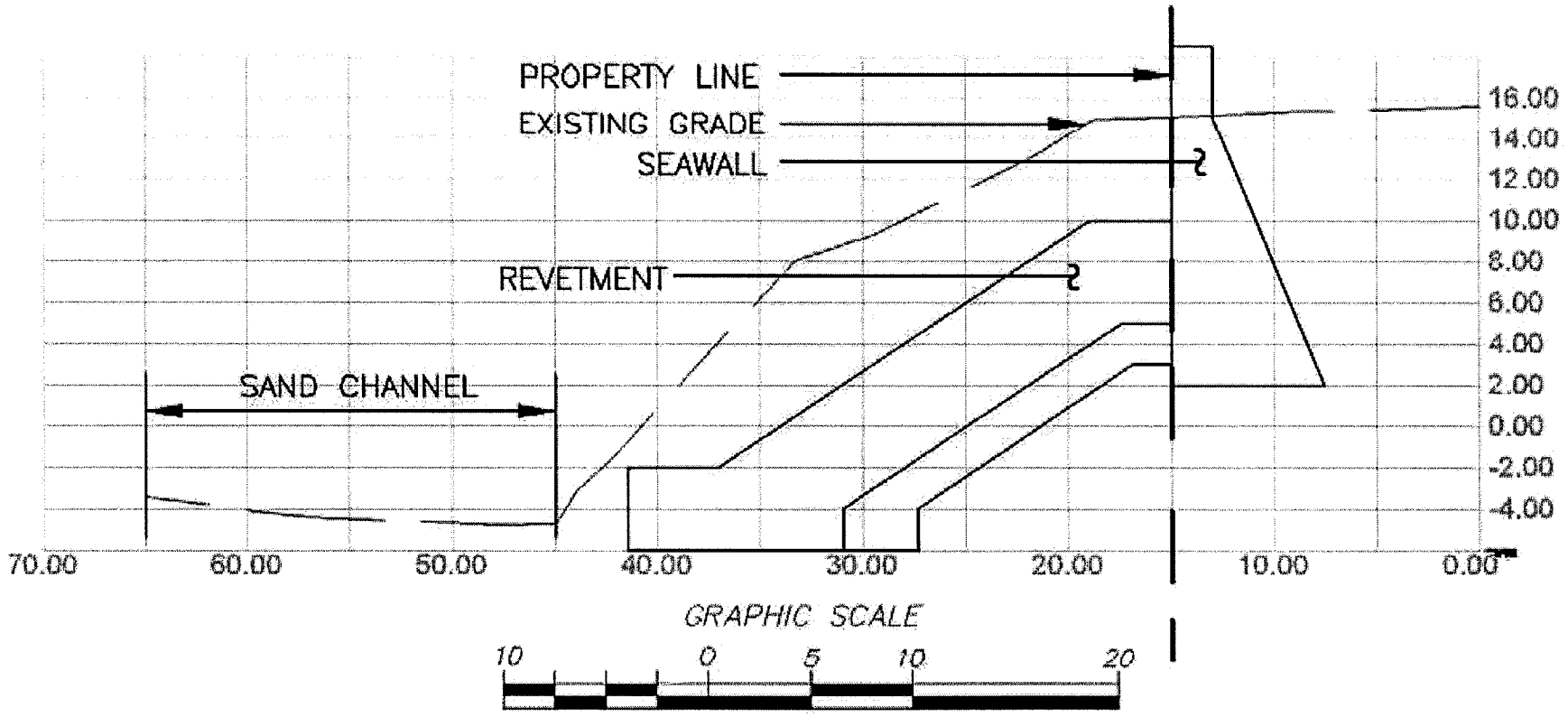
A. PREFERRED ALTERNATIVE - HYBRID REVETMENT/SEAWALL

Pursuant to recommendations of the UH Sea Grant Extension Service, State of Hawai`i and County of Maui the shoreline protection structure has been designed as a hybrid structure. The structure recommended includes a lower rock revetment with lateral access at the top of the revetment and a seawall structure behind the revetment structure. The hybrid structure was recommended to minimize the depth of the structure seaward of the properties in order to minimize any impacts on the shoreline area and existing recreational uses in the area, primarily the narrow channel fronting the subject properties.

The hybrid structure provides the necessary protection to the subject properties, safer lateral access along the shoreline, minimal impacts on existing recreational uses in the area, and reduces the encroachment of the structure into State owned lands. The preferred alternative consists of a hybrid revetment-seawall. This configuration is presented in **Figure 14**.

This configuration maximizes the positive aspects of both of these shoreline protection strategies. The revetment portion of the structure that is in regular contact with wave action is sloped, porous, and flexible. It has the greatest likelihood of promoting the accretion of sand at its base. The revetment portion has a lower reflection coefficient, and will provide the least wave reflection during the majority of wave conditions. By limiting the height of the revetment portion to about half of the overall height of the hybrid structure, the horizontal extent can be limited to the existing footprint, and the sand channel will not be impacted.

The seawall portion of the structure serves to provide a solid surface to abut the revetment. The revetment in turn provides protection against scour and erosion of the seawall footing. Additionally, the vertical seawall makes up the elevation difference between the revetment crest and the existing grade.



Source: Sea Engineering, Inc.

Figure 14

Proposed Shoreline Protection at TMK 2-6-009:005 and 021

Hybrid Revetment Seawall

NOT TO SCALE

Prepared for: Argyropoulos/Goetzman

MUNEKIYO & HIRAGA, INC.

Cohen/KuauShoreline/Hybrid

B. STRATEGIC RETREAT ALTERNATIVE

Strategic retreat on Parcel 21 is not possible. The existing dwelling is located less than 20 feet from the hardened shoreline. The portion of the home nearest the shoreline is a slab on grade construction which makes the relocation of the dwelling difficult. The lot as developed includes an accessory or ohana dwelling to the rear of the main residence and does not provide any opportunity to relocate the structure landward. Continued erosion will eventually create a nonhabitable condition for the existing dwelling. During heavy storm wave action the waves are over-topping the bank and reaching the dwelling. This parcel is in the same situation as the dwelling on the adjacent westerly property that has filed an application for a seawall.

Parcel 21 is a flag lot, with another parcel located on Hana Highway. This parcel is also owned by the owner of Parcel 21 and also developed with an older residential unit currently unoccupied.

Even if the main dwelling could be relocated to the rear parcel, the existing siting of the ohana unit would require both residences to be relocated. Portions of the main residence and the entire ohana unit are constructed as slab on grade which makes relocation structurally difficult and expensive. It will also require demolition of the rear dwelling on the adjacent parcel.

The rear parcel is 6,000 sq.ft. and would not be able to accommodate the main residence and ohana dwelling. In order to utilize the rear parcel a consolidation of the lots will be required to create a larger buildable area. Such an action will require additional permitting with an application for subdivision review. This is a time consuming and very expensive alternative that is not deemed to be economically feasible.

Parcel 5 does not have the same constraints as Parcel 21. The existing main residence and ohana unit are located near Hana Highway and away from the eroding shoreline. Relocation of the structures is not considered an alternative for Parcel 5.

Although the structures on Parcel 5 are further away from the shoreline, a comprehensive approach to the problem is being sought rather than waiting until said structures are threatened. Waiting for the structures on Parcel 5 to be threatened increases the threat of flank erosion on the eastern boundary of Parcel 21 if the shoreline boundary is allowed to recede.

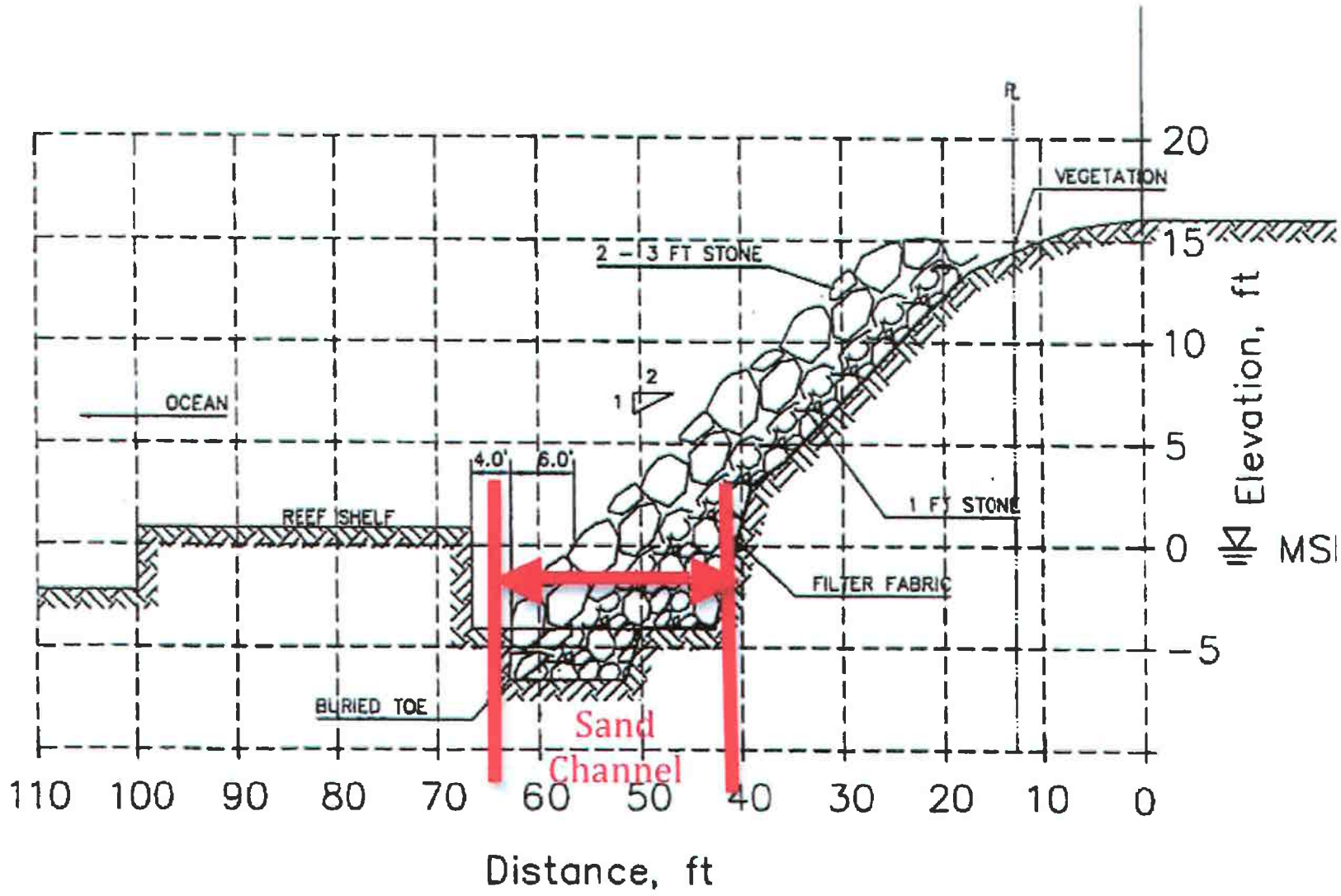
C. ROCK REVETMENT ALTERNATIVE

A revetment is a sloping uncemented structure built of wave resistant material. The most common method of revetment construction is to place an armor layer of stone, sized according to the design wave height, over an underlayer and filter designed to distribute the weight of the armor layer and to prevent loss of fine shoreline material through voids in the revetment. Properly designed and constructed rock revetments are durable, flexible, and highly resistant to wave damage. Should toe scour occur, the structure can settle and readjust without major failure. Damage from large waves is typically not catastrophic, and the revetment can still function effectively even if damage occurs. The rough and porous surface and flatter slope absorb and dissipate more wave energy than smooth vertical walls, thus reducing wave reflection, runup, and overtopping. Thus, there is greater likelihood of sand accumulation seaward of the structure.

The sloping revetment occupies more horizontal space and has a larger footprint than a seawall would. A revetment has been previously proposed as a solution to the erosion at the project site. **Figure 15** depicts a revetment section at the project site. As shown in **Figure 15**, the footprint of this revetment would extend approximately 65 feet seaward from the shoreline. This has raised concerns documented in comments by the Office of Conservation of Coastal Lands (OCCL) dated June 29, 2007. The main reason for concern is that the structure would cover the existing sand channel behind the reef shelf. This channel provides convenient access to the nearby surfing sites as well as a calm swimming area for the public. For this reason, a revetment alone is not considered to be a viable option for the project site.

D. VERTICAL SEAWALL ALTERNATIVE

A seawall is a vertical or sloping concrete–rock-masonry wall to protect the land from wave damage and erosion. A seawall, if properly designed and constructed, is a proven, long lasting, and relatively low maintenance shore protection method. Seawalls also have the advantage of requiring limited horizontal space along the shore. However, the impervious and vertical face of a seawall results in very little wave energy dissipation. Wave energy is deflected both upward and downward, and also a large amount of wave energy is reflected seaward. The downward component can cause scour at the base of the wall, and thus the foundation of a seawall is critical for its stability, particularly on a sandy and eroding shoreline. Ideally a seawall should be constructed on solid, non-erodible substrate. Seawalls are not flexible structures, and their structural stability is dependent upon the stability of their foundations.



Source: Sea Engineering, Inc.

Figure 15

Proposed Shoreline Protection at TMK 2-6-009:005 and 021

Rock Revetment Alternative

NOT TO SCALE

Prepared for: Argyropoulos/Goetzman

MUNEKIYO & HIRAGA, INC.

Cohen/KuauShoreline/RockRevetment

Reflected wave energy can inhibit the ability of sand to settle in front of a structure. Additionally, significant reflected wave energy is particularly undesirable when there are surfing sites nearby as the reflected waves can adversely impact the quality of the incoming waves. For these reasons, a seawall alone has not been selected for the project site.

E. NO ACTION ALTERNATIVE

The project area and in particular Parcel 5, has a history of chronic shoreline erosion in which the existing revetment has collapsed. Based upon topographic surveys performed in 2005 and 2007, the top of the eroded bank has receded from 5 to 10 feet in that period alone. The erosion has continued during this winter season, and it is highly likely that this erosion will continue. This additional erosion will eventually threaten to flank the existing shore protection at the adjacent Parcels 21 and 6. Once the shore protection has been flanked, erosion of these properties will begin. This is of particular concern to Parcel 21, since the house is close to the property boundary. Thus, no action is not a recommended option for this site.

The erosion on Parcel 5 has accelerated in which a temporary emergency action is under consideration to protect the dwelling on Parcel 21.

V. SUMMARY OF ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

V. SUMMARY OF ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

The redesigned hybrid shoreline protection structure, in accordance with the recommendations of the UH Sea Grant Extension Service, State of Hawai`i and County of Maui Planning Department, is anticipated to have the least adverse environmental impacts, provided appropriate mitigation measures are implemented during all construction activities. Best Management Practices (BMPs) will be followed to minimize short-term traffic, noise, air and water quality impacts. During construction water quality monitoring will also be coordinated. Further, in the event archaeological, historic or cultural remains are discovered during construction, the SHPD will be notified and appropriate mitigation measures will be incorporated into the project. The proposed project is not anticipated to create any significant, long-term, adverse effects.

VI. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

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The development of the shoreline protection structure is anticipated to result in the irreversible and irretrievable commitment of State land and private fiscal resources. Other resource commitments include energy, labor, and material resources. The commitment of these resources, however, is considered appropriate when evaluating the benefits to be derived from the proposed project versus the consequence of taking no action.

VII. FINDINGS AND CONCLUSIONS

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The proposed action, expected consequences, both primary and secondary, and the cumulative as well as the short-term and long-term effects of the action have been evaluated in accordance with the Significance Criteria of Section 11-200-12 of the Hawai`i Administrative Rules. Discussion of project conformance to the criteria is noted as follows:

1. **No Irrevocable Commitment to Loss or Destruction of Any Natural or Cultural Resource Would Occur as a Result of the Proposed Project**

   The proposed action is not anticipated to adversely impact known habitats of rare, endangered, or threatened species of flora or fauna. Due to previous ground disturbance on the property from previous construction activity for the existing residences, it has been determined through an archaeological assessment that an archaeological inventory survey was not required. As applicable, archaeological monitoring will be carried out during ground altering activities and should any historic and cultural features, including human burials, be found, work in the areas of the find shall be promptly halted and the find protected from further disturbance. The SHPD will be immediately contacted to determine the significance of the find and establish appropriate mitigative measures.

2. **The Proposed Action Would Not Curtail the Range of Beneficial Uses of the Environment**

   The proposed action will provide enhanced lateral access along the shoreline fronting the subject properties. It is not anticipated to curtail the range of beneficial uses to the environment.

3. **The Proposed Action Does Not Conflict With the State's Long-Term Environmental Policies or Goals or Guidelines as Expressed in Chapter 344, HRS**

   The State Environmental Policy and Guidelines are set forth in Chapter 344, HRS. The proposed action is in consonance with those policies and guidelines.

4. **The Economic or Social Welfare of the Community or State Would Not Be Substantially Affected**

The project will directly benefit the local economy by providing construction and construction-related employment. In the long term, the proposed project will have a beneficial effect upon the welfare of the community by ensuring the shoreline properties are protected, enhanced access provided, and the properties can continue to provide safe residential usage.

5. **The Proposed Action Does Not Affect Public Health**

No adverse impacts to public health are anticipated.

6. **No Substantial Secondary Impacts, Such as Population Changes or Effects on Public Facilities, are Anticipated**

The proposed project is not a source of new population in the region. In this regard, the proposed project is not anticipated to adversely affect public services in the region, such as schools, police, and fire protection.

7. **No Substantial Degradation of Environmental Quality is Anticipated**

During the construction phase of the project, there will be short-term air, noise, and water quality impacts. Water quality monitoring will be conducted during the construction phase and, if warranted, additional mitigative measures will be sought and implemented to reduce any adverse impacts resulting from the construction activity. In the long-term there are no anticipated impacts upon air and water quality and ambient noise levels.

8. **The Proposed Action Does Not Involve a Commitment to Larger Actions, Nor Would Cumulative Impacts Result in Considerable Effects On the Environment**

Once constructed the proposed action is not anticipated to involve a commitment to larger actions or to create cumulative impacts on the environment. To reduce any potential impacts, the design of the shoreline protection structure was modified to a hybrid structure in accordance with the recommendations of the UH Sea Grant Extension Service, State of Hawai`i DLNR/OCCL and the County of Maui Department of Planning.

9. **No Rare, Threatened or Endangered Species or Their Habitats Would be Adversely Affected By The Proposed Action**

There are no known rare, threatened, or endangered species or flora, fauna, nor habitats of such within the project area.

10. **Air Quality, Water Quality or Ambient Noise Levels Would Not Be Detrimentally Affected By the Proposed Project**

Construction activities will result in short-term air and water quality and noise impacts. Best Management Practices (BMPs) will be implemented during construction to minimize the short-term impacts on air and water quality and noise. During construction water quality monitoring will be conducted. If it is found that the construction activity is having an adverse impact, additional mitigative measures will be sought and implemented to reduce said impacts.

11. **The Proposed Project Would Not Affect Environmentally Sensitive Areas, Such As Flood Plains, Tsunami Zones, Erosion-prone Areas, Geologically Hazardous Lands, Estuaries, Fresh Waters or Coastal Waters**

The proposed shoreline protection is intended to protect the subject properties from ongoing shoreline erosion that poses a hazard to the public using the shoreline. Based on the recommendation of the UH Sea Grant Extension Service, County of Maui Planning Department, and Department of Land and Natural Resources, Office of Conservation and Coastal Lands, the redesigned shoreline protection is anticipated to have the least impact on the coastal area.

12. **The Proposed Project Will Not Substantially Affect Scenic Vistas and Viewplanes Identified in County or State Plans or Studies**

The proposed action is not anticipated to impact scenic vistas or viewplanes. Views from Hana Highway to the shoreline are currently obstructed by the existing residences on the properties.

13. **The Proposed Project Will Not require Substantial Energy Consumption**

The subject project will involve the commitment of fuel for construction equipment, vehicles, and machinery during construction and maintenance activities. Once construction is completed there will not be any additional energy consumption.

Based on the foregoing findings, it is anticipated that the proposed action will result in a finding of no significant impact (FONSI).

VIII. LIST OF PERMITS AND APPROVALS

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The following Federal, State, and County permits and approvals are anticipated to be required for project implementation:

County of Maui

1. Finding of No Significance Impact (FONSI) (Maui Planning Commission)
2. Special Management Area Use Permit (Maui Planning Commission)
3. Shoreline Setback Determination (Maui Planning Department)
4. Shoreline Setback Variance (Maui Planning Commission)
5. Construction Permits, as applicable
6. Special Flood Hazard Area Development Permit, as applicable

State of Hawai`i

7. Conservation District Use Permit (Department of Land and Natural Resources)
8. Easement on State Lands (Department of Land and Natural Resources)
9. Section 401 Water Quality Certification (Department of Health)
10. National Pollutant Discharge Elimination System (NPDES) Permit (Department of Health)
11. Community Noise Elimination Permit (Department of Health), if applicable
12. Coastal Zone Management Consistency Review (State Office of Planning)

Federal

13. Department of Army Permit (Department of Army Corps of Engineers)

IX. PARTIES CONSULTED DURING THE PREPARATION OF THE DRAFT ENVIRONMENTAL ASSESSMENT, LETTERS RECEIVED AND RESPONSES TO SUBSTANTIVE COMMENTS

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1. Ranae Ganske-Cerizo, Soil Conservationist
Natural Resources Conservation Service
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210 Imi Kala Street, Suite 209
Wailuku, Hawai`i 96793-2100

2. George Young
Chief, Regulatory Branch
U.S. Department of the Army
U.S. Army Engineer District, Honolulu
Regulatory Branch
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Fort Shafter, Hawai`i 96858-5440

3. Patrick Leonard
Field Supervisor
U. S. Fish and Wildlife Service
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Box 50088
Honolulu, Hawai`i 96813

4. Russ K. Saito, State Comptroller
Department of Accounting and General Services
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Honolulu, Hawai`i 96813

5. Theodore E. Liu, Director
State of Hawai`i
Department of Business, Economic Development & Tourism
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Honolulu, Hawai`i 96804

6. Patricia Hamamoto, Superintendent
State of Hawai`i
Department of Education
P.O. Box 2360
Honolulu, Hawai`i 96804

7. Micah Kane, Chairman
Department of Hawaiian Home Lands
P. O. Box 1879
Honolulu, Hawai`i 96805

8. Chiyome Fukino, M.D., Director
State of Hawai`i
Department of Health
919 Ala Moana Blvd., Room 300
Honolulu, Hawai`i 96814

9. Alec Wong, P.E., Acting Chief
Clean Water Branch
State of Hawai`i
Department of Health
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10. Herbert Matsubayashi
District Environmental Health Program Chief
State of Hawai`i
Department of Health
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11. Chairperson
State of Hawai`i
Department of Land and Natural Resources
P. O. Box 621
Honolulu, Hawai`i 96809

12. Administrator
State of Hawai`i
Department of Land and Natural Resources
State Historic Preservation Division
601 Kamokila Blvd., Room 555
Kapolei, Hawai`i 96707

13. Director
State of Hawai`i
Department of Transportation
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Honolulu, Hawai`i 96813

cc: Fred Cajigal

14. Director
Office Of Environmental Quality Control
235 S. Beretania Street, Suite 702
Honolulu, Hawai`i 96813

15. Clyde Nāmu`o, Administrator
Office of Hawaiian Affairs
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16. Director
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17. Carl Kaupololo, Chief
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Department of Fire and Public Safety
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18. Director
County of Maui
Department of Housing and Human Concerns
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19. Tamara Horcajo, Director
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Department of Parks and Recreation
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20. Jeffrey Hunt, Director
County of Maui
Department of Planning
250 South High Street
Wailuku, Hawai`i 96793

21. Thomas Phillips, Chief
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Police Department
55 Mahalani Street
Wailuku, Hawai`i 96793

22. Milton Arakawa, Director
County of Maui
Department of Public Works and Environmental Management
200 South High Street
Wailuku, Hawai`i 96793

23. Jeffrey Eng, Director
County of Maui
Department of Water Supply
200 South High Street
Wailuku, Hawai`i 96793

24. **Hawaiian Telcom**
60 South Church Street
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25. Neal Shinyama, Manager – Engineering
Maui Electric Company, Ltd.
P.O. Box 398
Kahului, Hawai`i 96733

JUL 1 0 2007

LINDA LINGLE
GOVERNOR OF HAWAII

ALLAN A. SMITH
INTERIM CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

PETER T. YOUNG
DEPUTY DIRECTOR

KEN C. KAWAHARA
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

July 5, 2007

OCCL File No.: MA-07-274
DLNR log # 58939

JUL -9 2007

Mich Hirano, AICP
Munekiyo & Hiraga, Inc.
306 High St, Suite 104
Wailuku, Hawaii 96793

Dear Mr. Hirano:

SUBJECT: Conservation District Use Application and Grant of Easement for a proposed Rock revetment at seaward of (TMK: (2) 2-6-09:005 & 021) Kuau, Maui.

Thank you for your June 4, 2007 letter regarding early consultation on the Draft Environmental Assessment (DEA) for removal and reconstruction of a rock revetment fronting the subject property. According to your letter the Department of Land and Natural Resources (DLNR) understands you are requesting a grant of easement for the subject material located seaward of the property. After an initial review the DLNR has a few comments and suggestions regarding the project:

1) There should be a distinction between parcel 21 and parcel 5 based on threats to inhabited dwellings. One of the DLNR criteria for emergency temporary shore protection is the minimum critical threshold erosion scarp distance of 20 feet or less from and inhabited dwelling. Using this same logic for justification for a permanent structure, it appears parcel 5 does not have an immanent threat to the dwelling. As such, other alternatives should be considered for this property including those outlined below.

2) Discussion of alternatives should be included in the DEA for both properties including no-action, relocation of the dwellings, beach restoration, and an embedded revetment located more landward.

3) Essentially the proposed structure is the same as proposed by Oceanit in 2005. Previous discussions with the engineers hired by Mr. Goetzman have centered on this

issue and DLNR staff have repeatedly emphasized during previous proposals that locating such a large structure in the proposed location would be unacceptable to the DLNR due to unnecessary impacts to coastal processes and restriction of public access.

4) Locate the structure (s) as far landward as possible. The proposed plan calls for a 45 foot wide revetment that starts 10 feet seaward of the property line. Why isn't the proposed structure for parcel 21 located more landward?

5) The DLNR recommends a hybrid seawall/revetment concept that would provide stabilization of the bluff with a public access walkway built in while minimizing the amount of structure located on state land (Figure 1).

6) It is not clear from the written correspondence what the easement request is for. Based on the conceptual plan to remove the existing material and replace it with new material any potential easements would have to be for the proposed new structure which yet undecided at this time. It would be in the best interest of both the public and the landowner to minimize the amount of material seaward of the property line.

7) Public access to and along the nearshore is important environmental aspect in this area that should be addressed in the DEA. The beach and nearshore are heavily used by the public to access nearby surf sites and as an ingress/egress. Discussion should be included of how the proposed project minimizes negative impacts to public access as well as enhancing access through a public walkway.

8) A Conservation District Use Application for such a structure will need to adequately address these issues as well.

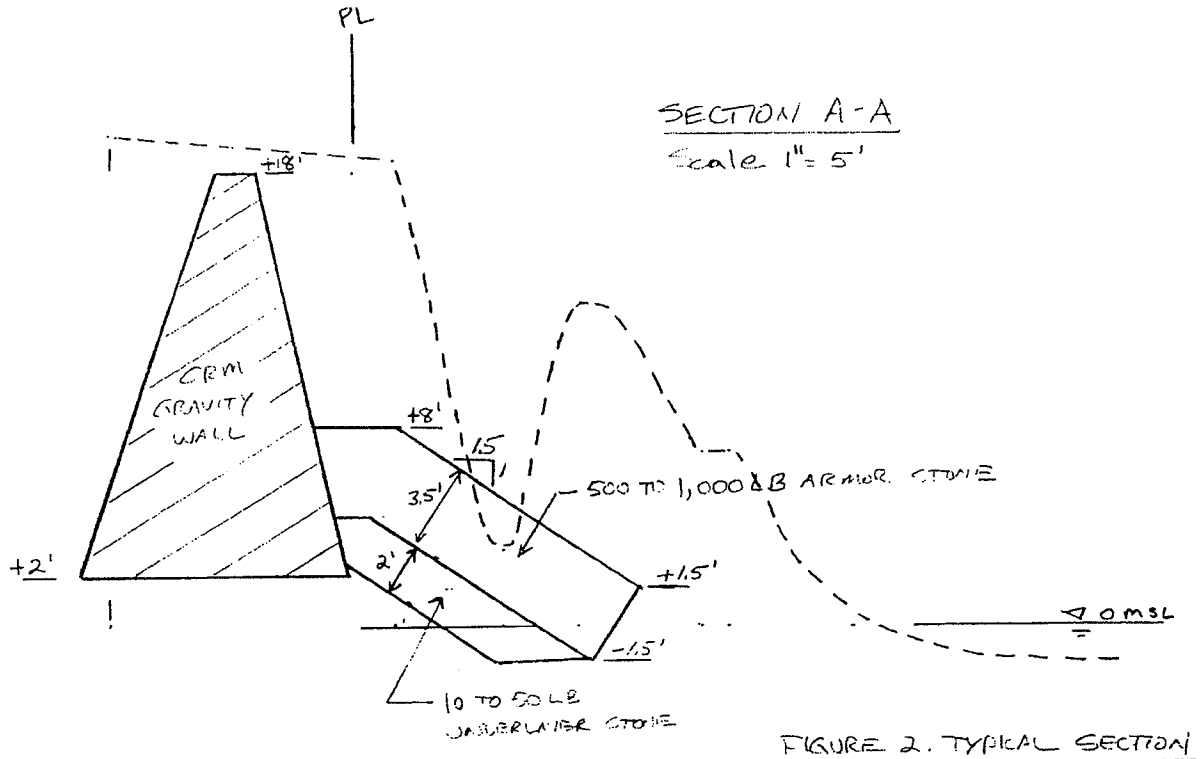
Please contact myself at the Office of Conservation and Coastal Lands at (808) 587-0377 if you have any questions regarding this matter.

Sincerely,

Sam Lemmo, Administrator
Office of Conservation and Coastal Lands

Attachment: Figure 1
cc: Chairperson's Office
Maui Board Member
Maui Land Agent
ACOE/ DOH-CWB
Maui County Planning Department (Jeff Hunt)
Maui County Planning Department (Thorne Abbott)
Maui County Planning Department (Zoe Norcross)

Figure 1. Conceptual Hybrid Revetment-Seawall



JUL 1 9 2007

LINDA LINGLE
GOVERNOR OF HAWAII

ALLAN A. SMITH
INTERIM CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

KEN C. KAWAHARA
DEPUTY DIRECTOR - WATER

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KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

July 18, 2007

OCCL File No.: MA-08-10
Encroachment MA-05-219

Mich Hirano, AICP
Munekiyo & Hiraga, Inc.
306 High St, Suite 104
Wailuku, Hawaii 96793

Dear Mr. Hirano:

SUBJECT: Conservation District Use Application and Grant of Easement for a proposed Rock revetment seaward of (TMK: (2) 2-6-09:005 & 021) Kuau, Maui.

Thank you for your June 4, 2007 letter regarding removal and reconstruction of a rock revetment fronting the subject property. According to your letter the Department of Land and Natural Resources (DLNR) understands you are requesting a grant of easement for the subject material located seaward of the property. After an initial review the DLNR has a few comments and suggestions regarding the project:

1) There should be a distinction between parcel 21 and parcel 5 based on threats to inhabited dwellings. One of the DLNR criteria for emergency temporary shore protection is the minimum critical threshold erosion scarp distance of 20 feet or less from and inhabited dwelling. Using this same logic for justification for a permanent structure, it appears parcel 5 does not have an immanent threat to the dwelling.

2) If bluff failure at Parcel 5 presents a significant safety issue as stated consider locating the proposed revetment in a more landward position that is not located entirely on state land.

3) The easement request might be most efficient if the proposed new revetment siting is conceptually agreed upon before the easement request is updated.

4) Essentially the proposed structure is the same as proposed by Oceanit in 2005. Previous discussions with the engineers hired by Mr. Goetzman have centered on this

issue and DLNR staff have repeatedly emphasized during previous proposals that locating such a large structure in the proposed location would be unacceptable to the DLNR due to unnecessary impacts to coastal processes and public access.

5) Locate the structure (s) as far landward as possible. The proposed plan calls for a 45 foot wide revetment that starts 10 feet seaward of the property line. Why isn't the proposed structure for parcel 21 located more landward?

6) The DLNR recommends a hybrid seawall/revetment concept that would provide stabilization of the bluff with a public access walkway built in while minimizing the amount of structure located on state land (Figure 1).

7) It is not clear from the written correspondence what the easement request is for. Based on the conceptual plan to remove the existing material and replace it with new material any potential easements would have to be for the proposed new structure which yet undecided at this time. It would be in the best interest of both the public and the landowner to minimize the amount of material seaward of the property line. Please update the easement request to include the area that is subject to the proposed new revetment rather than the existing material.

8) Public access to and along the nearshore is important environmental aspect in this area that should be addressed by any proposed new structures. The beach and nearshore are heavily used by the public to access nearby surf sites and as an ingress/egress. The proposed project needs to minimize negative impacts to public access.

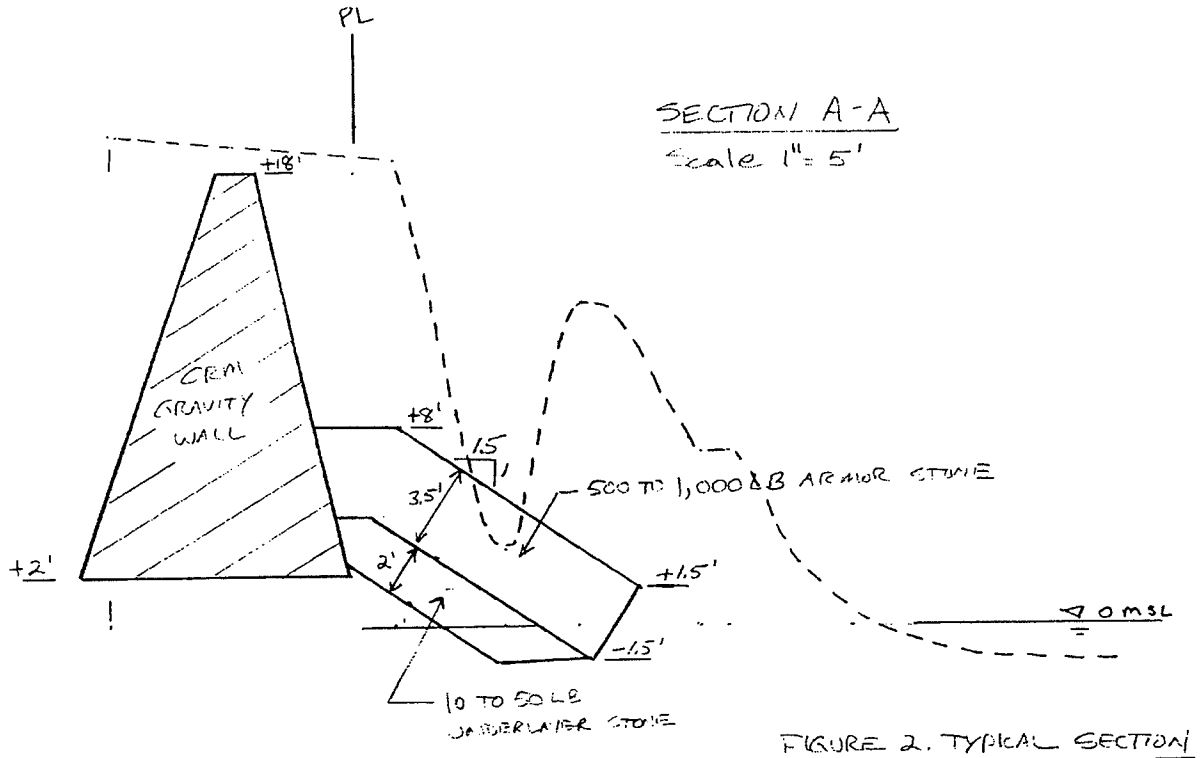
9) A Conservation District Use Application (CDUA) for such a structure will need to adequately address these issues as well.

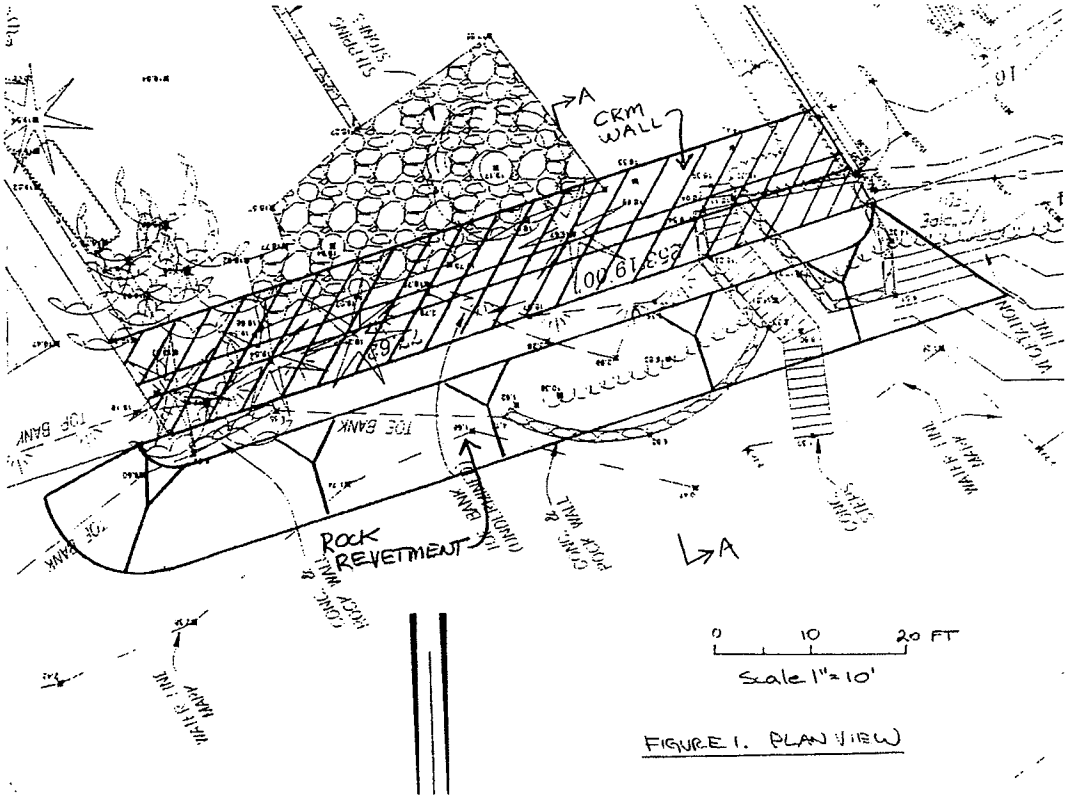
Please contact myself at the Office of Conservation and Coastal Lands at (808) 587-0377 if you have any questions regarding this matter.

By: _____
Sam Lemmo, Administrator
Office of Conservation and Coastal Lands

Attachment: Figure 1
cc: Chairperson's Office
Maui Board Member
Maui Land Agent
ACOE/ DOH-CWB
Maui County Planning Department (Jeff Hunt) (Thorne Abbott) (Zoe Norcross)

Figure 1. Conceptual Hybrid Revetment-Seawall





6

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
GWEN OHASHI HIRAGA
MITSURU "MICH" HIRANO
KARLYNN FUKUDA

MARK ALEXANDER ROY

April 9, 2009

Sam Lemmo, Administrator
Office of Conservation and Coastal Lands
Department of Land and Natural Resources
P.O. Box 621
Honolulu, Hawai`i 96809

SUBJECT: Proposed Shoreline Protection Structure at 475 and 465 Hana Highway, Tax Map Key (2) 2-6-009:005 and 021, Kuau, Maui, Hawai`i

Dear Mr. Lemmo:

Thank you for your comment letters of July 5 and 18, 2007. The following responds to your comments:

1. Although Parcel 5 does not have an imminent threat to the existing dwelling, the proposed shoreline protection structure is a unified effort by both property owners (Parcel 5 and Parcel 21) to resolve the existing erosion problem experienced by properties along this coast line. Such a unified approach to the problem is more effective than waiting for the erosion on Parcel 5 to threaten the existing residence on the property. If no structure is built on Parcel 5 it will increase the risk of flank erosion on Parcel 21 as the parcel continues to erode, since the dwelling is set further landward than the existing residence of Parcel 21.

2. The draft EA will include a discussion on alternatives, including no-action, relocation of the dwellings, and an embedded revetment located more landward. The subject properties do not front a sandy beach and the beach restoration alternative would not be appropriate. The sandy beach fronts the adjacent westerly property known as the "Blue Tile" house, who are also proposing a shoreline protection structure.

3. Based on comments from the Maui Planning Department, UH Sea Grant Extension Service, and your Department the structure has been modified as a hybrid structure with a lower rock revetment with an approximate four (4) ft. wide lateral access above the revetment and a seawall structure behind the revetment. This design was recommended to minimize impacts on the narrow channel fronting the subject properties.

4. As noted previously, as the design of the structure continues the engineers are investigating the possibility of setting the structure further landward. The setback of the footing for the structure from the existing residence on Parcel 21 will depend on the structural analysis by the engineers. The property owners will make every effort to site the structure as far landward as possible.

5. The revised plans for the structure incorporates the recommended hybrid seawall/revetment design.

6. As the permitting process continues the property owners will clarify the easement request to be consistent with the modified hybrid structure.

7. Public lateral access along the shoreline will be provided through a proposed walkway above the revetment portion of the structure. Access to the shoreline is currently from the nearby Beach located west of the subject properties adjacent to the "Blue Tile" house. The recommendation of the hybrid wall was accepted by the property owners in order to minimize the impacts on recreational users of the area.

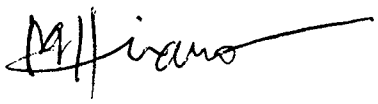
8. The physical constraints and alignment of the structure on Parcel 21 dictates the location of the structure on Parcel 5. Offsetting the structure creates engineering difficulties. As design of the structure continues the engineers are investigating the possibility of setting the structure further landward without compromising the structure on Parcel 21.

9. The applicant will continue to work with the Office of Conservation and Coastal Lands to achieve an agreement on the conceptual design before updating the easement request. Please note that the plans have been modified to incorporate a hybrid design as recommended.

10. We will address these issues in a Conservation District Use Application (CDUA) filed on behalf of the property owners.

Should you require additional clarification please call me at (808) 244-2015 or by email: planning@mhplanning.com. Copies of the draft environmental assessment (EA) will be forwarded to your agency.

Very truly yours,



Mich Hirano, AICP
Principal

MH:lh
cc: Stanton Cohen
Betsy Jacobson
(F:\DATA\Cohen\KuauShoreline\OCCLres.ltr.wpd)

JUN 2 1 2007

LINDA LINGLE
GOVERNOR OF HAWAII

CHIYOME L. FUKINO, M.D.
DIRECTOR OF HEALTH

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

In reply, please refer to:
EMD / CWB

06048CEC.07

June 18, 2007

Mr. Mich Hirano, AICP
Project Manager
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Mr. Hirano

Subject: Conservation District Use Application and Grant of Easement for a Proposed Rock Revetment Seaward of TMK: (2) 2-6-09:005 and 021, Kuau, Maui, Hawai'i

Thank you for the opportunity to provide advanced comment on the Environmental Assessment (EA) to be prepared for the subject project.

The following is from your letter of June 4, 2007:

> "During an undetermined time period prior to 1982, two (2) concrete rock mound seawalls were constructed fronting two (2) adjacent parcels of shore fronting properties identified by TMKs 2-6-09:005 and 021 (Parcel 5 and Parcel 21), located in Kuau, Paia, Hawai'i. The seawall structures are located on State land. Over the years, the seawall structures have been severely damaged by wave action during strong winter storms. Moreover, due to the failure of the seawall structures, considerable erosion of the properties upland of the seawalls has occurred. On Parcel 5, the erosion is undermining an approximate 20 foot high bank and poses potential danger to people using the shoreline. On Parcel 21, the top bank of the property is rapidly eroding. The single-family residence is setback approximately 15 feet from the top of the bank. There is severe wave wash reaching the house during heavy storms and potential for damage to the property from erosion and flooding.
>
> The upland property owners are proposing to remove the debris from the remaining rock mound seawall and build a new engineered grouted rock mound revetment to protect their property from further erosion. The engineering solution proposed for Parcel 21 is to build a grouted rock revetment from the top of the bank to below the

water level where the toe of the revetment will be buried to prevent scouring and damage from slumping. Although the engineering design solution for Parcel 5 has not been finalized, it will involve construction of a rock revetment wall to protect against further erosion and undermining of the revetment foundation similar to Parcel 21. Structures to dissipate wave energy and reduce wave runup will also be incorporated into the design. The east end of the revetment would wrap around and tie into the neighbors rock and rubble slope protection. The west end of the revetment would tie into the revetment proposed for Parcel 21."

The review and comments from the Department of Health, Clean Water Branch (CWB), is based solely on the information provided in your letter of June 4, 2007 and its compliance with Hawaii Administrative Rules (HAR), Chapters 11-54 and 11-55. You may be responsible for fulfilling additional requirements related to our program. We recommend that you also read our standard comments on our website at http://www.hawaii.gov/health/environmental/env-planning/landuse/CWB-standardcomment.pdf.

1. Any project and its potential impacts to State waters must meet the following criteria:

   a. Antidegradation policy (HAR, Section 11-54-1.1), which requires that the existing uses and the level of water quality necessary to protect the existing uses of the receiving State water be maintained and protected.

   b. Designated uses (HAR, Section 11-54-3), as determined by the classification of the receiving State waters.

   c. Water quality criteria (HAR, Sections 11-54-4 through 11-54-8).

2. Please contact the Army Corps of Engineers at (808) 438-9258 to see if this project requires a Department of the Army (DA) permit. Permits may be required for work performed in, over, and under navigable waters of the United States. Projects requiring a DA permit may also require a Section 401 Water Quality Certification (WQC) from our office.

3. You are required to obtain a National Pollutant Discharge Elimination System (NPDES) permit for discharges of wastewater, including storm water runoff, into State surface waters (HAR, Chapter 11-55). For the following types of discharges into Class A or Class 2 State waters, you may apply for NPDES general permit coverage by submitting a Notice of Intent (NOI) form:

   a. Storm water associated with construction activities, including clearing, grading, and excavation, that result in the disturbance of equal to or greater than one (1) acre of total land area. The total land area includes a contiguous area where multiple separate and

distinct construction activities may be taking place at different times on different schedules under a larger common plan of development or sale. **An NPDES permit is required before the start of the construction activities.**

b. Construction dewatering effluent.

You must submit a separate NOI form for each type of discharge at least 30 days prior to the start of the discharge activity, except when applying for coverage for discharges of storm water associated with construction activity. For this type of discharge, the NOI must be submitted 30 days before to the start of construction activities. The NOI forms may be picked up at our office or downloaded from our website at: http://www.hawaii.gov/health/environmental/water/cleanwater/forms/genl-index.html.

4. You must also submit a copy of the NOI or NPDES permit application to the State Department of Land and Natural Resources, State Historic Preservation Division (SHPD), or demonstrate to the satisfaction of the CWB that SHPD has or is in the process of evaluating your project. Please submit a copy of your request for review by SHPD or SHPD's determination letter for the project along with your NOI or NPDES permit application, as applicable.

5. Please note that all discharges related to the project construction or operation activities, whether or not NPDES permit coverage and/or Section 401 WQC are required, must comply with the State's Water Quality Standards. Noncompliance with water quality requirements contained in HAR, Chapter 11-54, and/or permitting requirements, specified in HAR, Chapter 11-55, may be subject to penalties of $25,000 per day per violation.

If you have any questions, please visit our website at http://www.hawaii.gov/health/environmental/water/cleanwater/index.html, or contact Mr. Edward Chen of the Engineering Section, CWB, at (808) 586-4309.

Sincerely,

Alec Wong

ALEC WONG, P.E., CHIEF
Clean Water Branch

EC:np

c: Regulatory Branch, HED, COE
CZM Program, OP, DBEDT
OCCL, DLNR
Chief, DEHP, Maui

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
GWEN OHASHI HIRAGA
MITSURU "MICH" HIRANO
KARLYNN FUKUDA

MARK ALEXANDER ROY

April 9, 2009

Alec Wong, Chief
Department of Health
Clean Water Branch
State of Hawai`i
P.O. Box 3378
Honolulu, Hawai`i 96801-3378

SUBJECT: Proposed Shoreline Protection Structure at 475 and 465 Hana Highway, Tax Map Key (2) 2-6-009:005 and 021, Kuau, Maui, Hawai`i

Dear Mr. Wong:

Thank you for your comment letter of June 18, 2007. The project will comply with the requirements of Hawaii Administrative Rules (HAR), Chapters 11-54 and 11-55. As required, an National Pollutant Discharge Elimination System (NPDES) permit shall be filed with the Department of Health and a copy filed with the Department of Land and Natural Resources, State Historic Preservation Division (SHPD).

As the project progresses, we will coordinate the permitting requirements with the Army Corps of Engineers. If required, a Department of Army (DA) permit will be obtained as well as a Section 401 Water Quality Certification (WQC) for the Department of Health.

Should you require additional clarification please call me at (808) 244-2015 or by email: planning@mhplanning.com. A copy of the draft environmental assessment (EA) will be forwarded to your agency.

Very truly yours,

Mich Hirano, AICP
Principal

MH:lh
cc: Stanton Cohen
Betsy Jacobson
F:\DATA\Cohen\KuauShoreline\dohcwbres.ltr.wpd

JUL 0 3 2007

LINDA LINGLE
GOVERNOR OF HAWAII

CHIYOME L. FUKINO, M. D.
DIRECTOR OF HEALTH

LORRIN W. PANG, M. D., M. P. H.
DISTRICT HEALTH OFFICER

STATE OF HAWAII
DEPARTMENT OF HEALTH
MAUI DISTRICT HEALTH OFFICE
54 HIGH STREET
WAILUKU, MAUI, HAWAII 96793-2102

July 3, 2007

Mr. Mich Hirano
Munekiyo & Hiraga, Inc.
305 South High Street, Suite 104
Wailuku, Hawai`i 96793

Dear Mr. Hirano:

Subject: **Conservation District Use Application & Grant of Easement for a Proposed Revetment**
TMK: (2) 2-6-09: 005 & 021

Thank you for the opportunity to participate in the early consultation process for the environmental assessment preparation process. The following comments are offered:

1. The noise created during the construction phase of the project may exceed the maximum allowable levels as set forth in Hawaii Administrative Rules, Chapter 11-46, "Community Noise Control". A noise permit may be required and should be obtained before the commencement of work.

2. National Pollutant Discharge Elimination System (NPDES) permit coverage is required for this project. The Clean Water Branch should be contacted at 808 586-4309.

3. The Army Corps of Engineers should be contacted at (808) 438-9258 to identify whether a Federal license or permit (including a Department of Army permit) is required for this project. Pursuant to Section 401(a)(1) of the Federal Water Pollution Act (commonly known as the "Clean Water Act"), a Section 401 Water Quality Certification is required for "[a]ny applicant for Federal license or permit to conduct any activity including, but not limited to, the construction or operation of facilities, which may result in any discharge into the navigable waters...."

It is strongly recommended that the Standard Comments found at the Department's website: www.state.hi.us/health/environmental/env-planning/landuse/landuse.html be reviewed, and any comments specifically applicable to this project should be adhered to.

Should you have any questions, please call me at 808 984-8230.

Sincerely,

Herbert S. Matsubayashi
District Environmental Health Program Chief

c: EPO

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
GWEN OHASHI HIRAGA
MITSURU "MICH" HIRANO
KARLYNN FUKUDA

MARK ALEXANDER ROY

April 9, 2009

Herbert S. Matsubayashi
District Environmental Health Program Chief
Department of Health
Maui District Health Office
54 High Street
Wailuku, Hawai`i 96793

SUBJECT: Proposed Shoreline Protection Structure at 475 and 465 Hana Highway, Tax Map Key (2) 2-6-009:005 and 021, Kuau, Maui, Hawai`i

Dear Mr. Matsubayashi:

Thank you for your comment letter of July 3, 2007. The following responds to your comments.

1. The project will comply with Administrative Rules, Chapter 11-46, "Community Noise Control. If required, the project will apply for a noise permit.

2. The project will apply for a National Pollutant Discharge Eliminarion System (NPDES) permit.

3. We are in contact with the Army Corps of Engineers (Corps) and will coordinate this project with the Corps and the State Department of Health. The project will apply for a Section 401 Water Quality certification.

Further, as recommended we will review the DOH web site and adhere to any comments specifically applicable to this project.

Should you require additional clarification please call me at (808) 244-2015 or by email: planning@mhplanning.com. A copy of the draft environmental assessment (EA) will be forwarded to your agency.

Very truly yours,

Mich Hirano, AICP
Principal

MH:lh
cc: Stanton Cohen
Betsy Jacobson
F:\DATA\Cohen\KuauShoreline\dohmauires.ltr.wpd

JUL 0 2 2007

LINDA LINGLE
GOVERNOR OF HAWAI'I

LAURENCE K. LAU
INTERIM DIRECTOR

STATE OF HAWAI'I
DEPARTMENT OF HEALTH
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
235 SOUTH BERETANIA STREET
LEIOPAPA A KAMEHAMEHA, SUITE 702
HONOLULU, HAWAI'I 96813
Telephone (808) 586-4185
Facsimile (808) 586-4186
Electronic Mail: OEQC@doh.hawaii.gov

June 28, 2007

Mr. Mich Hirano, AICP
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawai'i 96793

Dear Mr. Hirano:

Subject: Conservation District Use Application and Grant of Easement for a Proposed Rock Revetment Seaward of TMK (2) 2-6-09:005 and 021, Kuau, Maui

Our office has the following comments in response to your request for early consultation:

Please be advised that there are State policies relating to the construction of shoreline revetments due to their impacts to erosion of beaches and adjacent properties. Please refer to the "Shoreline Hardening Policy and Environmental Assessment Guidelines" that can be found on pages 53-57 of *The Environmental Guidebook.* We suggest that you also refer to *Natural Hazard Considerations for Purchasing Real Estate in Hawai'i*, which we have enclosed with this letter, and the *Hawaii Coastal Hazard Mitigation Guidebook* by Dennis J. Hwang (2005).

Please also discuss impacts from dust and noise during construction, long-term water quality and soil impacts from the breakdown of the materials used to construct the revetments, impacts upon marine flora and fauna, and potential impacts to archaeological resources (e.g. Native Hawaiian burials).

Should you have any questions, please call George Casen or Les Segundo at 586-4185.

Sincerely,

Laurence K. Lau
Deputy Director for Environmental Health

c: File

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
GWEN OHASHI HIRAGA
MITSURU "MICH" HIRANO
KARLYNN FUKUDA

MARK ALEXANDER ROY

April 9, 2009

Katherine Kealoha, Director
Department of Health
Office of Environmental Quality Control
State of Hawai`i
235 S. Beretania Street
Leiopapa A Kamehameha, Suite 702
Honolulu, Hawai`i 96813

SUBJECT: Proposed Shoreline Protection Structure at 475 and 465 Hana Highway, Tax Map Key (2) 2-6-009:005 and 021, Kuau, Maui, Hawai`i

Dear Ms. Kealoha:

Thank you for your comment letter of June 28, 2007. We will review the "Shoreline Hardening Policy and Environmental Assessment Guidelines" of the *Environmental Guidebook* and refer to *Natural Hazard Consideration for Purchasing Real Estate in Hawai'i* and the *Hawaii Coastal Hazard Mitigation Guidebook* by Dennis J. Hwang (2005).

Further, the draft Environmental Assessment (EA) will discuss impacts from dust and noise during construction, long-term water quality ad soil impacts from the breakdown of the materials used to construct the revetments, impacts upon marine flora and fauna, and potential impacts to archaeological resources.

Should you require additional clarification, please call me at (808) 244-2015 or by email at planning@mhplanning.com. Copies of the draft EA will be forwarded to your agency.

Very truly yours,

Mich Hirano, AICP
Principal

MH:lh
cc: Stanton Cohen
Betsy Jacobson
F:\DATA\Cohen\KuauShoreline\oeqcres.ltr.wpd

JUL 0 2 2007

PHONE (808) 594-1888 FAX (808) 594-1865

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
711 KAPI'OLANI BOULEVARD, SUITE 500
HONOLULU, HAWAI'I 96813

HRD07/3073

June 27, 2007

Mich Hirano, AICP
Project Manager
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, HI 96793

RE: Request for comments on the planned Draft Environmental Assessment and Conservation District Use Application for Proposed Rock Revetment; Kuau, Maui; TMKs: seaward of 2-6-009:005 and 021

Dear Mich Hirano,

The Office of Hawaiian Affairs (OHA) is in receipt of your June 4, 2007, request for comments on the above project, which would allow property owners to remove debris from old rock seawalls and construct a grouted rock revetment to stop further erosion of their property. OHA generally does not support hardening of the shoreline, and would want to have more information to determine whether or not we could support this proposal.

We would want to know if the current owners purchased the property with the seawalls already in place, or if they constructed the original structures, and if the latter, when that occurred. We would also want to know whether the rest of the nearby eroding shoreline has been hardened.

OHA has concerns about public access to the shoreline in general and Native Hawaiian access for gathering, fishing and cultural purposes. We would want assurances that access would not be negatively impacted by the proposed construction and that the construction would not impact upon natural nearshore processes that could therefore impact upon natural and cultural resources. Furthermore, we would request assurances that should any should iwi kūpuna or Native

Hawaiian cultural or traditional deposits be found during potentially permitted ground disturbance or excavation, work will cease, and the appropriate agencies will be contacted pursuant to applicable law.

Thank you for the opportunity to comment at this time. We look forward to reviewing the forthcoming documents. If you have any further questions or concerns please contact Heidi Guth at (808) 594-1962 or e-mail her at heidig@oha.org.

Sincerely,

Clyde W. Nāmu'o
Administrator

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
GWEN OHASHI HIRAGA
MITSURU "MICH" HIRANO
KARLYNN FUKUDA

MARK ALEXANDER ROY

April 9, 2009

Clyde Nāmu`o
Administrator
Office of Hawaiian Affairs
711 Kapiolani Boulevard, Suite 500
Honolulu, Hawai`i 96813

SUBJECT: Proposed Shoreline Protection Structure at 475 and 465 Hana Highway, Tax Map Key (2) 2-6-009:005 and 021, Kuau, Maui, Hawai`i

Dear Mr. Nāmu`o:

Thank you for your comment letter of June 27, 2007. The following responds to your comments.

1. The old rock seawall was pre-existing before the current property owners purchased the properties. The rock seawall fronts two (2) parcels (Parcel 5 and Parcel 21). The shoreline is not hardened to the east of Parcel 5.

2. In consultation with the State Department of Land and Natural Resources, the Maui Planning Department and the UH Sea Grant Extension Service, the shoreline structure has been modified to a hybrid revetment/seawall to minimize the impacts of the wall on recreational activities in the area including public access. The lower revetment portion of the structure will include an approximate four (4) foot wide walkway above the revetment that will allow lateral shoreline access. The structure will connect to another shoreline protection structure proposed on the adjacent westerly property which is adjacent to Kaulahao Beach aka "Blue Tile" beach. Provision for a similar lateral access on the adjacent westerly property should ensure continued lateral access along the shoreline from Kaulahao Beach.

3. The owners are aware of the cultural sensitivity of the shoreline area and a monitoring plan will be prepared. In the event iwi kupuna or Native Hawaiian cultural or traditional deposits are found during ground altering acitivities, work will cease in the immediate area, the State Historic Preservation Division will be notified, and appropriate mitigative action taken.

Should you require additional clarification please call me at (808) 244-2015 or by email: planning@mhplanning.com. A copy of the draft environmental assessment (EA) will be forwarded to your agency.

Very truly yours,

Mich Hirano, AICP
Principal

MH:lh
cc: Stanton Cohen
Betsy Jacobson
F:\DATA\Cohen\KuauShoreline\ohares.ltr.wpd

JUN 1 8 2007

LINDA LINGLE
GOVERNOR

BARRY FUKUNAGA
DIRECTOR

Deputy Directors
FRANCIS PAUL KEENO
BRENNON T. MORIOKA
BRIAN H. SEKIGUCHI

IN REPLY REFER TO:

STP 8.2516

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

June 13, 2007

Mr. Mich Hirano, AICP
Project Manager
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Mr. Hirano:

Subject: Proposed Rock Revetment Seaward
Conservation District Use Application (CDUA) and
Grant of Easement
TMK: (2) 2-6-09: 005 and 021

Thank you for your notification of the project to replace the existing rock mound seawall with a rock revetment at a property on the seaward side of Hana Highway in Kuau, Maui.

The proposed replacement project is not anticipated to create a traffic impact on our State highway. We request that the proper use of highway accesses, the due care and proper contractor control of debris spillage, and construction material hauling at and around highway accesses be required of the applicants and their contractor(s).

We appreciate the opportunity to provide comments.

Very truly yours,

BARRY FUKUNAGA
Director of Transportation

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
GWEN OHASHI HIRAGA
MITSURU "MICH" HIRANO
KARLYNN FUKUDA

MARK ALEXANDER ROY

April 9, 2009

Brennan Morioka, Director
Department of Transportation
State of Hawai`i
889 Punchbowl Street
Honolulu, Hawai`i 96813

SUBJECT: Proposed Shoreline Protection Structure at 475 and 465 Hana Highway, Tax Map Key (2) 2-6-009:005 and 021, Kuau, Maui, Hawai`i

Dear Mr. Morioka:

Thank you for your comment letter of June 13, 2007. During construction the project will initiate proper use of highway accesses, take due care and proper contractor control of debris spillage, and construction material hauling at and around highway accesses.

Should you require additional clarification please call me at (808) 244-2015 or by email: planning@mhplanning.com. A copy of the draft environmental assessment (EA) will be forwarded to your agency.

Very truly yours,

Mich Hirano, AICP
Principal

MH:lh
cc: Stanton Cohen
Betsy Jacobson
F:\DATA\Cohen\KuauShoreline\dotres.ltr.wpd

UNIVERSITY OF HAWAI'I

Sea Grant Extension Service
Maui Community College

6/29/2007

Mich Hirano
Munekiyo and Hiraga, Inc.
305 High Street, Suite 104
Wailuku, HI, 96793

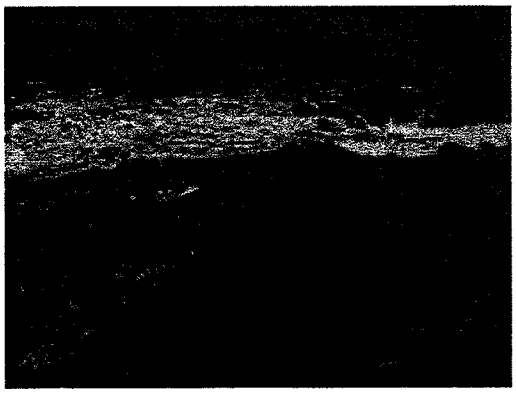
Dear Mr. Hirano,

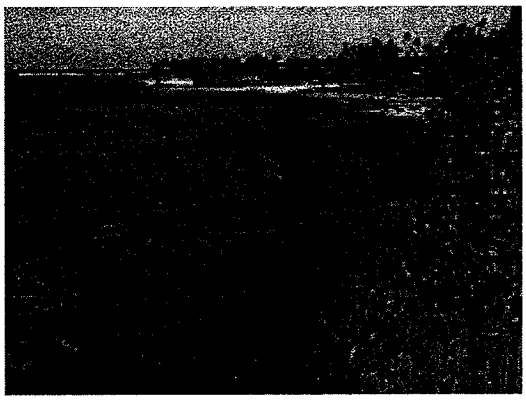
Re: Conservation District Use Application and Grant of Easement for a Proposed Rock Revetment Seaward of TMK (2) 2-6-09:005 and 021, Kuau, Maui, Hawaii

Thank you for the opportunity to comment on the proposed erosion mitigation solution for the above properties. As these properties are not adjacent to a sandy beach and not situated on any sand reserves, I am not concerned that shoreline armoring will lead to any beach damage or sand loss at this location.

I do, however, have an access-related concern with the design of the proposed structure. It is proposed that the toe of the revetment will extend to within 4 feet of the reef shelf. The problem is that the channel that currently exists between the base of the embankment and the reef shelf is actually a very frequently used access to the outer reef by surfers during winter months. During summer months, it is used by locals as access from the beach to the ocean. (About 1 month ago, on my first purely recreational visit to the nearby beach, I witnessed a large family – 13 people ranging in age from 6-50+, going on a Sunday morning stand-up paddleboard journey down the coast. They launched from the beach and paddled through this same channel, and out of the bay. Half an hour later, 2 men on outrigger canoes entered through the channel, landed on the beach, and carried their canoes to their nearby homes.)

On a site visit to Parcel 21 and the parcel immediately to the west on November 3, 2004, I took the following photographs showing a surfer paddling through the shore-parallel channel before heading out to the very popular Tavares Bay surf break.





310 Kaahumanu Avenue Kahului, Maui, HI 96732 Telephone: (808) 984-3335 Facsimile (808) 242-8733
E-Mail: norcross@soest.hawaii.edu

If the structure were built as designed, the channel would no longer be safe enough for the surfers and paddlers to paddle through. The surge of the incoming waves combined with the reflection of the waves off the nearby revetment would present a significant hazard.

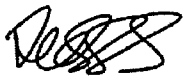
In previous discussions with these homeowners, particularly for Parcel 5, we had suggested looking at designing a structure that is a revetment on the bottom transitioning to a vertical seawall roughly mid-way up. The benefit to this would be a smaller footprint, a smaller encroachment, and protection of a wide enough channel for surfers to pass through. In addition, a lateral access pathway could be provided at the transition between the revetment and the seawall.

Options to consider may include, but not be limited to:

1) The hybrid revetment/seawall design mentioned above;
2) A vertical seawall
3) A revetment constructed on private land – ie, excavating the yards of the properties in order to move the entire revetment mauka and out of the channel
4) Do nothing – allow the natural erosion processes to continue

Thank you for your consideration. Please contact me if you have any questions.

Sincerely,



Zoe Norcross-Nu'u
Sea Grant Coastal Processes Extension Agent

cc. Jeff Hunt, Director, Maui Planning Department

310 Kaahumanu Avenue Kahului, Maui, HI 96732 Telephone: (808) 984-3335 Facsimile (808) 242-8733
E-Mail: norcross@soest.hawaii.edu

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
GWEN OHASHI HIRAGA
MITSURU "MICH" HIRANO
KARLYNN FUKUDA

MARK ALEXANDER ROY

April 9, 2009

Zoe Norcross-Nu`u
Sea Grant Coastal Processes Extension Agent
University of Hawai`i
Sea Grant Extension Service
Maui Community College
310 Ka`ahumanu Avenue
Kahului, Hawai`i 96732

SUBJECT: Proposed Shoreline Protection Structure at 475 and 465 Hana Highway, Tax Map Key (2) 2-6-009:005 and 021, Kuau, Maui, Hawai`i

Dear Ms. Norcross-Nu`u:

Thank you for your comment letter of June 29, 2007. Pursuant to your recommendations the shoreline protection structure will be modified to a hybrid design. The structure will consist of a lower rock revetment with an approximate four (4) ft. wide lateral access above the revetment and a seawall structure behind the revetment. The return on the western boundary of Parcel 21 and the transition for public lateral access on the proposed revetment wall will depend of the shoreline structure approved on the adjacent westerly property.

The revetment has been sited as far landward as possible to reduce the structure's impact on the shore-parallel channel fronting the properties. The structural engineer's analysis will determine how close the footing of the seawall on Parcel 21 will be located from the existing slab on grade residence. Due to the existing structure on Parcel 21 the revetment cannot be constructed entirely on private land.

The no action scenario does not resolve the current erosion problem experienced by the subject properties. Continued erosion will eventually create a health and safety problem for the property owners since it is difficult to relocate the existing slab on grade residence out of harms way.

Should you require additional clarification please call me at (808) 244-2015 or by email: planning@mhplanning.com. A copy of the draft environmental assessment (EA) will be forwarded to your agency.

Very truly yours,

Mich Hirano, AICP
Principal

MH:lh
cc: Stanton Cohen
Betsy Jacobson
F:\DATA\Cohen\KuauShoreline\UHSeaGrantExtensionServiceres.ltr.wpd

CHARMAINE TAVARES
Mayor

JUN 2 9 2007
TAMARA HORCAJO
Director

ZACHARY Z. HELM
Deputy Director

(808) 270-7230
Fax (808) 270-7934

DEPARTMENT OF PARKS & RECREATION

700 Hali'a Nakoa Street, Unit 2 , Wailuku, Hawaii 96793

June 25, 2007

Mr. Mitch Hirano, Planner
Munekiyo and Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Mr. Hirano:

SUBJECT: Conservation District Use application and Grant of Easement for a Proposed Rock Revetment Seaward of TMK (2)2-6-09:005 and 021; Kuau, Maui, Hawaii

We have reviewed the proposed shoreline protection for the Argyropoulos and Baskin properties at 475 and 465 Hana Highway. The Department of Parks and Recreation is concerned with the impact on the neighboring ocean recreation areas and beaches. The proposal will alter both the land and waterline and could result in negative impacts to the natural coastline.

The proposal is for the State land to be altered and not the owner's property for issues of construction, ownership, and maintenance must also be considered.

Should you have any questions please contact me or Tammy Osurman, Capital Improvements Project Coordinator at 270-7388.

Sincerely,

TAMARA HORCAJO
Director

xc: Patrick Matsui, Chief of Planning and Development
DSA

TH:to

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
GWEN OHASHI HIRAGA
MITSURU "MICH" HIRANO
KARLYNN FUKUDA

MARK ALEXANDER ROY

April 9, 2009

Tamara Horcajo, Director
Department of Parks and Recreation
Attention: Tammy Osurman
County of Maui
700 Hali`a Nakoa Street, Unit 2
Wailuku, Hawai`i 96793

SUBJECT: Proposed Shoreline Protection Structure at 475 and 465 Hana Highway, Tax Map Key (2) 2-6-009:005 and 021, Kuau, Maui, Hawai`i

Dear Ms. Horcajo:

Thank you for your comment letter of June 25, 2007. In consultation with the State Department of Land and Natural Resources, the Maui Planning Department and the UH Sea Grant Extension Service, the shoreline structure has been modified to a hybrid revetment/seawall to minimize the impacts of the wall on recreational activities in the area including public access. The lower revetment portion of the structure will include an approximate four (4) foot wide walkway above the revetment that will allow lateral shoreline access. The structure will connect to another shoreline protection structure proposed on the adjacent westerly property which is adjacent to Kaulahao Beach aka "Blue Tile" beach. Provision for a similar lateral access on the adjacent westerly property should ensure continued lateral access along the shoreline from Kaulahao Beach.

Further, we are in discussion with the State Department of Land and Natural Resources regarding the use of State lands and appropriate permits and easements will be obtained.

Should you require additional clarification please call me at (808) 244-2015 or by email: planning@mhplanning.com. A copy of the draft environmental assessment (EA) will be forwarded to your agency.

Very truly yours,

Mich Hirano, AICP
Principal

MH:lh
cc: Stanton Cohen
Betsy Jacobson
F:\DATA\Cohen\KuauShoreline\dprres.ltr.wpd

CHARMAINE TAVARES
Mayor

JEFFREY S. HUNT
Director

COLLEEN M. SUYAMA
Deputy Director

JUL 11 2007

COUNTY OF MAUI
DEPARTMENT OF PLANNING

July 5, 2007

Mr. Mitch Hirano, AICP
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Mr. Hirano:

RE: Request for Comments on a Conservation District Use Application and Grant of Easement for a Proposed Rock Revetment Seaward of TMK: (2) 2-6-009:005 and 021, Kuau, Maui, Hawaii

The County of Maui Department of Planning (Department) concurs with Ms. Zoe Norcross-Nu'u's letter of June 29, 2007, which recommends the following considerations:

1. Consider and describe a hybrid revetment / seawall design;
2. Consider and describe a vertical seawall;
3. Consider and describe a revetment on private land; and
4. Consider and describe the 'null' or do nothing alternative.

In addition, the Department provides the following comments:

1. Consider and describe relocating structures mauka (landward) of the erosion prone area;
2. Provide a cost / benefit analysis of all options, including structural relocation;
3. Describe the shape, nature and proximity of structures at the site and the parcels configuration; and
4. If the parcel is a flag lot, describe the history of the subdivision, the recipients of the subdivided lots, and the relationship of the current parcel owners to the owner of the original (pre-subdivision) lot.

Please note that any application for shoreline hardening, whether it be on State or County lands, may require a Shoreline Setback Variance and Special Management Area Use Permit. Such permits require an Environmental Assessment that addresses each of the above alternatives, including cost / benefit analysis, which is standard information required by the Maui Planning Commission.

Should you require further clarification, please contact Mr. Thorne Abbott, Staff Planner, at thorne.abbott@mauicounty.gov or at 270-7520.

Sincerely,

JEFFREY S. HUNT, AICP
Planning Director

JSH:TEA:bg
c: Colleen M. Suyama, Deputy Planning Director
Thorne E. Abbott, Staff Planner
Zoe Norcross-Nu'u, SeaGrant Specialist
DLNR-OCCL
EAC File
General File
K:\WP_DOCS\PLANNING\EAC\2007\0017_KuauSeawall\Comment.wpd

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
GWEN OHASHI HIRAGA
MITSURU "MICH" HIRANO
KARLYNN FUKUDA

MARK ALEXANDER ROY

April 9, 2009

Jeffrey S. Hunt, Director
Department of Planning
County of Maui
250 South High Street
Wailuku, Hawai`i 96793

SUBJECT: Proposed Shoreline Protection Structure at 475 and 465 Hana Highway, Tax Map Key (2) 2-6-009:005 and 021, Kuau, Maui, Hawai`i

Dear Mr. Hunt:

Thank you for your comment letter of July 5, 2007. The following responds to your comments.

1. Pursuant to the recommendations of Ms. Zoe Norcross-Nuu, the shoreline protection structure has been modified to a hybrid revetment/seawall design.

2. The alternatives section of the draft Environmental Assessment (EA) will include relocating structures landward of the erosion prone area.

3. The draft EA will discuss the cost/benefits of the various alternatives considered.

4. Parcel 21 is a flag lot that was part of a previous subdivision. The draft EA will include a discussion of the relationship of the current parcel owners to the owner of the original (pre-subdivision) lot.

The project will be applying to the County of Maui for a Shoreline Setback Variance and a Special Management Area Use Permit. A draft EA is being prepared and a copy will be filed with the Maui Planning Department.

Should you require additional clarification please call me at (808) 244-2015 or by email: planning@mhplanning.com. Copies of the draft EA will be forwarded to your agency.

Very truly yours,

Mich Hirano, AICP
Principal

MH:lh
cc: Stanton Cohen
Betsy Jacobson
F:\DATA\Cohen\KuauShoreline\planningres.ltr.wpd

X. REFERENCES

X. REFERENCES

County of Maui, The General Plan of the County of Maui, September 1990 Update.

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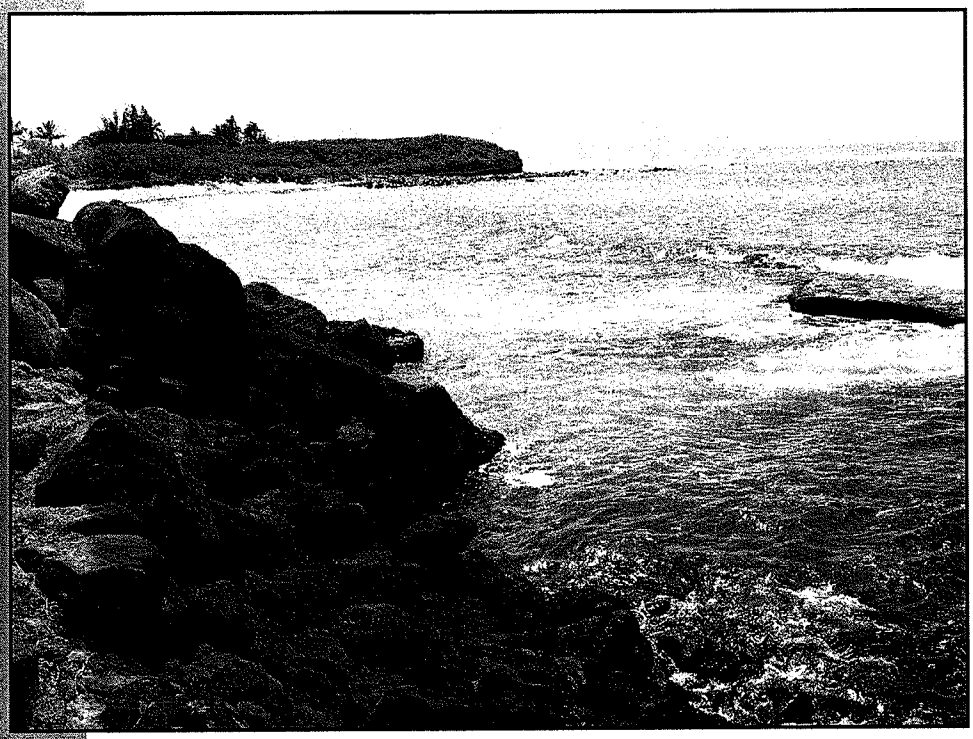
APPENDIX A.

Kuau Shore Protection Coastal Engineering Evaluation and Basis of Design, January 2009

Kuau Shore Protection Coastal Engineering Evaluation and Basis of Design

Paia, Maui, Hawaii

January 2009



Prepared for:
Gary Goetzman and James Argyropoulos
Maui, HI

Prepared by:
Sea Engineering, Inc.
Makai Research Pier
Waimanalo, HI 96795

SEI Job No. 25031

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1. INTRODUCTION

Sea Engineering, Inc. has been retained to perform an evaluation of shoreline processes and conceptual design of alternatives for protection of the shoreline fronting parcels TMKs 2-6-09-005 and 021 in Kuau, Paia, Maui. The objective of the proposed design and coastal evaluation is to identify and expand upon feasible design alternatives in the context of existing wave and shoreline conditions and processes and issues pertaining to permitting.

Kuau is located on the north shore of Maui, approximately six miles east of Kahului (Figure 1-1). The coastline between Kahului and Kuau consists of a series of narrow sand beaches separated by low-lying rocky headlands. A fringing reef, varying in width from 2,000 to 5,000 feet, lies off this six-mile long coastal sector. The reef is a few feet deep near the shoreline and slopes gradually to depths of 10 to 30 feet at its seaward edge. The project site consists of two parcels referred to as the Goetzman property (Lot 021) and the Cohen property (Lot 005).

The Office of Environmental Quality Control (OEQC) produced "Guidelines for Assessing Shoreline Alteration and Hardening Projects" to assist in the complete preparation of coastal engineering assessments. The guidelines recommend that coastal assessments include the following:

1. Historical shoreline analysis of coastal erosion and accretion rates
2. Shoreline description
3. Site maps
4. Beach profiles
5. Existing structure analysis
6. Description of improvements
7. Coastal hazard history
8. Wave, current, and sediment pattern analyses
9. Thirty-year erosion hazard
10. Photographs
11. Alternatives
12. Professional Engineer seal

This coastal assessment has been prepared in accordance with the OEQC guidelines to provide the information necessary to advance the permitting and planning process.

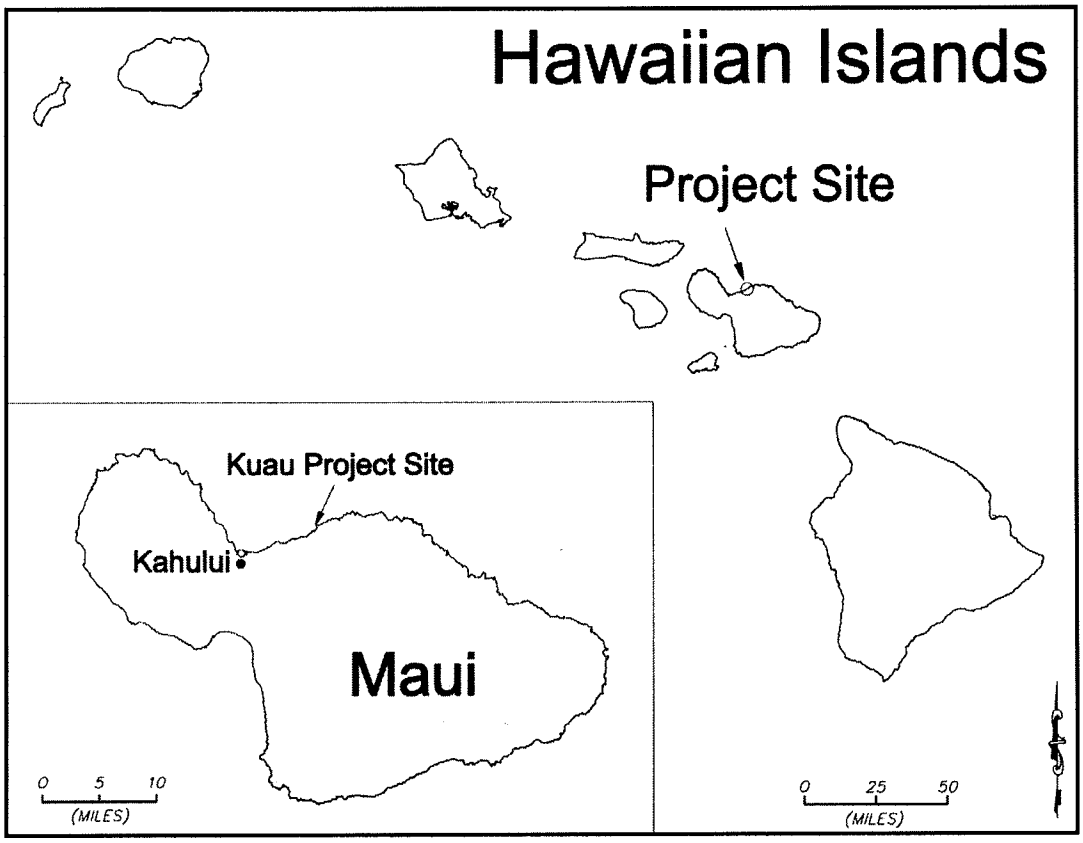


Figure 1-1 Kuau Project Location Map

2. SITE CONDITIONS

2.1 Regional Setting/Site Survey

The beaches east of Kahului Harbor consist primarily of calcareous sand with little terrestrial material. The predominant sand transport in the area is from east to west, and evidence of this is the accretion on the updrift (east) side of the many small groins in the area, and erosion has occurred when the westward moving sand transport is interrupted. The coastline from Kahului to Paia has been plagued by serious erosion problems for many years (Cox, 1954; Clark, 1989; Makai Ocean Engineering, Inc. and Sea Engineering, Inc., 1991). Many of the beaches are characterized by natural evidence of severe erosion (exposed beach rock, wave cut scarps, and submerged tree stumps) and by man's efforts to check the erosion (seawalls, revetments, and groin fields). According to Cox, the beaches from Kahului to Paia eroded for at least 50 years prior to 1954. The only exception was the beach area just east of Kahului Harbor, where the harbor breakwater blocked the westward moving sand, causing the shoreline to accrete. Cox estimated the accretion at that location to be 6,000 cubic yards per year. Sand was removed from this accreting beach for construction purposes, and according to Moberly and Chamberlain (1964) sand was still being removed in the 1960s. Cox interviewed local residents and his general impression was that the beaches in the area had retreated 100 feet from 1900 to 1954, with 30 feet of that occurring from 1945 to 1954. These figures were not rigorously documented; however, they do provide an indication of the extent of the problems that have occurred along this coastline.

The project site is located on Kuau Bay near the town of Paia, Maui (Figure 2-1, Figure 2-2). Kuau Bay is bordered by Tavares Bay to the east and the two bays are a combined 2,400 feet wide. The reef is located 1,500 to 2,000 feet from shore and contains the surf break referred to as "Tavares Bay." The reef is less than three feet deep is some places. Hookipa, a popular surfing and windsurfing location, is about 1.5 miles east.

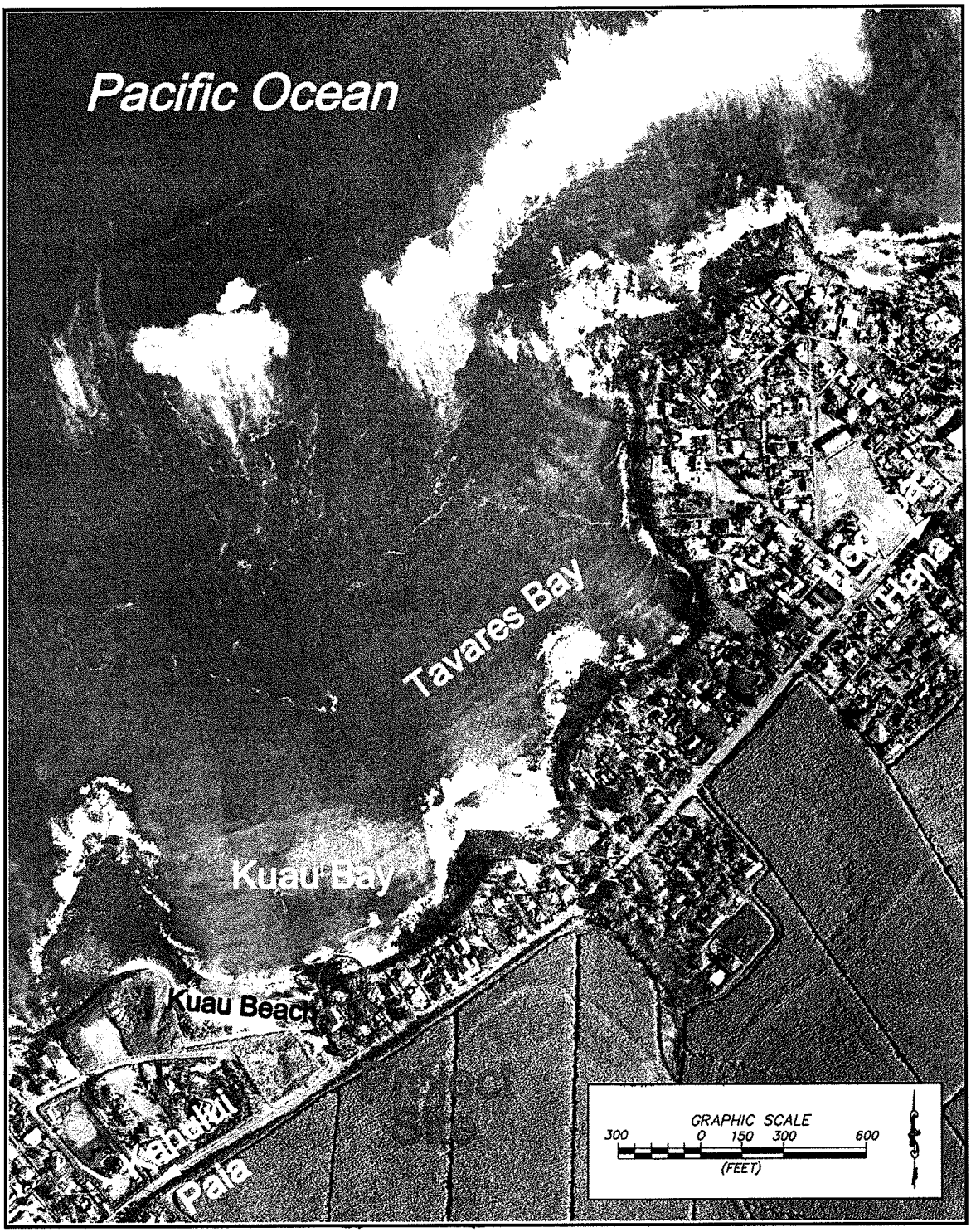


Figure 2-1 Kuau location map

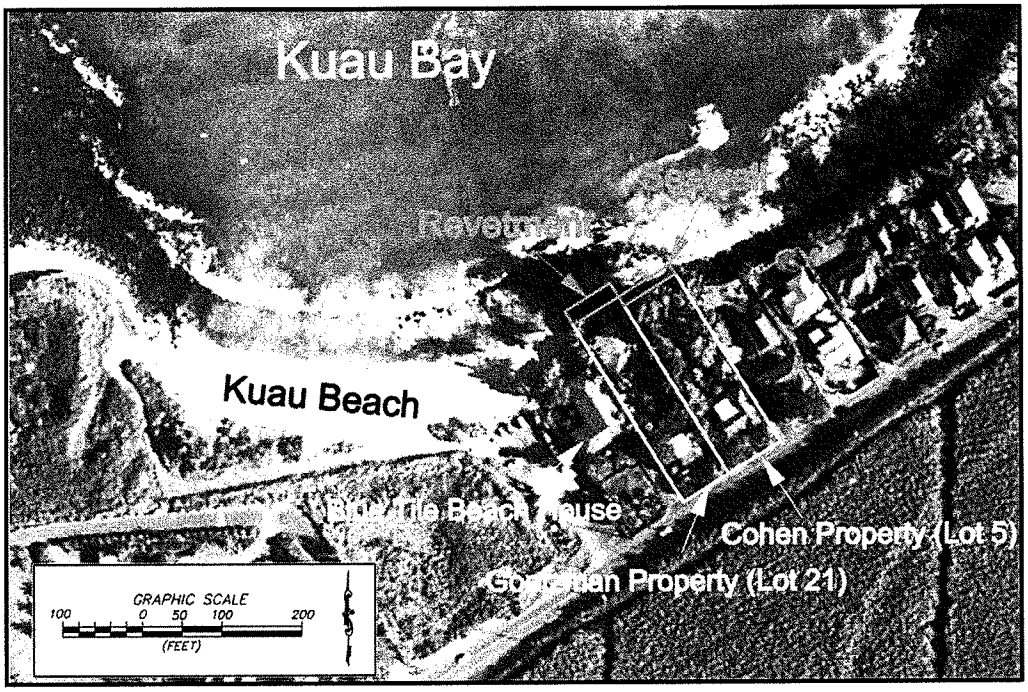


Figure 2-2 Project site location map

The project site consists of two adjacent parcels. The two parcels are separated from Kuau Beach by a third property, known as the Blue Tile Beach House. Shore protection for this property is being designed by another company. The typical elevation of the seaward lawns of these parcels is 16 to 20 feet above mean lower low water (MLLW). The shoreline at these parcels faces approximately northwest and high escarpments are found at the seaward limits of the properties. Kuau Beach extends about 550 feet west of the Blue Tile Beach House and is typically about 70 feet wide. The nearshore bathymetry includes a protected channel parallel to shore that is frequented by users such as surfers, paddlers, and swimmers. A bathymetric map is shown as Figure 2-3. The figure shows the locations of the outer reefs, as well as the surf break referred to as "Tavares Bay."

The shoreline along much of Kuau and Tavares bays east of Kuau Beach has been hardened, either naturally or by homeowners. Portions of the shoreline consist of basalt cobbles; it is difficult to differentiate between naturally-occurring rock and placed rock.

Kuau Beach is bordered on the east by the Blue Tile Beach House. Part of that property is protected with a steep-faced CRM seawall (Figure 2-4). Erosion has left the toe of the seawall exposed to waves and the wave effects have undermined the toe, suggesting that the seawall was constructed at a time when the beach was more accreted. Undermining of the toe compromises the effectiveness as well as the structural stability of the seawall. The seawall, which is overgrown with Naupaka, ends near the midpoint of the property line (Figure 2-5) and the rest of

the property to the east shows vertical escarpments in the clay matrix (Figure 2-5 and Figure 2-6). Sandy beach extends to the eastern property line.

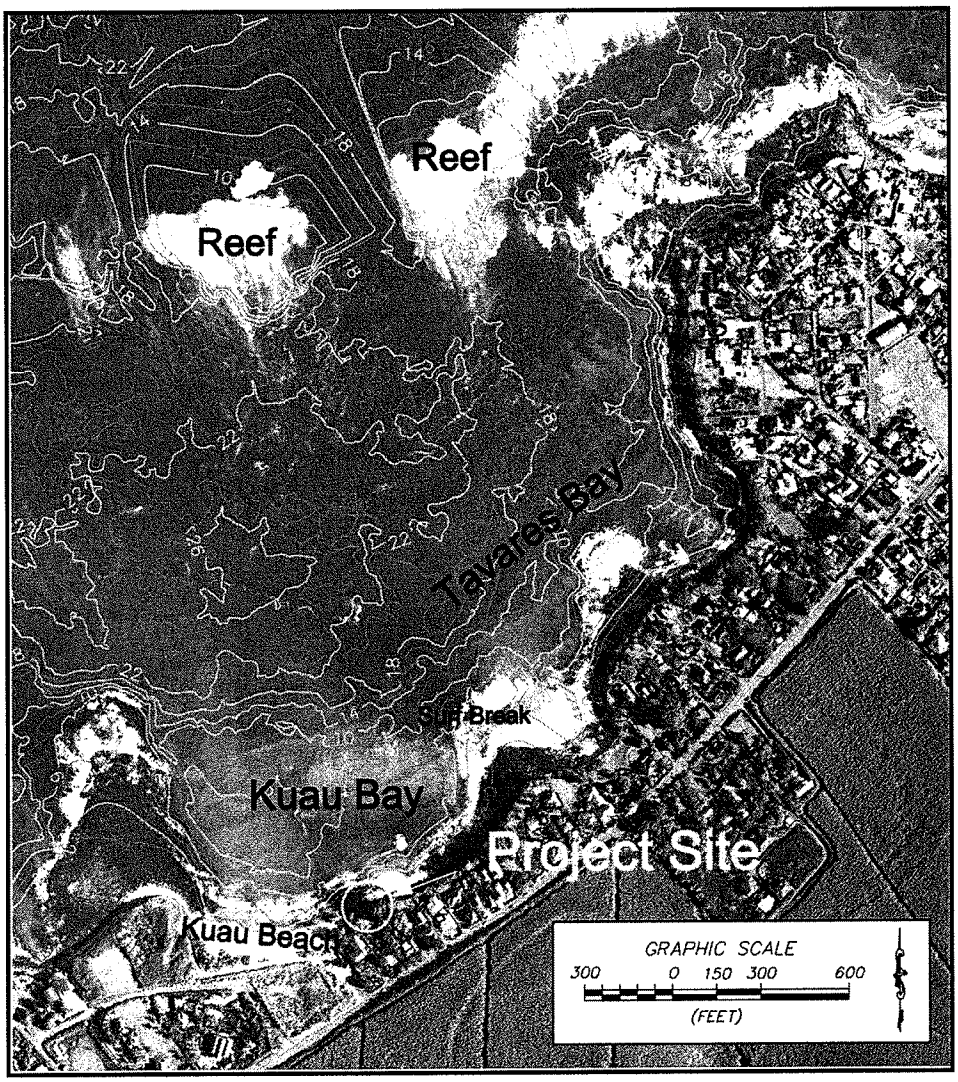


Figure 2-3 Bathymetric map of Kuau and Tavares bays

Figure 2-4 Seawall at Blue Tile Beach House

Figure 2-5 End of seawall at Blue Tile Beach House

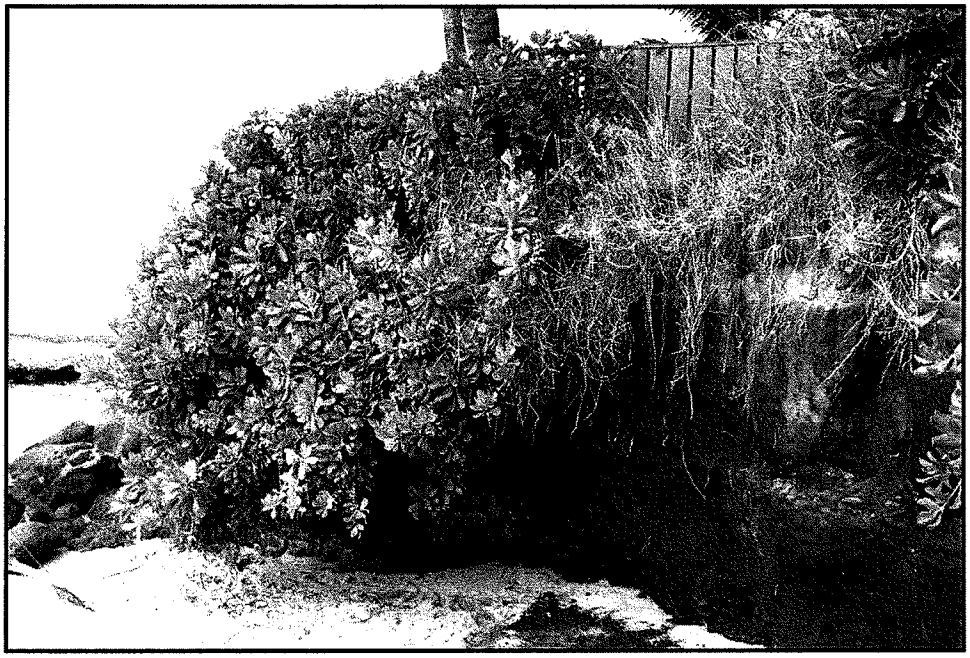


Figure 2-6 Steep escarpment near eastern property line of the Blue Tile Beach House

The second property east of Kuau Beach is referred to as the Goetzman property (parcel 21). This property is stabilized by a rock revetment shown in Figure 2-7 that extends from the western property line to the eastern property line. The elevation of the property is about 18 inches above the crest of the revetment and much of the escarpment above the revetment is stabilized with Naupaka (Figure 2-8). Portions of the revetment contain a thin grouted cap that has broken away in several locations. A rock bench formation about 60 feet offshore of the revetment is shown in Figure 2-9. Rising to an elevation of up to +2 feet MSL, the rock bench produces a protected area that is used by beach users such as swimmers, surfers, and paddlers. The slope of the revetment was measured to vary between 1V:1.1H and 1v:1.6H, while stone diameters were found to range from about two feet to about five feet. The revetment is reported to be reasonably effective during prevailing conditions.

The third property east of Kuau Beach is the property owned by James Argyropoulos (Lot 21). This property had previously been protected mainly by a vertical seawall. This seawall was apparently constructed with no anchoring into the soil and has since collapsed, exposing a vertical escarpment (Figure 2-10) that is up to 16-foot high. Some of the failed seawall remains as debris at the base of the escarpment. Other portions that are still standing have experienced extensive erosion behind the wall (Figure 2-11) and present safety concerns.

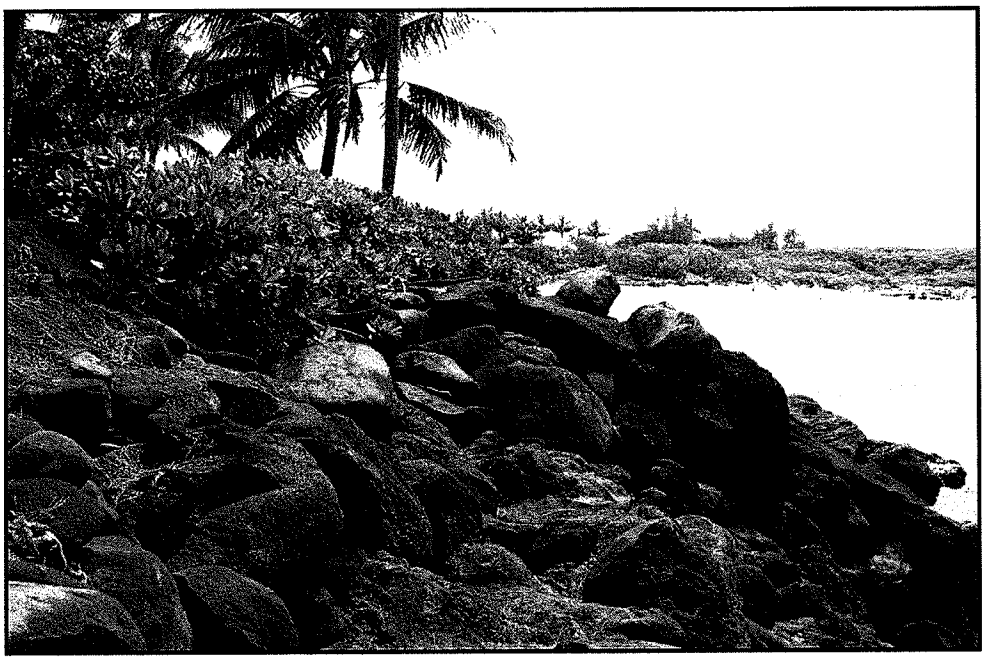


Figure 2-7 Rock revetment fronting Goetzman property

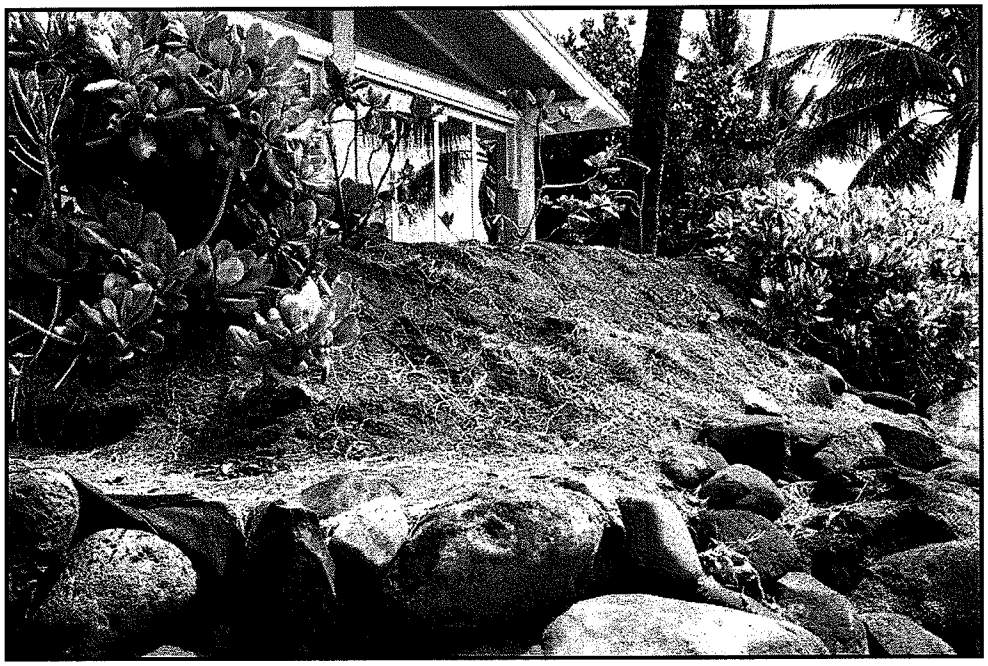


Figure 2-8 Top of revetment at Goetzman property

Figure 2-9 Rock bench offshore of Goetzman property

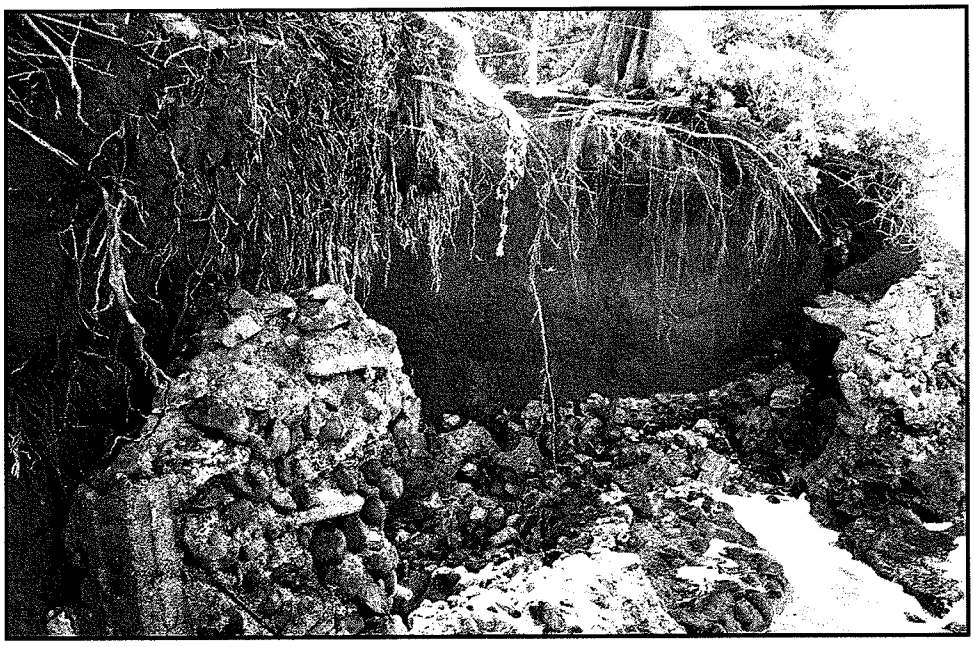


Figure 2-10 Failed seawall at Cohen property

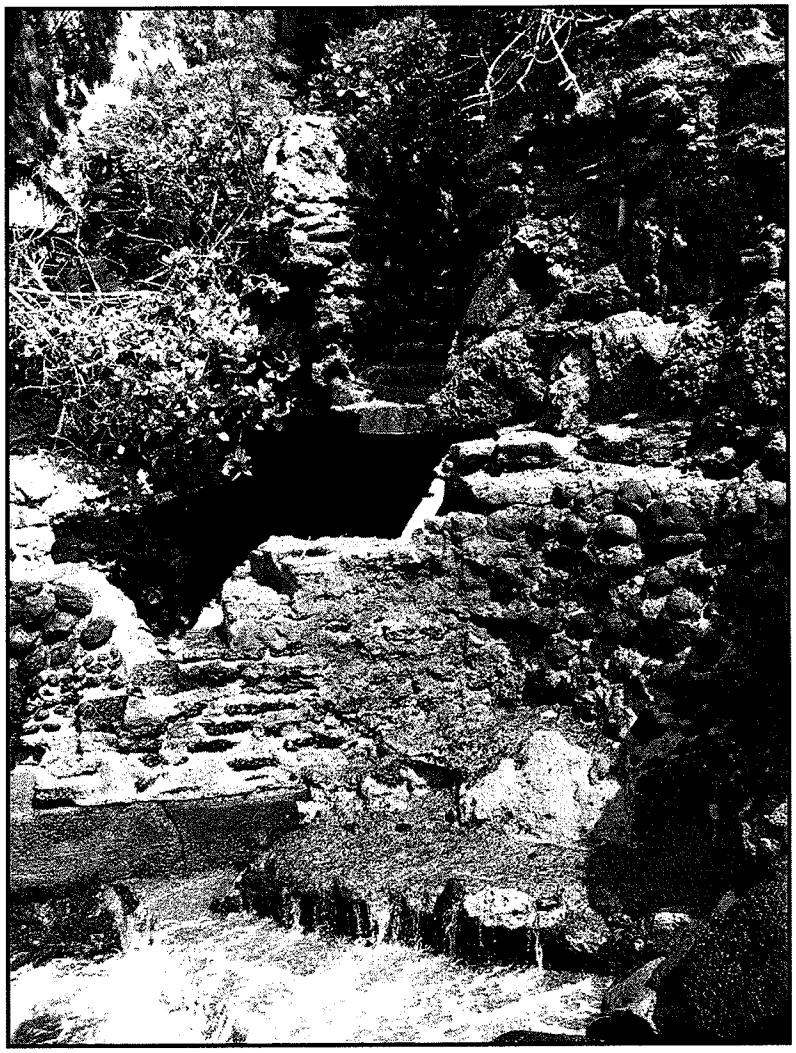


Figure 2-11 Erosion behind seawall and below stairs from Cohen property causing partial collapse of the seawall

Coastal erosion along this shoreline has been evaluated by the University of Hawaii's Coastal Geology Group (CGG), who presented the results in shoreline erosion maps shown in Figure 2-12 and Figure 2-13. The CGG used historical survey data and aerial photographs dated from 1912 to 2002 to quantify the shoreline change. The photographs were computer rectified and the low water lines on the photographs were digitized to provide a record of the long-term changes to that important coastal feature. The beach is presently experiencing erosion of more than one foot per year. The erosion map references Clark (1989), stating that the 1946 tsunami caused significant beach loss that resulted in shoreline hardening by property owners. The erosion maps

indicate little or no change along the project shoreline since the 1960 photograph, likely a result of the hardened shoreline.

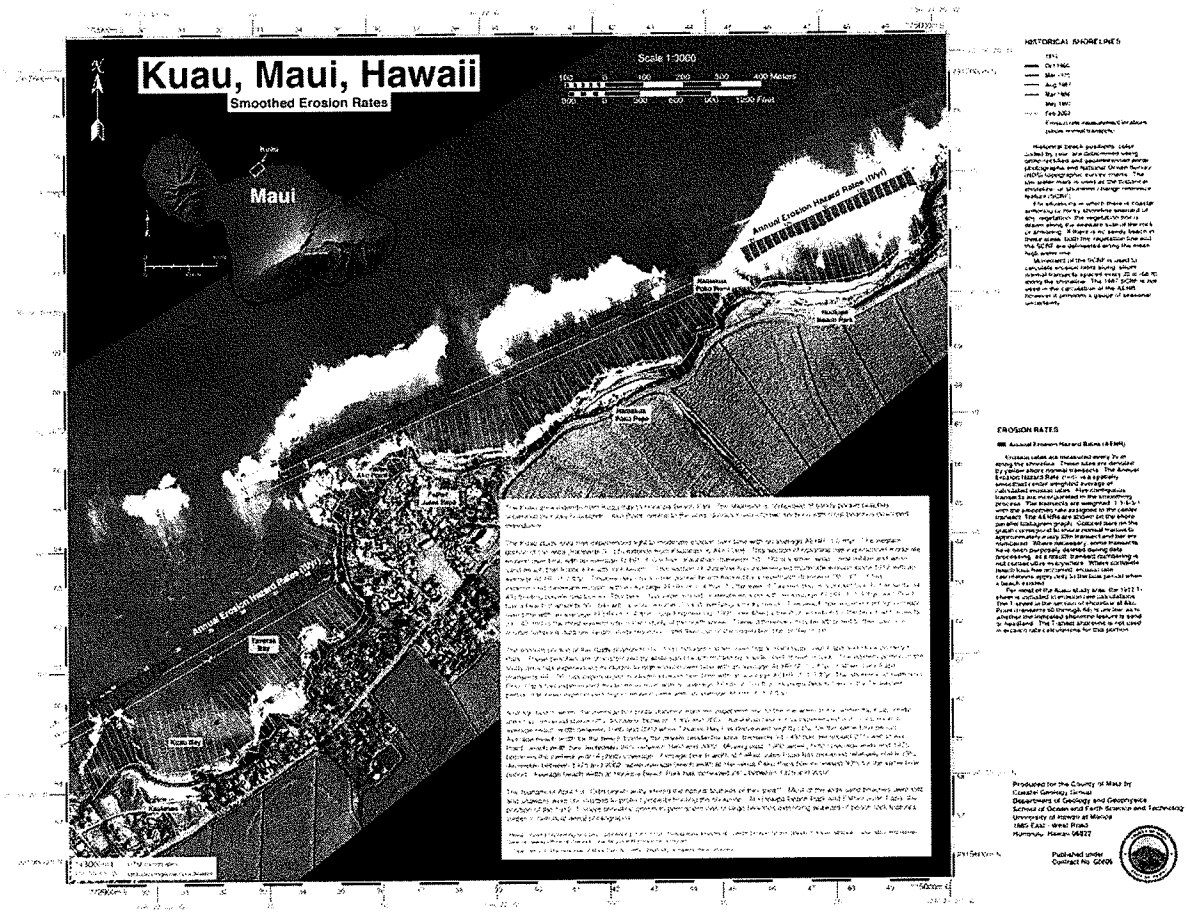


Figure 2-12 Kuau Shoreline Erosion Map

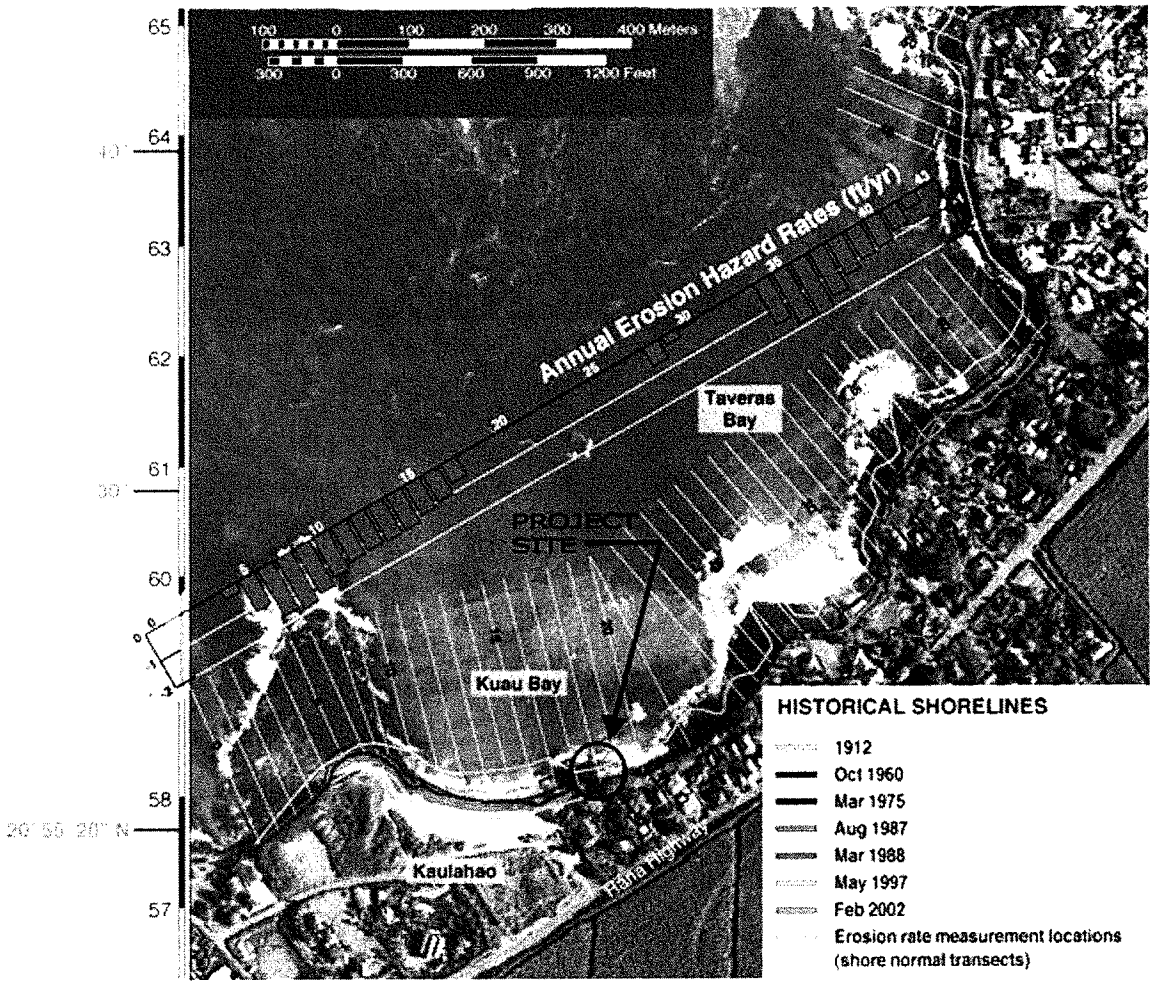


Figure 2-13 Kuau shoreline erosion map, close-up view

2.2 Beach profiles

Ten beach profiles were measured during a 2007 site visit. The profiles covered over 200 feet of shoreline ranging from the beach fronting the Blue Tile Beach House to the east side of the Cohen property. These profiles are numbered 01 through 10; their locations are shown in Figure 2-14 are the profiles are presented in Figure 2-15 and Figure 2-16. Profile 01 was measured in-line with the middle of the Blue Tile Beach House property. This profile shows a beach slope of approximately 1V:9H; the beach elevation at the base of the escarpment at the time of measurement was about +5 MLLW. Profiles 02 through 05 were measured across the Goetzman revetment. The profiles show that the elevation of the property a few feet landward of the

revetment is typically about +17 feet MLLW. The profiles also show the sand channel and rock bench shown previously in Figure 2-9. The channel has a typical depth of four to five feet below MLLW.

Profiles 06 through 09 were measured across the seawall at the Cohen property. The profiles show the typical elevation of the property inshore of the seawall to be +19 to +20 feet MLLW. Profiles 07 through 09 show the seawall failure and the rubble at the base of the seawall. Water depth 100 feet offshore of the seawall is typically 5 to 6 feet MLLW.

Profile 10 was measured at the neighboring property on the east side of the Cohen property. This profile shows a stable revetment with a slope of 1V:1.2H. Boulders at the base of the revetment extend to an elevation of about +7 feet MLLW at a slope of 1V:4H.

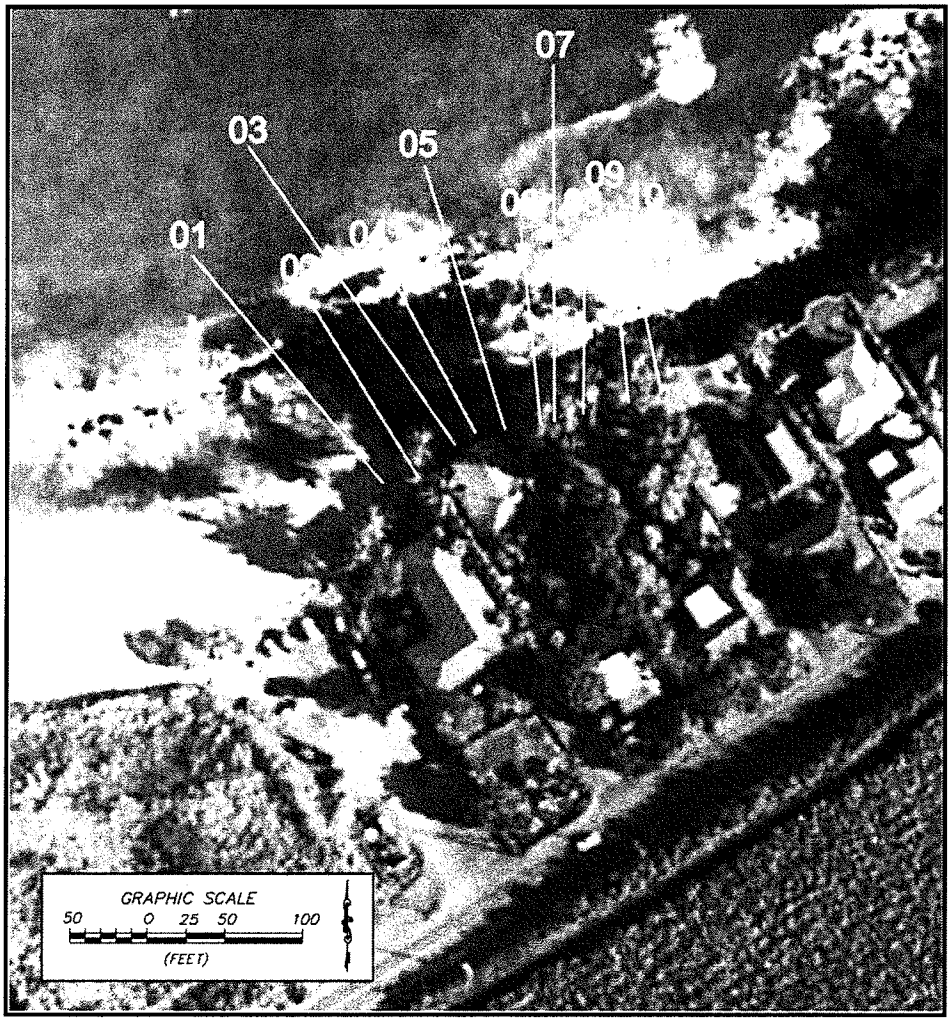


Figure 2-14 Profile locations

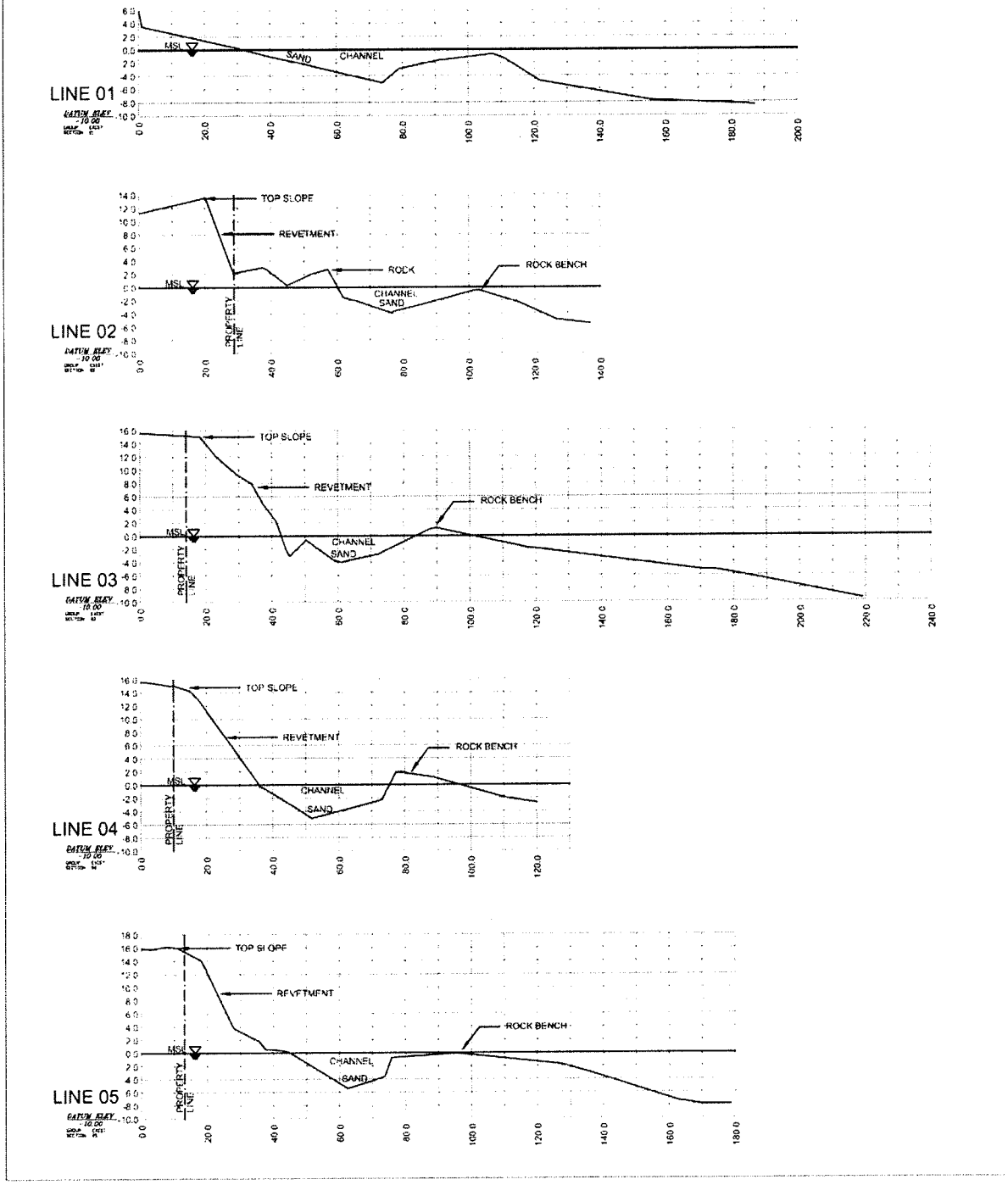


Figure 2-15 Profiles 01 through 05

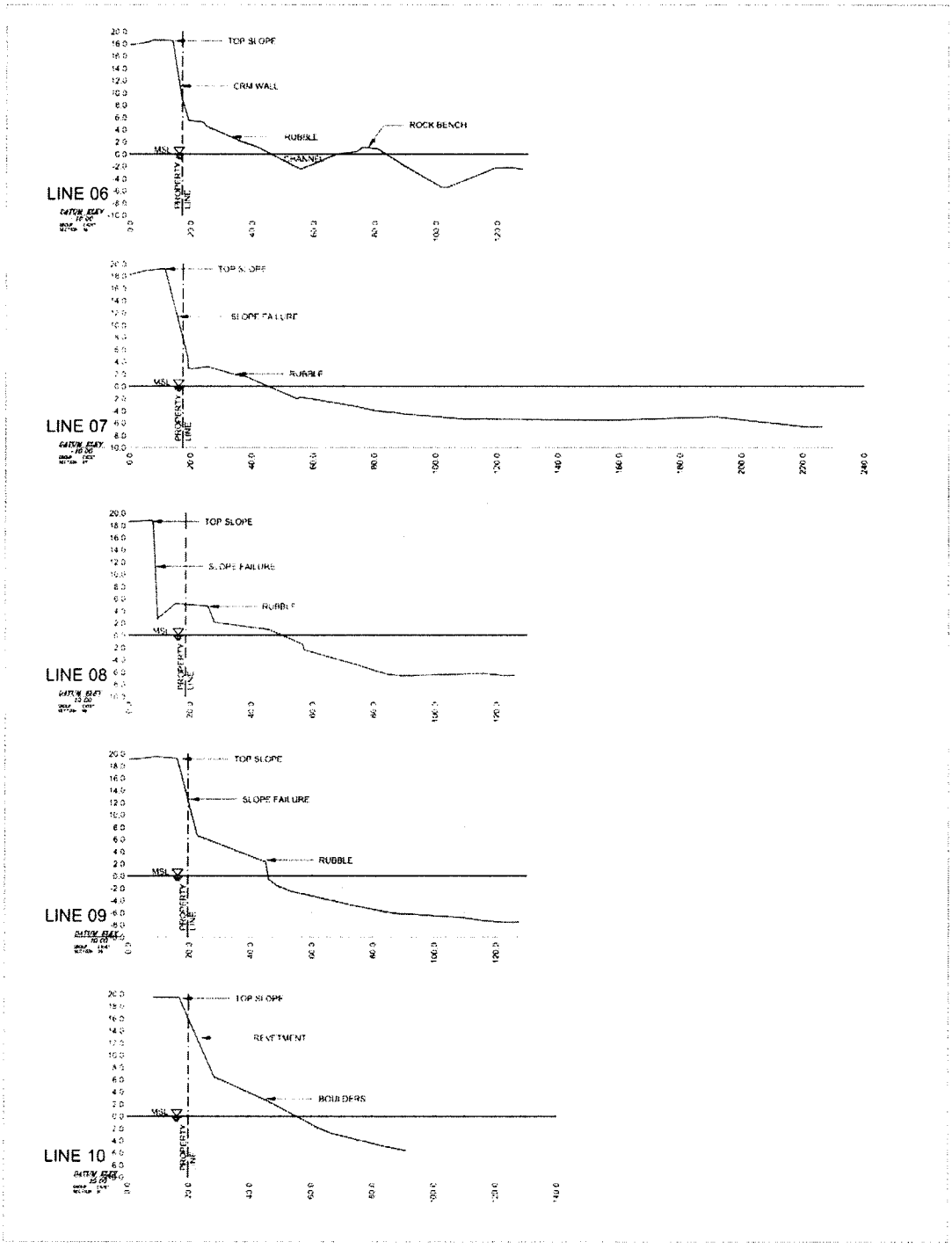


Figure 2-16 Profiles 06-10

3. OCEANOGRAPHIC DESIGN PARAMETERS

3.1 Winds

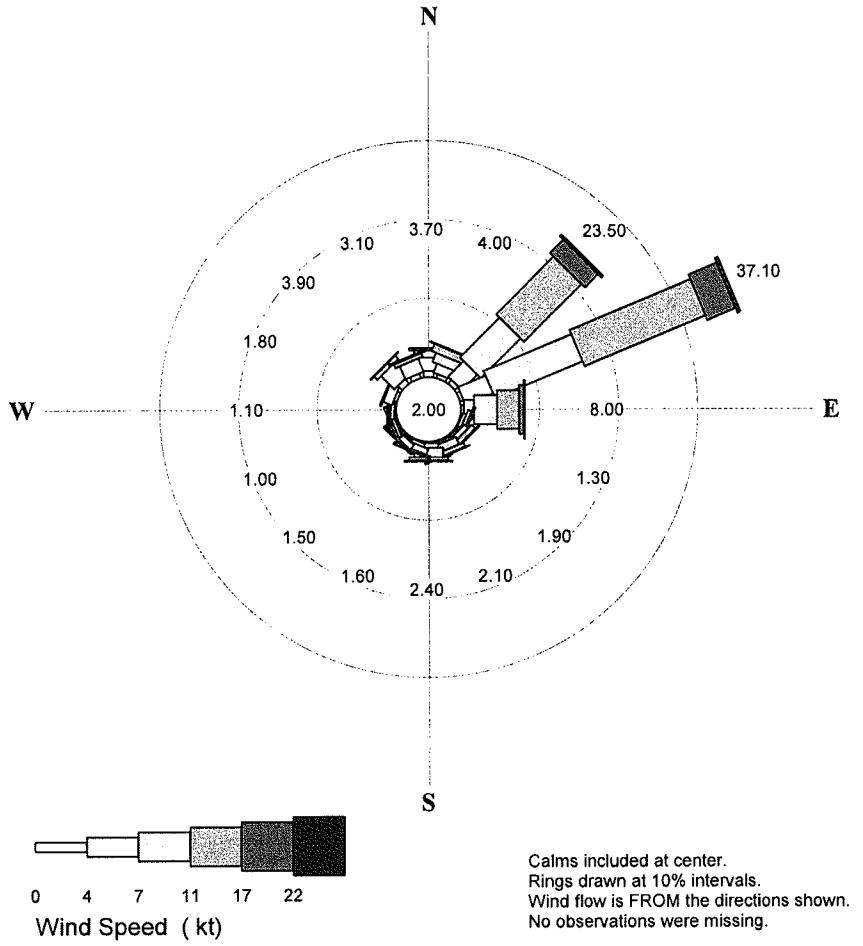
The prevailing wind throughout the year is the northeasterly trade wind. Its average frequency varies from more than 90% during the summer season to only 50% in January, with an overall annual frequency of about 70%. Westerly, or Kona, winds occur primarily during the winter months, generated by low pressure or cold fronts that typically move from west to east past the islands. Figure 3-1 shows a wind rose diagram based on wind data recorded at Honolulu International Airport between 1949 and 1995.

Tradewinds are produced by the outflow of air from the Pacific Anticyclone, also known as the Pacific High. The center of this system is located well north and east of the Hawaiian chain and moves to the north and south seasonally. In the summer months, the center moves to the north, causing the tradewinds to be at their strongest from May through September. In the winter, the center moves to the south, resulting in decreasing tradewind frequency from October through April. During these months, the tradewinds continue to blow; however, their average monthly frequency decreases to 50%.

During the winter months, two other wind patterns of a more transient nature increase in prevalence. These include winds from extra-tropical and Kona storms. Winds from extra-tropical storms can be very strong from almost any direction, depending on the strength and position of the storm. At Honolulu Airport, wind speeds resulting from these storms have on several occasions exceeded 60 mph. Kona winds are generally from a southerly to southwesterly direction and are usually associated with slow moving low pressure systems known as Kona lows situated to the west of the island chain. These storms are often accompanied by heavy rains and winds ranging from light to strong.

3.2 Hurricanes

While hurricanes occur infrequently in the vicinity of Hawaii, they do occasionally pass close to the islands. In recent years, three hurricanes have hit the island of Kauai. Hurricane Dot passed over Kauai in 1959, Hurricane Iwa passed within 30 miles of Kauai in 1982, and Hurricane Iniki passed directly over the island of Kauai in 1992. Hurricanes Iwa and Iniki caused extensive coastal flooding and damage on the west shores of Oahu and Maui as well. Early season hurricanes generally form off the west coast of Mexico and move westward. These storms usually pass south of the islands, with a northwest curvature near the islands. Late season hurricanes tend to form south of Hawaii and move north toward the islands. Typical approach directions are therefore from the sector east through southwest. Although direct hurricane impact on Kuau is unlikely, winds and waves generated by such storms could affect the project coastline.



PERCENT OCCURRENCE: Wind Speed (kt)
LOWER BOUND OF CATEGORY

DIR	0	4	7	11	17	22
N	0.80	1.70	0.90	0.30	0.00	0.00
NNE	0.50	1.20	1.20	1.00	0.10	0.00
NE	0.60	2.80	7.10	10.30	2.40	0.30
ENE	0.40	3.80	12.00	16.60	3.90	0.40
E	0.30	1.30	2.90	2.80	0.60	0.10
ESE	0.10	0.40	0.50	0.30	0.00	0.00
SE	0.10	0.30	0.70	0.70	0.10	0.00
SSE	0.10	0.30	1.00	0.60	0.10	0.00

TOTAL OBS = 134736 MISSING OBS = 0

PERCENT OCCURRENCE: Wind Speed (kt)
LOWER BOUND OF CATEGORY

DIR	0	4	7	11	17	22
S	0.10	0.60	1.20	0.40	0.10	0.00
SSW	0.10	0.40	0.80	0.30	0.00	0.00
SW	0.10	0.30	0.80	0.30	0.00	0.00
WSW	0.10	0.20	0.40	0.30	0.00	0.00
W	0.20	0.50	0.20	0.20	0.00	0.00
WNW	0.40	1.20	0.20	0.00	0.00	0.00
NW	0.80	2.40	0.60	0.10	0.00	0.00
NNW	0.60	1.80	0.50	0.20	0.00	0.00

CALM OBS = 2695 PERCENT CALM = 2.00

Figure 3-1 Wind Rose diagram, Honolulu International Airport, 1949-1995

3.3 Waves

3.3.1 Prevailing waves

The wave climate in Hawaii is typically characterized by four general wave types. These include northeast tradewind waves, southern swell, North Pacific swell, and Kona wind waves. Tropical storms and hurricanes also generate waves that can approach the islands from virtually any direction. Unlike winds, any and all of these wave conditions may occur at the same time.

Tradewind waves occur throughout the year and are the most persistent April through September when they usually dominate the local wave climate. They result from the strong and steady tradewinds blowing from the northeast quadrant over long fetches of open ocean. Tradewind deepwater waves are typically between 3 to 8 feet high with periods of 5 to 10 seconds, depending upon the strength of the tradewinds and how far the fetch extends east of the Hawaiian Islands. The direction of approach, like the tradewinds themselves, varies between north-northeast and east-southeast and is centered on the east-northeast direction. The project site is directly exposed to tradewind waves.

Southern swell is generated by storms in the southern hemisphere and is most prevalent during the summer months of April through September. Traveling distances of up to 5,000 miles, these waves arrive with relatively low deepwater wave heights of 1 to 4 feet and periods of 14 to 20 seconds. Depending on the positions and tracks of the southern hemisphere storms, southern swells approach between the southeasterly and southwesterly directions. The project site is sheltered from south swell by the island of Maui.

During the winter months in the northern hemisphere, strong storms are frequent in the North Pacific in the mid latitudes and near the Aleutian Islands. These storms generate large North Pacific swells that range in direction from west-northwest to northeast and arrive at the northern Hawaiian shores with little attenuation of wave energy. These are the waves that have made surfing beaches on the North Shore of Oahu famous, including Waimea Bay, Pipeline, and Sunset Beach, as well as sites on the north shore of Maui such as Jaws. Deepwater wave heights often reach 15 feet and in extreme cases exceed 30 feet. Periods vary between 12 and 20 seconds, depending on the location of the storm. The project site is directly exposed to north swell.

Kona storm waves are fairly infrequent, occurring only about 10 percent of the time during a typical year. Kona waves typically range in period from 6 to 10 seconds with heights of 5 to 10 feet, and approach from the southwest. Deepwater wave heights during the severe Kona storm of January 1980 were about 17 feet. These waves had a significant impact on the south and west shores of Maui. The project site is not directly exposed to Kona storm waves.

Severe tropical storms and hurricanes have the potential to generate extremely large waves, which in turn could potentially result in large waves at the project site. Recent hurricanes impacting the Hawaiian Islands include Hurricane Iwa in 1982 and Hurricane Iniki in 1992. Iniki directly hit the island of Kauai and produced large waves along the southern shores of all the Hawaiian islands. Damage from these hurricanes was extensive. Although not a frequent or even likely event, they can be considered in the project design, particularly with regard to coastal structure stability.

3.3.2 Wave Transformation in Shallow Water

As deepwater waves approach the shoreline, they begin to transform due to the effects of shoaling, bottom friction, refraction, and diffraction. As waves shoal, heights increase and the wave crests steepen, to the point that the waves become unstable, leading to breaking and dissipation of wave energy. Wave energy can also be attenuated due to bottom friction. The approach direction can change as the wave front refracts, or becomes oriented parallel to the existing bathymetric contours. Lateral spreading of energy, known as diffraction, can occur behind a natural or man-made barrier.

3.3.3 Prevailing Deepwater Wave Climate

The Kuau study site faces north-northwest and is affected by north swell during the winter months and tradewind waves at any time of the year. Measured directional wave data is available for Buoy 106 of the Coastal Data Information Program (CDIP), which is located four miles northwest of Waimea Bay on the island of Oahu. The data from this buoy is applicable because the buoy has similar wave exposure as the project site. Semi-hourly readings of significant wave height, period, and direction are available for August 2000 to present. Joint frequency of wave height and period produced for 22.5-degree direction bands are shown in Table 3-1. More than 99% of the waves recorded at this buoy site are from the directions of west clockwise through east-northeast. Waves from the other directions make up less than one percent. The corresponding wave height and period roses are shown in Figures 3-1 and 3-2 and include the data for all directions. The data shows peak energy from the northwest (north swell) and the northeast (tradewind waves). These two bands contain greater than 55% of the waves. The rest of the waves are distributed in the direction bands from north-northwest to north-northeast.

Historical wave data is also available in the form of hindcast data sets provided by the U.S. Army Corps of Engineers' Wave Information Studies (WIS). WIS results are generated by numerical simulation of past wind and wave conditions. WIS information produces records of wave conditions based on historical wind and wave data at numerous stations around the

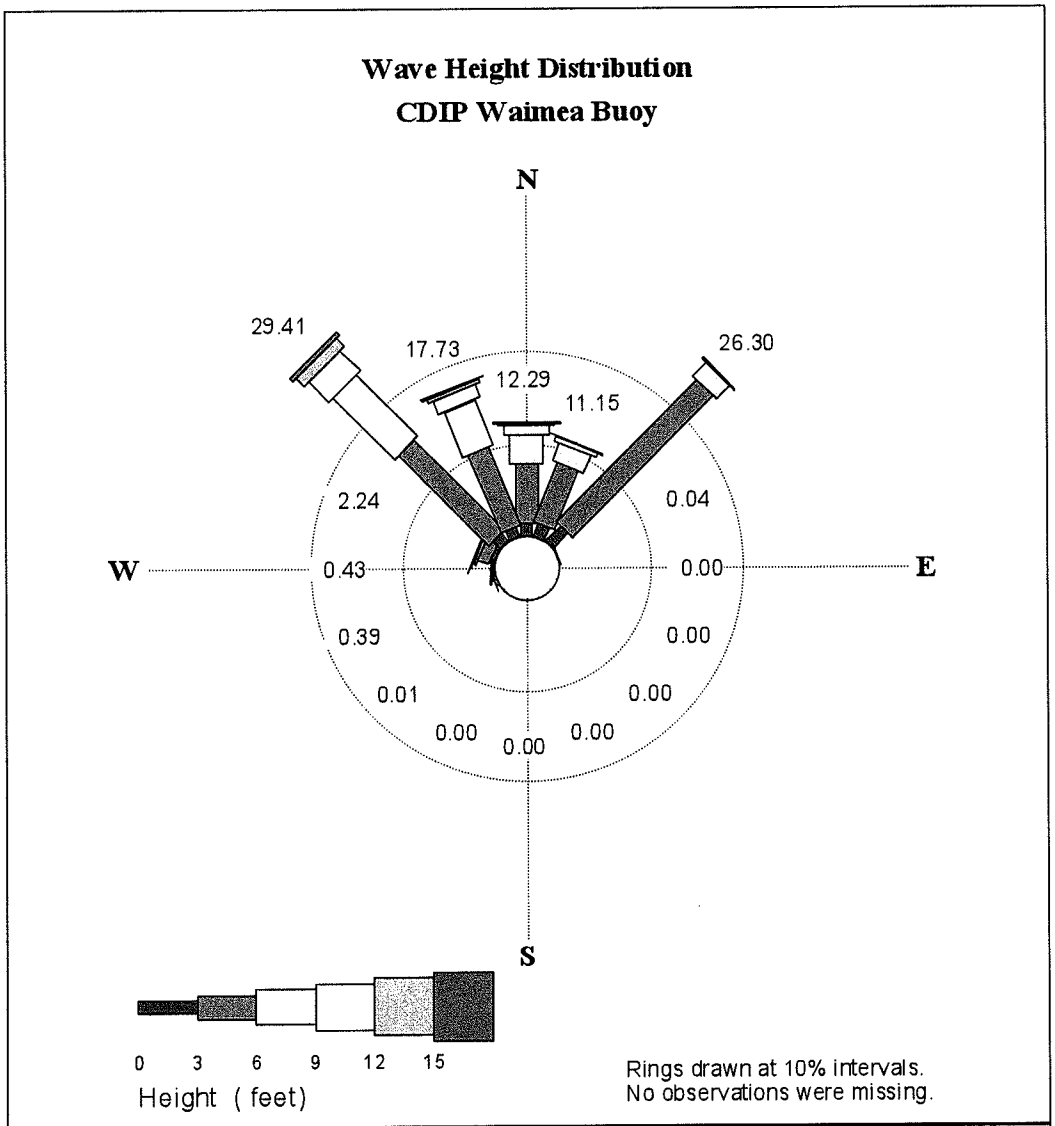
Hawaiian Islands. These hourly records of wave conditions are available for the years 1981 through 2004.

WIS Station 101, located 75 miles north of the project site, was chosen as being representative for comparison with the CDIP data. Table 3-2 shows the frequency of occurrence of wave height and period for the WIS data. Additionally, the wave height and wave period distributions for the full WIS 101 data set are presented as roses in Figures 3-3 and 3-4. As with the CDIP Waimea buoy, the wave roses for WIS 101 show the north swell and tradewind waves. The WIS and CDIP data sets compare very well for the north swell in terms of direction and period. In the northwest direction bin, however, the WIS data shows greater wave heights than the CDIP data.

Since the WIS station is located well offshore, it is exposed to waves from a greater direction range and shows tradewind wave energy from the east and east-northeast, as opposed to the Waimea buoy, which shows almost no energy from these directions. Some of this energy likely refracts and appears in the northeast direction bin for the Waimea Buoy, while some is blocked by the island of Oahu. A comparison of the percent occurrence over the typical range of tradewind waves, however, shows good agreement between the two data sets.

Table 3-1 CDIP Waimea Buoy Distribution Table of Direction, Height, and Period

		Period (s)											
Dir (°TN)	Hs\Ts	<4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	Total%
W	0-2	-	-	-	-	0.01	0.01	0.03	0.02	0.01	-	-	0.07
258.75 -	2-4	-	0.00	-	0.02	0.03	0.10	0.14	0.02	0.00	-	-	0.31
281.25	4-6	-	-	0.00	-	0.01	0.01	0.01	0.00	-	-	-	0.03
	6-8	-	-	0.02	-	-	-	-	-	-	-	-	0.02
	8-10	-	-	0.00	-	-	-	-	-	-	-	-	0.00
Hs (ft)	10-12	-	-	-	0.00	-	-	-	-	-	-	-	0.00
	Total%	0.00	0.00	0.02	0.02	0.04	0.12	0.18	0.04	0.01	0.00	0.00	0.43
WNW	0-2	-	-	-	-	0.02	0.02	0.00	0.00	-	-	-	0.05
281.25 -	2-4	-	-	-	0.02	0.20	0.44	0.33	0.03	0.02	-	0.00	1.04
303.75	4-6	-	-	0.00	-	0.06	0.22	0.29	0.07	0.02	0.01	0.00	0.67
	6-8	-	-	0.01	-	0.00	0.04	0.13	0.03	0.02	0.02	0.00	0.25
	8-10	-	-	-	-	0.00	0.01	0.07	0.03	0.01	-	-	0.13
Hs (ft)	10-12	-	-	-	-	0.00	0.00	0.02	0.02	0.00	-	-	0.05
	12-14	-	-	-	-	0.00	0.00	0.02	0.02	0.00	-	-	0.05
	14-16	-	-	-	-	-	0.00	0.00	0.00	0.00	-	-	0.01
	16-18	-	-	-	-	-	-	-	0.00	-	-	-	0.00
	Total%	0.00	0.00	0.01	0.02	0.29	0.74	0.87	0.20	0.08	0.03	0.01	2.24
NW	0-2	-	0.00	0.00	0.06	0.03	0.01	0.01	-	-	-	-	0.12
303.75 -	2-4	-	-	0.01	0.50	2.09	1.28	0.54	0.13	0.08	0.03	0.01	4.66
326.25	4-6	-	-	0.00	0.11	2.71	4.10	2.51	0.50	0.30	0.11	0.01	10.35
	6-8	-	-	0.01	0.06	0.73	2.44	2.86	0.66	0.35	0.13	0.01	7.24
	8-10	-	-	0.00	0.04	0.25	1.00	1.66	0.42	0.20	0.05	0.00	3.63
Hs (ft)	10-12	-	-	-	0.02	0.07	0.37	0.81	0.31	0.11	0.02	-	1.70
	12-14	-	-	-	0.00	0.03	0.13	0.40	0.27	0.09	0.02	-	0.94
	14-16	-	-	-	0.00	0.01	0.05	0.16	0.15	0.09	0.01	-	0.47
	16-18	-	-	-	-	0.00	0.02	0.05	0.07	0.05	0.01	-	0.20
	18-20	-	-	-	-	-	0.00	0.01	0.03	0.02	0.00	-	0.06
	20-22	-	-	-	-	-	-	0.01	0.01	0.01	0.00	-	0.03
	Total%	0.00	0.00	0.02	0.79	5.93	9.40	9.03	2.54	1.30	0.37	0.03	29.41
NNW	0-2	-	-	0.01	0.09	0.03	0.00	0.00	-	-	-	-	0.13
326.25 -	2-4	-	-	0.07	1.35	1.83	0.39	0.14	0.04	0.01	0.00	-	3.82
348.75	4-6	-	-	0.03	0.54	3.39	1.78	0.51	0.06	0.02	0.01	-	6.35
	6-8	-	-	0.04	0.18	1.54	1.65	0.62	0.07	0.03	0.01	-	4.15
	8-10	-	-	0.01	0.07	0.44	0.82	0.45	0.05	0.02	-	0.00	1.87
Hs (ft)	10-12	-	-	0.00	0.03	0.15	0.32	0.31	0.04	0.02	0.00	-	0.87
	12-14	-	-	0.00	0.01	0.06	0.10	0.15	0.05	0.01	0.00	-	0.38
	14-16	-	-	-	-	0.01	0.02	0.04	0.02	0.01	0.00	-	0.10
	16-18	-	-	-	-	-	0.01	0.04	0.01	0.00	0.00	-	0.06
	18-20	-	-	-	-	-	-	0.01	0.00	-	-	-	0.01
	20-22	-	-	-	-	-	-	-	0.00	-	-	-	0.00
	Total%	0.00	0.00	0.16	2.27	7.44	5.11	2.27	0.34	0.13	0.03	0.00	17.73
N	0-2	-	0.00	0.03	0.06	0.02	-	-	-	-	-	-	0.11
-11.25 -	2-4	-	0.02	0.43	1.96	0.91	0.10	0.02	-	-	-	-	3.44
+11.25	4-6	-	0.01	0.22	1.29	2.01	0.67	0.09	-	-	-	-	4.28
	6-8	-	0.00	0.13	0.47	1.04	0.61	0.15	0.01	-	-	-	2.42
	8-10	-	-	0.03	0.30	0.46	0.30	0.12	0.00	-	-	-	1.21
Hs (ft)	10-12	-	-	0.02	0.05	0.15	0.15	0.13	0.02	0.00	-	-	0.52
	12-14	-	-	0.00	0.02	0.06	0.05	0.07	0.01	0.00	-	-	0.22
	14-16	-	-	-	0.00	0.01	0.03	0.02	0.01	0.00	-	-	0.08
	16-18	-	-	-	-	-	0.00	-	0.00	-	-	-	0.01
	Total%	0.00	0.03	0.85	4.16	4.66	1.92	0.60	0.07	0.01	0.00	0.00	12.29
NNE	0-2	0.00	0.02	0.07	0.05	0.00	-	-	-	-	-	-	0.16
11.25 -	2-4	0.00	0.43	1.93	1.78	0.26	0.02	0.00	-	-	-	-	4.42
33.75	4-6	-	0.07	1.33	1.78	0.58	0.08	0.03	-	-	-	-	3.88
	6-8	-	0.00	0.28	0.66	0.55	0.10	0.02	0.00	-	-	-	1.61
	8-10	-	-	0.05	0.24	0.27	0.11	0.03	-	-	-	-	0.70
Hs (ft)	10-12	-	-	0.01	0.03	0.12	0.07	0.04	-	-	-	-	0.27
	12-14	-	-	-	0.01	0.01	0.05	0.02	0.00	-	-	-	0.09
	14-16	-	-	-	-	0.00	0.00	0.01	0.01	-	-	-	0.02
	16-18	-	-	-	-	-	0.00	-	-	-	-	-	0.00
	Total%	0.00	0.53	3.68	4.55	1.80	0.43	0.15	0.01	0.00	0.00	0.00	11.15
NE	0-2	0.02	0.02	0.07	0.03	-	0.01	-	-	-	-	-	0.15
33.75 -	2-4	0.04	2.16	6.47	2.63	0.06	0.02	0.00	-	-	-	-	11.38
56.25	4-6	-	0.58	6.52	5.25	0.25	0.01	-	-	-	-	-	12.60
	6-8	-	0.01	0.25	1.23	0.30	0.00	-	-	-	-	-	1.79
	8-10	-	-	0.00	0.14	0.11	0.01	0.00	-	-	-	-	0.27
Hs (ft)	10-12	-	-	0.00	0.03	0.05	0.02	-	-	-	-	-	0.11
	12-14	-	-	-	-	0.01	-	-	-	-	-	-	0.01
	Total%	0.06	2.76	13.31	9.31	0.78	0.07	0.01	0.00	0.00	0.00	0.00	26.30
ENE	0-2	0.00	-	-	-	-	-	-	-	-	-	-	0.00
56.25	2-4	0.01	0.01	0.01	0.01	-	-	-	-	-	-	-	0.03
78.75	4-6	-	-	-	0.00	-	-	-	-	-	-	-	0.00
	6-8	-	-	-	-	-	-	-	-	-	-	-	0.00
	8-10	-	-	-	-	-	-	-	-	-	-	-	0.00
Hs (ft)	10-12	-	-	-	-	-	-	-	-	-	-	-	0.00
	12-14	-	-	-	-	-	-	-	-	-	-	-	0.00
	14-16	-	-	-	-	-	-	-	-	-	-	-	0.00
	16-18	-	-	-	-	-	-	-	-	-	-	-	0.00
	18-20	-	-	-	-	-	-	-	-	-	-	-	0.00
	20-22	-	-	-	-	-	-	-	-	-	-	-	0.00
	Total%	0.01	0.01	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04



PERCENT OCCURRENCE: Height (feet)
LOWER BOUND OF CATEGORY

DIR	0	3	6	9	12	15
N	1.26	6.57	3.18	0.97	0.27	0.03
NNE	1.52	6.93	2.04	0.54	0.11	0.01
NE	2.36	21.77	1.99	0.17	0.01	0.00
ENE	0.02	0.02	0.00	0.00	0.00	0.00
E	0.00	0.00	0.00	0.00	0.00	0.00
ESE	0.00	0.00	0.00	0.00	0.00	0.00
SE	0.00	0.00	0.00	0.00	0.00	0.00
SSE	0.00	0.00	0.00	0.00	0.00	0.00

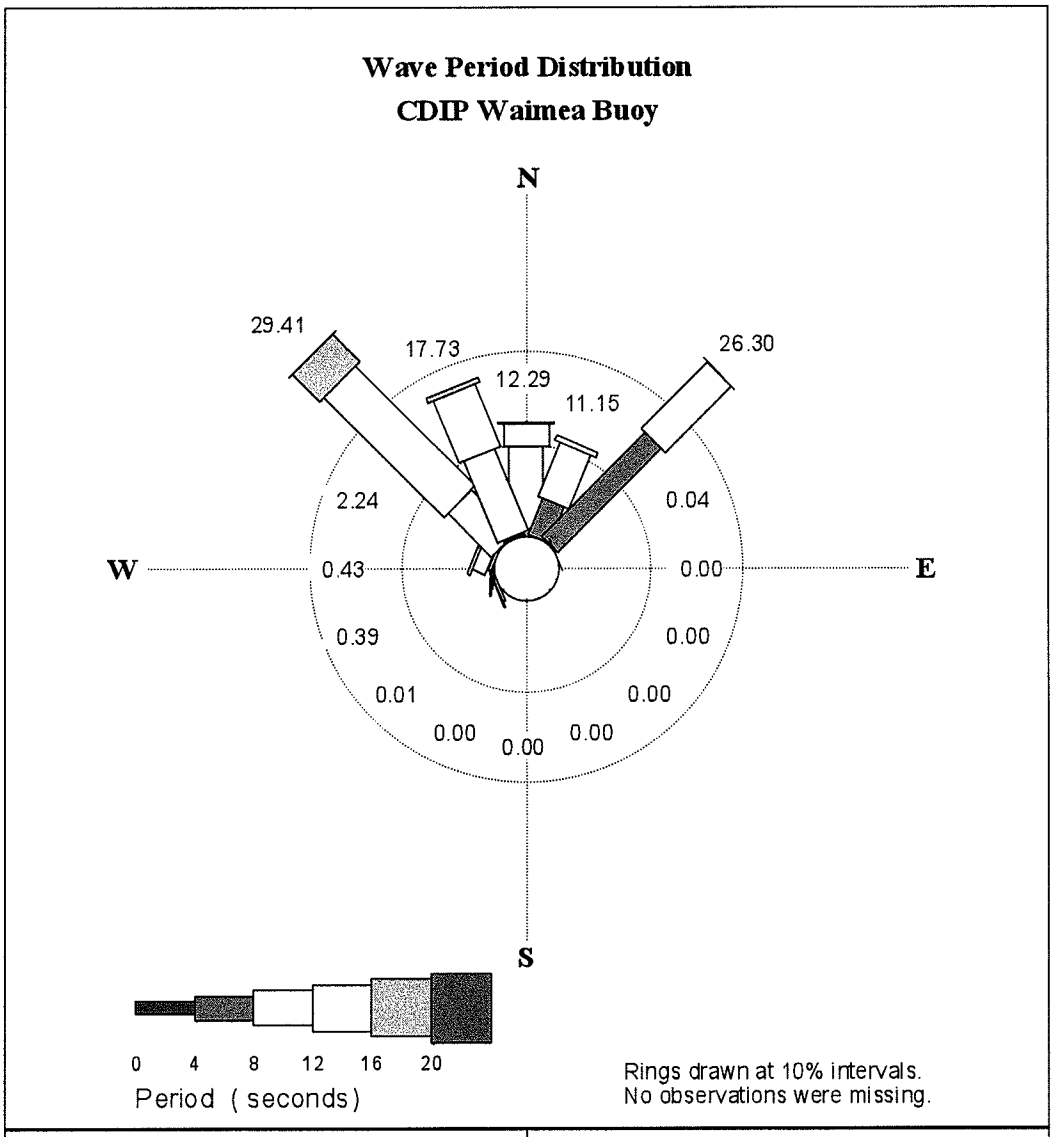
TOTAL OBS = 94983 MISSING OBS = 0

PERCENT OCCURRENCE: Height (feet)
LOWER BOUND OF CATEGORY

DIR	0	3	6	9	12	15
S	0.00	0.00	0.00	0.00	0.00	0.00
SSW	0.00	0.00	0.00	0.00	0.00	0.00
SW	0.01	0.00	0.00	0.00	0.00	0.00
WSW	0.33	0.06	0.00	0.00	0.00	0.00
W	0.23	0.18	0.02	0.00	0.00	0.00
WNW	0.47	1.30	0.32	0.10	0.05	0.01
NW	1.16	13.96	9.46	3.11	1.23	0.48
NNW	1.07	9.23	5.29	1.60	0.44	0.11

CALM OBS = 0

Figure 3-2 CDIP Waimea Buoy 106



PERCENT OCCURRENCE: Period (seconds)
LOWER BOUND OF CATEGORY

DIR	0	4	8	12	16	20
N	0.00	0.88	8.81	2.52	0.07	0.00
NNE	0.01	4.20	6.35	0.58	0.01	0.00
NE	0.08	16.06	10.09	0.07	0.00	0.00
ENE	0.01	0.01	0.02	0.00	0.00	0.00
E	0.00	0.00	0.00	0.00	0.00	0.00
ESE	0.00	0.00	0.00	0.00	0.00	0.00
SE	0.00	0.00	0.00	0.00	0.00	0.00
SSE	0.00	0.00	0.00	0.00	0.00	0.00

TOTAL OBS = 94983 MISSING OBS = 0

PERCENT OCCURRENCE: Period (seconds)
LOWER BOUND OF CATEGORY

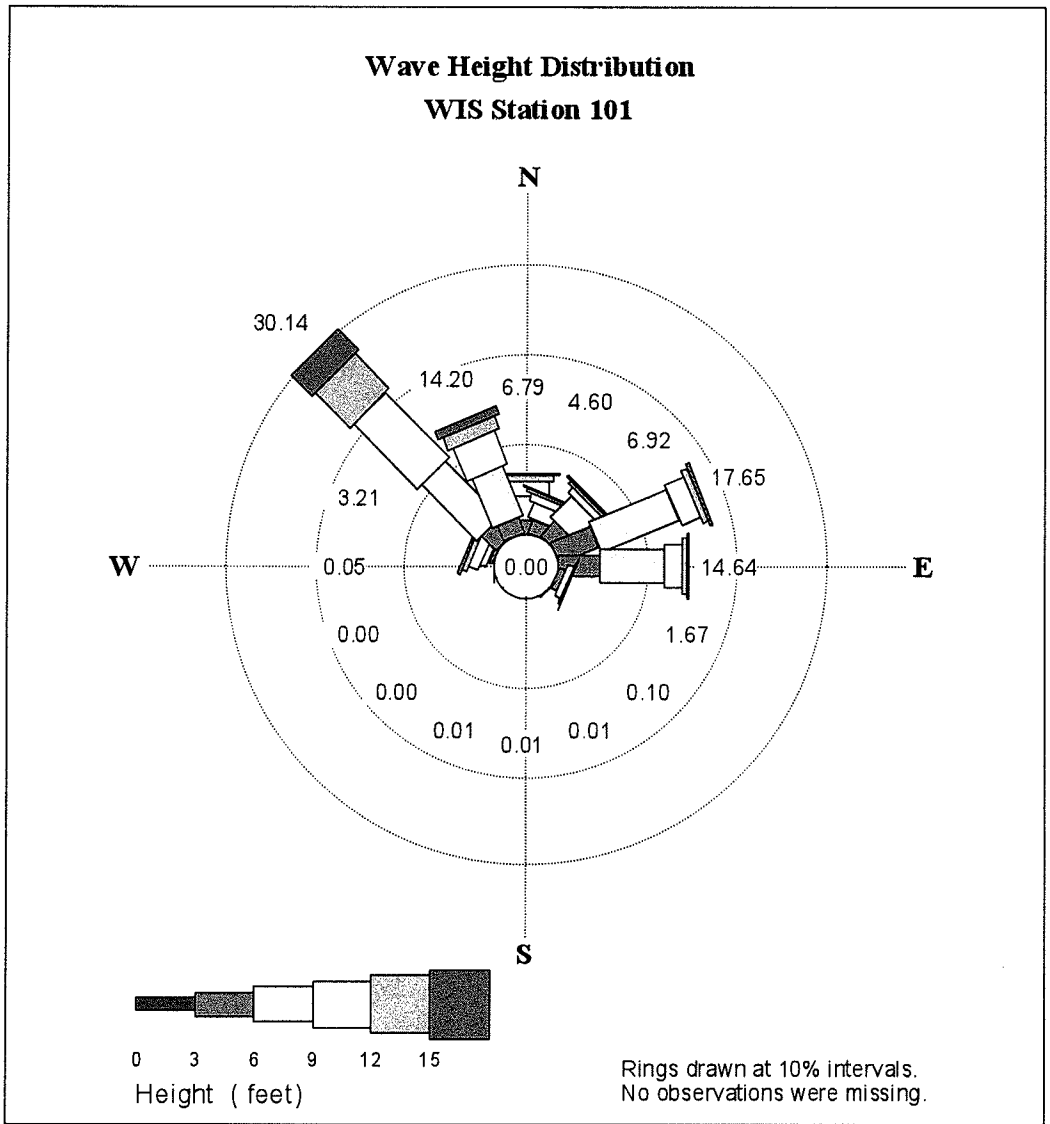
DIR	0	4	8	12	16	20
S	0.00	0.00	0.00	0.00	0.00	0.00
SSW	0.00	0.00	0.00	0.00	0.00	0.00
SW	0.00	0.00	0.00	0.00	0.00	0.00
WSW	0.00	0.00	0.01	0.26	0.12	0.00
W	0.00	0.02	0.06	0.30	0.05	0.00
WNW	0.00	0.01	0.31	1.61	0.31	0.01
NW	0.00	0.02	6.72	18.43	4.21	0.03
NNW	0.00	0.16	9.71	7.37	0.49	0.00

CALM OBS = 0

Figure 3-3 CDIP Waimea Buoy 106

Table 3-2 WIS 101 Distribution Table of Direction, Height, and Period

		Period (s)												
Dir (°TN)	Hs\Ts	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24-26	Total%
W	0-2	0.00	-	-	-	-	-	-	-	-	-	-	-	0.00
258.75 -	2-4	-	-	-	-	-	-	-	-	-	-	-	-	0.00
281.25	4-6	-	-	-	-	0.00	0.01	0.01	0.00	-	-	-	-	0.02
	6-8	-	0.00	-	0.00	0.00	0.02	0.01	-	-	-	-	-	0.03
	8-10	-	-	0.00	-	-	-	-	-	-	-	-	-	0.00
Hs (ft)	10-12	-	-	-	-	-	-	-	-	-	-	-	-	0.00
	12-14	-	-	-	-	-	-	-	-	-	-	-	-	0.00
	14-16	-	-	-	-	-	0.00	0.00	-	-	-	-	-	0.00
	Total%	0.00	0.00	0.00	0.00	0.00	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.05
WNW	0-2	0.00	0.00	-	-	-	-	-	-	-	-	-	-	0.01
281.25 -	2-4	-	-	-	0.01	0.01	0.01	0.01	0.01	-	-	-	-	0.05
303.75	4-6	-	-	-	0.01	0.08	0.19	0.06	0.03	-	-	-	-	0.37
	6-8	-	-	0.00	0.01	0.11	0.20	0.08	0.03	0.00	0.00	0.00	-	0.45
	8-10	-	-	0.00	0.00	0.06	0.53	0.11	0.02	0.02	0.01	0.00	-	0.75
Hs (ft)	10-12	-	-	-	-	0.01	0.31	0.28	0.05	0.02	0.01	0.00	-	0.68
	12-14	-	-	-	-	0.01	0.16	0.19	0.07	0.01	0.00	-	-	0.45
	14-16	-	-	-	-	-	0.04	0.14	0.08	0.01	-	-	-	0.27
	16-18	-	-	-	-	-	0.01	0.03	0.04	0.00	-	-	-	0.09
	18-20	-	-	-	-	-	0.01	0.02	0.03	0.00	-	-	-	0.06
	20-22	-	-	-	-	-	0.00	0.00	0.01	0.00	-	-	-	0.02
	Total%	0.00	0.00	0.00	0.03	0.28	1.46	0.94	0.39	0.07	0.02	0.00	0.00	3.19
NW	0-2	-	0.01	0.00	-	-	-	-	-	-	-	-	-	0.01
303.75 -	2-4	-	-	0.00	0.02	0.06	0.02	-	-	-	-	-	-	0.09
326.25	4-6	-	-	-	0.42	1.26	0.42	0.10	0.04	0.00	0.00	-	-	2.24
	6-8	-	-	0.00	0.17	2.41	2.03	0.53	0.18	0.04	0.01	0.00	0.00	5.36
	8-10	-	-	0.00	0.02	1.65	4.09	1.02	0.38	0.13	0.03	0.00	0.01	7.33
Hs (ft)	10-12	-	-	-	0.01	0.46	3.59	1.55	0.50	0.15	0.04	0.00	0.00	6.31
	12-14	-	-	-	0.00	0.14	1.81	1.62	0.49	0.13	0.03	0.00	0.00	4.23
	14-16	-	-	-	0.00	0.04	0.51	1.13	0.45	0.09	0.02	0.00	0.00	2.22
	16-18	-	-	-	-	0.01	0.21	0.56	0.39	0.06	0.01	0.00	-	1.24
	18-20	-	-	-	-	0.00	0.07	0.20	0.22	0.06	0.01	-	0.00	0.56
	20-22	-	-	-	-	-	0.01	0.10	0.16	0.03	0.00	0.00	-	0.29
	Total%	0.00	0.01	0.00	0.63	6.01	12.76	6.81	2.79	0.70	0.14	0.01	0.01	29.87
NNW	0-2	-	-	-	-	-	-	-	-	-	-	-	-	0.00
326.25 -	2-4	-	-	-	0.03	0.01	0.00	-	0.00	0.00	-	-	-	0.05
348.75	4-6	-	-	0.00	0.83	0.68	0.18	0.05	0.02	0.00	-	-	-	1.76
	6-8	-	-	-	0.53	2.38	0.82	0.17	0.05	0.02	0.00	-	-	3.96
	8-10	-	-	-	0.11	1.63	1.40	0.33	0.12	0.03	0.00	-	0.00	3.63
Hs (ft)	10-12	-	-	0.00	0.02	0.67	1.06	0.39	0.14	0.03	0.00	0.00	0.00	2.33
	12-14	-	-	-	0.02	0.16	0.61	0.31	0.10	0.02	0.00	-	0.00	1.21
	14-16	-	-	-	-	0.04	0.28	0.24	0.08	0.02	0.00	0.00	-	0.66
	16-18	-	-	-	-	0.01	0.10	0.17	0.05	0.01	-	-	-	0.35
	18-20	-	-	-	-	0.00	0.03	0.04	0.05	0.02	-	-	-	0.13
	20-22	-	-	-	-	-	0.01	0.03	0.02	0.01	-	-	-	0.07
	Total%	0.00	0.00	0.00	1.53	5.58	4.49	1.73	0.63	0.16	0.02	0.00	0.00	14.15
N	2-4	-	-	0.01	0.11	0.01	-	-	-	-	-	-	-	0.13
-11.25 -	4-6	-	-	0.04	1.03	0.33	0.05	0.01	-	-	-	-	-	1.46
+11.25	6-8	-	-	0.01	0.59	0.98	0.19	0.04	0.00	0.00	-	-	-	1.82
	8-10	-	-	0.01	0.20	0.84	0.32	0.04	0.00	-	-	-	-	1.41
Hs (ft)	10-12	-	-	0.00	0.06	0.49	0.28	0.10	0.02	0.00	-	-	-	0.95
	12-14	-	-	0.00	0.04	0.19	0.25	0.08	0.01	-	-	-	-	0.57
	14-16	-	-	-	0.00	0.08	0.10	0.08	0.00	-	-	-	-	0.27
	16-18	-	-	-	0.00	0.02	0.04	0.05	0.00	-	-	-	-	0.11
	18-20	-	-	-	-	-	0.01	0.02	0.01	-	-	-	-	0.03
	20-22	-	-	-	-	-	-	0.01	0.01	-	-	-	-	0.02
	Total%	0.00	0.00	0.08	2.04	2.94	1.24	0.43	0.05	0.00	0.00	0.00	0.00	6.78
NNE	2-4	-	-	0.06	0.11	-	-	-	-	-	-	-	-	0.16
11.25 -	4-6	-	-	0.16	1.03	0.14	0.01	0.00	0.00	-	-	-	-	1.35
33.75	6-8	-	-	0.14	0.71	0.41	0.09	0.03	0.01	-	-	-	-	1.38
	8-10	-	-	0.02	0.30	0.40	0.08	0.02	0.01	-	-	-	-	0.84
Hs (ft)	10-12	-	-	0.02	0.13	0.24	0.06	0.01	-	-	-	-	-	0.46
	12-14	-	-	0.01	0.06	0.14	0.05	0.01	-	-	-	-	-	0.27
	14-16	-	-	0.00	0.01	0.04	0.03	0.02	-	-	-	-	-	0.09
	16-18	-	-	-	0.00	0.01	0.01	-	-	-	-	-	-	0.02
	18-20	-	-	-	-	0.00	0.01	0.00	-	-	-	-	-	0.01
	20-22	-	-	-	-	-	-	0.01	-	-	-	-	-	0.01
	Total%	0.00	0.00	0.40	2.34	1.37	0.35	0.10	0.02	0.00	0.00	0.00	0.00	4.59
NE	2-4	0.00	0.00	0.12	0.07	0.00	-	-	-	-	-	-	-	0.20
33.75 -	4-6	-	0.01	0.84	1.13	0.12	0.02	0.00	-	-	-	-	-	2.12
56.25	6-8	-	0.00	0.76	1.41	0.31	0.01	0.01	-	-	-	-	-	2.50
	8-10	-	-	0.21	0.65	0.26	0.01	0.00	-	-	-	-	-	1.13
Hs (ft)	10-12	-	-	0.06	0.21	0.15	0.00	0.00	-	-	-	-	-	0.42
	12-14	-	-	0.01	0.12	0.12	0.01	-	-	-	-	-	-	0.26
	14-16	-	-	0.00	0.06	0.07	0.01	-	-	-	-	-	-	0.14
	16-18	-	-	-	0.02	0.07	0.00	-	-	-	-	-	-	0.09
	18-20	-	-	-	0.00	0.03	0.01	-	-	-	-	-	-	0.04
	20-22	-	-	-	-	0.00	0.02	-	-	-	-	-	-	0.02
	Total%	0.00	0.02	2.01	3.67	1.12	0.09	0.01	0.00	0.00	0.00	0.00	0.00	6.92
	0-2	0.00	0.00	-	-	-	-	-	-	-	-	-	-	0.01
ENE	2-4	0.00	0.02	0.16	0.08	0.01	-	-	-	-	-	-	-	0.27
56.25	4-6	-	0.20	2.84	1.34	0.17	0.02	0.00	-	-	-	-	-	4.57
78.75	6-8	-	0.04	4.41	2.72	0.20	0.02	0.01	-	-	-	-	-	7.40
	8-10	-	-	1.02	1.93	0.17	0.01	-	-	-	-	-	-	3.12
Hs (ft)	10-12	-	-	0.19	0.81	0.19	0.00	-	-	-	-	-	-	1.19
	12-14	-	-	0.02	0.35	0.16	0.01	-	-	-	-	-	-	0.55
	14-16	-	-	0.00	0.13	0.18	0.02	-	-	-	-	-	-	0.32
	16-18	-	-	-	0.03	0.12	-	-	-	-	-	-	-	0.15
	18-20	-	-	-	0.00	0.04	0.01	-	-	-	-	-	-	0.05
	20-22	-	-	-	-	0.01	0.00	-	-	-	-	-	-	0.01
	Total%	0.01	0.27	8.65	7.38	1.23	0.09	0.01	0.00	0.00	0.00	0.00	0.00	17.64
E	0-2	0.00	0.00	-	-	-	-	-	-	-	-	-	-	0.00
78.75 -	2-4	-	-	0.28	0.10	0.02	0.02	0.00	-	-	-	-	-	0.42
101.25	4-6	-	0.07	2.03	1.73	0.25	0.26	0.03	0.01	-	-	-	-	4.38
	6-8	-	0.01	2.11	3.00	0.29	0.32	0.07	0.00	-	-	-	-	5.79
	8-10	-	-	0.30	1.65	0.27	0.06	0.02	-	-	-	-	-	2.30
Hs (ft)	10-12	-	-	0.02	0.63	0.33	0.02	0.00	-	-	-	-	-	1.01
	12-14	-	-	0.00	0.17	0.28	0.00	-	-	-	-	-	-	0.46
	14-16	-	-	-	0.02	0.13	0.01	0.00	-	-	-	-	-	0.16
	16-18	-	-	-	0.00	0.03	0.02	0.01	-	-	-	-	-	0.06
	18-20	-	-	-	-	0.02	0.01	-	-	-	-	-	-	0.04
	20-22	-	-	-	-	0.01	0.00	-	-	-	-	-	-	0.02
	Total%	0.00	0.08	4.74	7.31	1.63	0.73	0.13	0.01	0.00	0.00	0.00	0.00	14.63



PERCENT OCCURRENCE: Height (feet)
LOWER BOUND OF CATEGORY

DIR	0	3	6	9	12	15
N	0.00	1.58	2.62	1.56	0.73	0.28
NNE	0.00	1.50	1.85	0.83	0.33	0.09
NE	0.01	2.31	3.23	0.82	0.34	0.21
ENE	0.03	4.82	9.42	2.30	0.69	0.40
E	0.01	4.80	7.26	1.84	0.55	0.18
ESE	0.00	0.80	0.69	0.16	0.02	0.00
SE	0.00	0.08	0.01	0.00	0.00	0.00
SSE	0.00	0.00	0.00	0.00	0.00	0.00

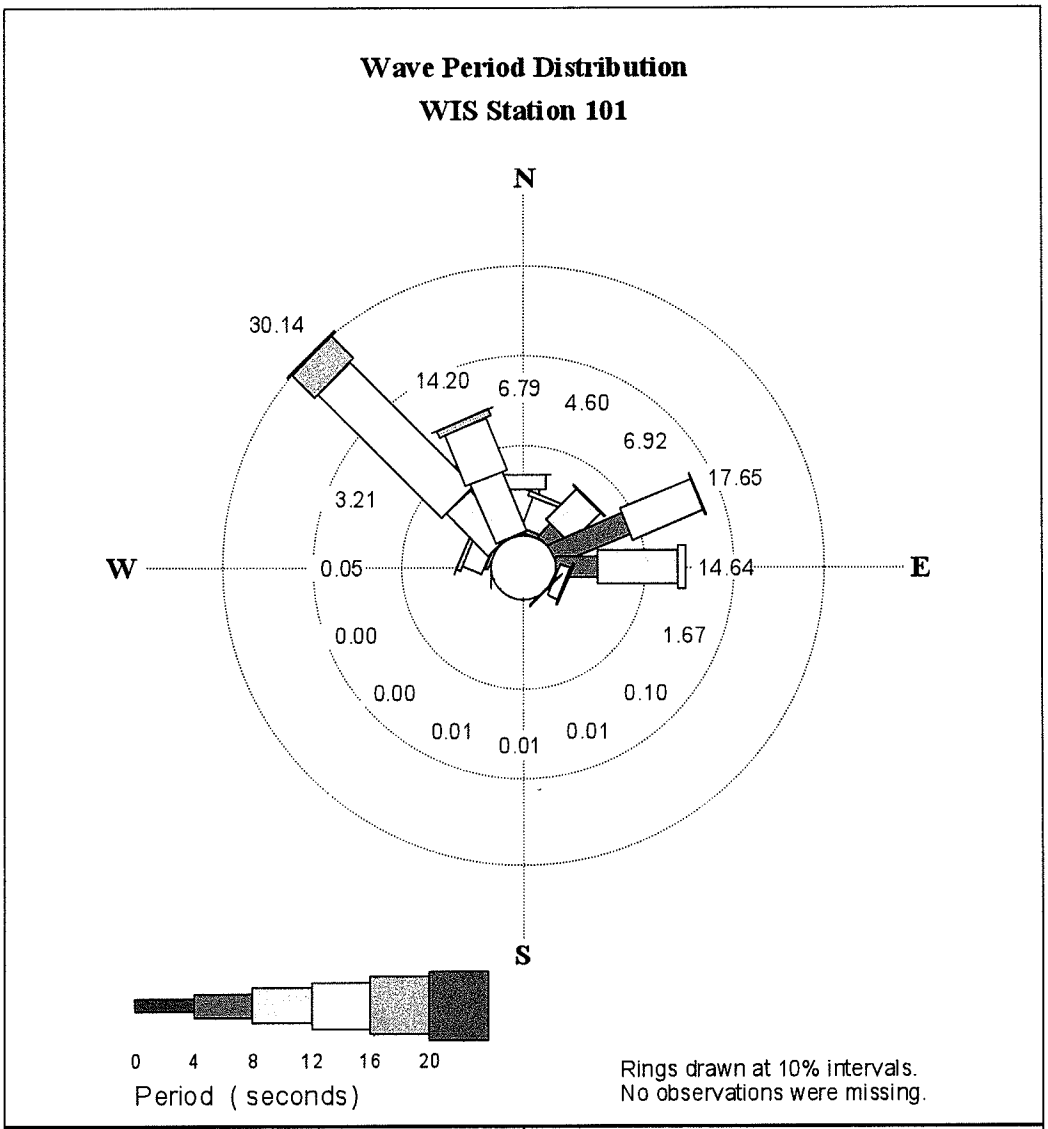
TOTAL OBS = 210384 MISSING OBS = 0

PERCENT OCCURRENCE: Height (feet)
LOWER BOUND OF CATEGORY

DIR	0	3	6	9	12	15
S	0.00	0.00	0.00	0.00	0.00	0.00
SSW	0.00	0.00	0.01	0.00	0.00	0.00
SW	0.00	0.00	0.00	0.00	0.00	0.00
WSW	0.00	0.00	0.00	0.00	0.00	0.00
W	0.00	0.02	0.03	0.00	0.00	0.00
WNW	0.01	0.42	0.75	1.13	0.63	0.28
NW	0.01	2.33	8.80	10.19	5.51	3.30
NNW	0.00	1.81	5.95	3.97	1.59	0.88

CALM OBS = 0 PERCENT CALM = 0.00

Figure 3-4 WIS 101 wave height rose



PERCENT OCCURRENCE: Period (seconds)
LOWER BOUND OF CATEGORY

DIR	0	4	8	12	16	20
N	0.00	0.08	4.99	1.66	0.05	0.00
NNE	0.00	0.40	3.72	0.45	0.02	0.00
NE	0.00	2.04	4.77	0.10	0.00	0.00
ENE	0.01	8.95	8.59	0.11	0.00	0.00
E	0.00	4.85	8.91	0.86	0.01	0.00
ESE	0.00	0.16	1.27	0.23	0.00	0.00
SE	0.00	0.01	0.04	0.05	0.00	0.00
SSE	0.00	0.00	0.00	0.00	0.00	0.00

TOTAL OBS = 210384 MISSING OBS = 0

PERCENT OCCURRENCE: Period (seconds)
LOWER BOUND OF CATEGORY

DIR	0	4	8	12	16	20
S	0.00	0.00	0.01	0.00	0.00	0.00
SSW	0.00	0.01	0.00	0.00	0.00	0.00
SW	0.00	0.00	0.00	0.00	0.00	0.00
WSW	0.00	0.00	0.00	0.00	0.00	0.00
W	0.00	0.00	0.00	0.04	0.00	0.00
WNW	0.00	0.00	0.31	2.40	0.47	0.02
NW	0.00	0.01	6.76	19.60	3.61	0.17
NNW	0.00	0.00	7.18	6.20	0.80	0.02

CALM OBS = 0

Figure 3-5 WIS 101 wave period rose

3.4 Tsunamis

The north coast of Maui has been impacted by severe tsunami wave runup. Measured tsunami runup elevations (Loomis, 1976) in the immediate vicinity of the project site were 17 feet (relative to mean sea level) during the 1946 tsunami, 10 feet during the 1957 tsunami, and 11 feet during the 1960 tsunami.

3.5 Design Waves and Water Levels

Design of coastal structures requires an analysis of wave and storm conditions to determine design wave height and water level. The process of determining these parameters involves analyzing available historical extreme event frequency and data, as well as modeling results for both extreme and prevailing waves.

3.5.1 Extreme Wave Height

The project site is exposed to north swell that regularly exceeds deepwater wave heights of 20 feet, and therefore the shore protection must be designed to withstand an extreme north swell wave. Wave hindcast data from the WIS data set was presented previously in Section 3.3.3. The annual highest waves from the WIS 101 data set were obtained; these 24 waves ranged from 19.6 feet to 31.9 feet in height and the corresponding wave periods ranged from 14.8 seconds to 19.9 seconds. The data can be further analyzed using a Gumbel distribution of extreme events to obtain design wave heights and return periods. The design wave heights and return periods are shown in Table 3-3.

Table 3-3 Wave heights vs. return periods

Return Period (years)	Wave Height (feet)
1	24.7
5	29.4
10	31.4
25	34.1
50	36.1
75	37.3
100	38.1

For this study, the 25-year wave is selected as representative of a severe storm condition and a wave period of 18 seconds is chosen as the corresponding wave period.

3.6 Nearshore Wave Heights and Water Levels

3.6.1 Tides

Hawaii tides are semi-diurnal with pronounced diurnal inequalities (i.e., two high and low tides each 24-hour period with different elevations). Tidal predictions and historical extreme water levels are given by the Center for Operational Oceanographic Products and Services, NOS, NOAA, website. The water level data for Kahului Harbor, based on the 1983-2001 tidal epoch, is:

Mean Higher High Water	2.26 ft.
Mean High Water	1.90 ft.
Mean Tide Level	1.12 ft.
Mean Low Water	0.33 ft.
Mean Lower Low Water	0.00 ft.

Hawaii is also subject to periodic extreme tide level due to large scale oceanic eddies that propagate through the islands. These eddies produce tide levels up to 0.5 ft higher than normal for periods of up to several weeks.

3.6.2 Still Water Levels and Nearshore Wave Heights

During high wave conditions, the nearshore water level may be elevated above the tide level by the action of breaking waves offshore. This water level rise, termed wave setup, is typically 10 to 13% of the breaker height. Thus, the water level could be elevated by several feet during severe storm wave conditions. During hurricane conditions, an additional water level rise due to wind stress and reduced atmospheric pressure can occur. Collectively termed "storm surge," this can potentially add another 1 to 2 feet to the stillwater level. For example, during the 1992 passage of Hurricane Iniki over Port Allen Harbor on the island of Kauai, a National Weather Service tide gauge recorded a water level rise of 4.9 feet above the predicted tide elevation.

The possible stillwater level rise at the project site is an important design parameter because in coastal areas protected by shallow reefs, the size of the waves impacting the shoreline depends on the water depth, which includes the stillwater level rise due to tides, wind and wave setup, and atmospheric pressure effects. Data on still water level rise is available from actual NOAA water level measurements, as well as from wave transformation calculations. Still water level rise will therefore increase the size of nearshore waves.

3.6.3 Design Still Water Level

At lower water levels, the wave energy is dissipated when the waves break offshore and the energy reaching the shoreline is quite small. Higher water levels result in higher wave energy reaching the shoreline, and therefore, increased wave runup and wave forces on the structures. The highest prevailing water level condition would be a MHHW tide plus wave setup caused by the design breaking wave.

Wave setup is a function of the breaking wave height, period, and bottom topography. The project site is exposed to waves from northwest through northeast as presented in Section 3.3. While all of these waves would lose some energy through refraction, a wave approaching with a deepwater direction from the north-northwest would experience the least refraction. For design purposes, the design wave is considered to approach from the north-northwest, which will yield a more conservative result.

The design water level at the project site would be MHHW plus wave setup caused by the extreme design wave. MHHW was presented in Section 3.6.1 as 2.26 feet at Kahului Harbor and the 25-year wave, which is the selected extreme design wave height, breaks with a height of 48.8 feet. Wave setup for the case of a 48.8-foot high breaking wave with a period of 18 seconds is 6.0 feet (Shore Protection Manual, 1984). The extreme water level is therefore taken to be 8.8 feet above MLLW, as shown in Table 3-4.

The water level for high prevailing conditions is also of interest. The prevailing condition is found from the CDIP buoy data as wave height 9 feet and period 16 seconds. This wave represents the high prevailing condition—90% of the waves on record have lower wave heights and shorter periods. This deepwater wave would have a breaking height of 14.9 feet, which would produce a wave setup of 1.7 feet. The high prevailing water level is found to be 4.5 feet, as shown in Table 3-4.

Table 3-4 Still water level rise components

Component	Extreme event	High Prevailing event
Astronomical Tide	2.3 ft.	2.3 ft
Wave setup	6.0 ft	1.7 ft
Super-elevation (eddy)	0.5 ft	0.5 ft
Total water level rise (MLLW)	8.8 ft	4.5 ft

4. ALTERNATIVES CONSIDERED

A number of alternatives have been considered to address the ongoing erosion. These include no action, revetment alone, seawall alone, and hybrid revetment-seawall.

4.1 No Action

The project area and in particular Parcel 5, has a history of chronic erosion. Based upon topographic surveys performed in 2005 and 2007, the top of the eroded bank has receded from 5 to 10 feet in that period alone. The erosion has continued during this winter season, and it is highly likely that this erosion will continue. This additional erosion will eventually threaten to flank the existing shore protection at the adjacent Parcels 21 and 6. Once the shore protection has been flanked, erosion of these properties will begin. This is of particular concern to Parcel 21, since the house is close to the property boundary. Thus, no action is not a recommended option for this site.

4.2 Revetment Alone

A revetment is a sloping uncemented structure built of wave resistant material. The most common method of revetment construction is to place an armor layer of stone, sized according to the design wave height, over an underlayer and filter designed to distribute the weight of the armor layer and to prevent loss of fine shoreline material through voids in the revetment. Properly designed and constructed rock revetments are durable, flexible, and highly resistant to wave damage. Should toe scour occur, the structure can settle and readjust without major failure. Damage from large waves is typically not catastrophic, and the revetment can still function effectively even if damage occurs. The rough and porous surface and flatter slope absorb and dissipate more wave energy than smooth vertical walls, thus reducing wave reflection, runup, and overtopping. Thus, there is greater likelihood of sand accumulation seaward of the structure.

The sloping revetment occupies more horizontal space and has a larger footprint than a seawall would. A revetment has been previously proposed as a solution to the erosion at the project site. Figure 4 - 1 below depicts a revetment section at the project site. As shown in this figure, the footprint of this revetment would extend approximately 55 seaward from the shoreline. This has raised concerns documented in comments by the Office of Conservation and Coastal Lands (OCCL) dated June 29, 2007. The main reason for concern is that the structure would cover the existing sand channel behind the reef shelf. This channel provides convenient access to the nearby surfing sites as well as a calm swimming area for the public. For this reason, a revetment alone is not considered to be a viable option for the project site.

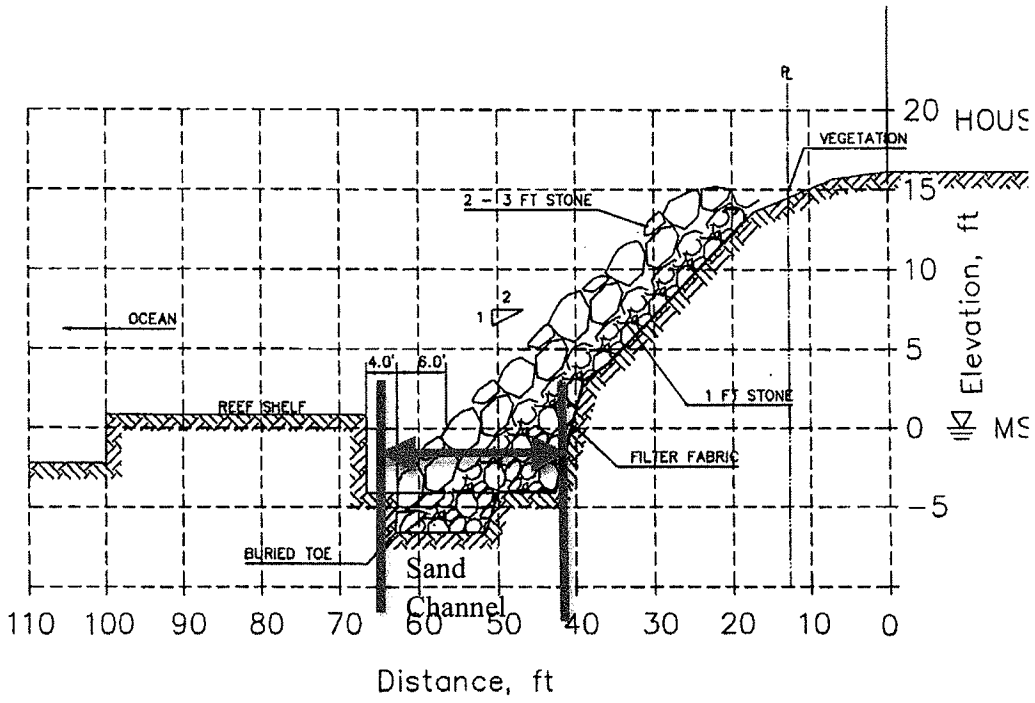


Figure 4 - 1 Illustration of Revetment Alone

4.3 Seawall Alone

A seawall is a vertical or sloping concrete–rock-masonry wall to protect the land from wave damage and erosion. A seawall, if properly designed and constructed, is a proven, long lasting, and relatively low maintenance shore protection method. Seawalls also have the advantage of requiring limited horizontal space along the shore. However, the impervious and vertical face of a seawall results in very little wave energy dissipation. Wave energy is deflected both upward and downward, and also a large amount of wave energy is reflected seaward. The downward component can cause scour at the base of the wall, and thus the foundation of a seawall is critical for its stability, particularly on a sandy and eroding shoreline. Ideally a seawall should be constructed on solid, non-erodible substrate. Seawalls are not flexible structures, and their structural stability is dependent upon the stability of their foundations.

Reflected wave energy can inhibit the ability of sand to settle in front of a structure. Additionally, significant reflected wave energy is particularly undesirable when there are surfing sites nearby as the reflected waves can adversely impact the quality of the incoming waves. For these reasons, a seawall alone is not recommended for the project site.

4.4 Hybrid Revetment – Seawall

The recommended alternative consists of a hybrid revetment-seawall. This configuration is presented below in Figure 4 - 2.

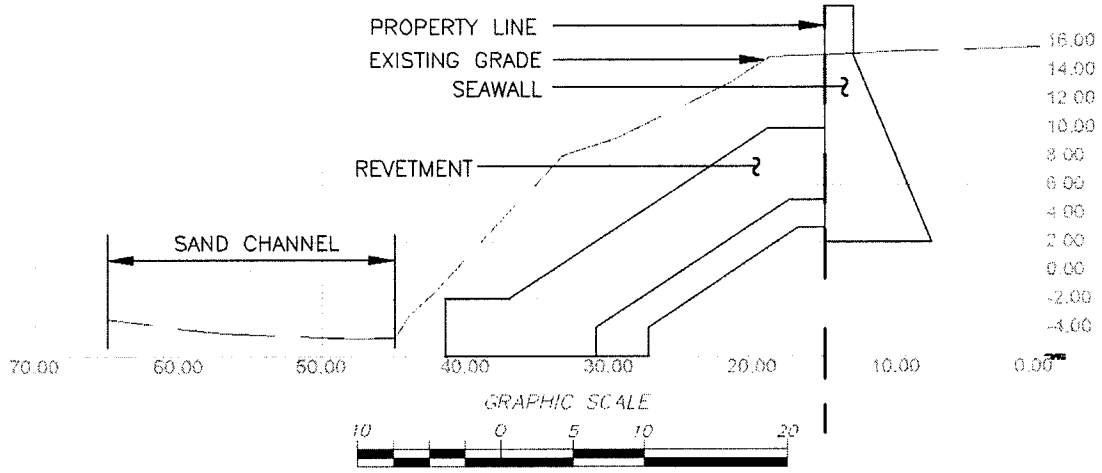


Figure 4 - 2 Illustration of Hybrid Revetment-Seawall

This configuration maximizes the positive aspects of both of these shoreline protection strategies. The revetment portion of the structure that is in regular contact with wave action is sloped, porous, and flexible. It has the greatest likelihood of promoting the accretion of sand at its base. The revetment portion has a lower reflection coefficient, and will provide the least wave reflection during the majority of wave conditions. By limiting the height of the revetment portion to about half of the overall height of the hybrid structure, the horizontal extent can be limited to the existing footprint, and the sand channel will not be impacted.

The seawall portion of the structure serves to provide a solid surface to abut the revetment. The revetment in turn provides protection against scour and erosion of the seawall footing. Additionally, the vertical seawall makes up the elevation difference between the revetment crest and the existing grade.

Detailed plan and section views of the proposed hybrid revetment-seawall can be found in Appendix A.

5. SHORE PROTECTION DESIGN PARAMETERS

Shore protection revetment armor layers are sized according to the design wave height. Methodology developed by the U.S. Army Corps of Engineers provides the required stone size and crest elevation. The structure is designed as a rock rubblemound with a side slope of 1V:1.5H, which is the steepest slope recommended by the Coastal Engineering Manual (2006). Crest width is taken to be three stones.

5.1 Stone Size

The stone size is based on extreme wave conditions discussed in Section 3.6.3. Design water level elevation for the extreme event was found to be 8.8 feet above MLLW. This water level combined with one foot of water depth near the toe of the revetment produces a depth-limited breaking wave height of 6.9 feet based on the breaker index of 0.7. The required groin armor stone weight for stability under the design wave height is given by the Hudson Formula (Coastal Engineering Manual, 2006):

$$W = \frac{w_r H^3}{K_D (S_r - 1)^3 \cot\theta}$$

where,

W = weight in pounds of an individual armor stone
w_r = unit weight of the stone, 160 lb/ft^3
H = wave height, 6.9 feet
K_D = armor stone stability coefficient, 2 for two layers randomly placed
S_r = specific gravity of the stone relative to seawater, use 2.5
cot θ = cotangent of the groin side slope, use 1.5

The resultant armor stone weight would be approximately 5200 lbs. A range of +/- 25% of the median weight is typically utilized, which yields a stone weight range of 3900 to 6500 lbs. If basalt stone is used, the corresponding stone diameter range is between 2.5ft and 3.5ft.

5.2 Underlayer

Stone is typically utilized for the underlayer and is readily available in the necessary sizes. Underlayer stone is sized at approximately 1/10 the armor weight, making the underlayer stone in this case between about 390 to 650 pounds. The sizing is important for providing porosity for energy dissipation rather than reflection, to achieve interlocking between the armor and

underlayer, and to insure that the underlayer material cannot be removed through voids in the armor layer.

5.3 Wave Runup and Crest Elevation

The elevation of the structures determines the amount of wave overtopping that will occur during high prevailing wave conditions, which were determined in Section 3.6.3. While larger structures will reduce the overtopping, they present a larger footprint and are more costly. Additionally, from an aesthetics perspective, structures with lower crest elevations provide less visual impact.

Runup elevation was calculated using the Automated Coastal Engineering System (ACES) module in the Coastal Engineering Design and Analysis System (CEDAS) package, both of which were developed by the U.S. Army Corps of Engineers' Coastal & Hydraulic Laboratory (CHL). Runup is a function of the maximum wave height at the project site at the prevailing water level; the nearshore bathymetry limits the wave height that can impact the structures. For this project it is considered appropriate to calculate the runup elevation for the high prevailing deepwater wave height of 9 feet and a period of 16 seconds. The design water level resulting from this wave is +4.5 feet MLLW. Wave breaker indices for shallow reef environments vary from 0.5 to 0.78, where a value of 0.7 is applied to sites with gently-sloping nearshore bathymetry such as the project site. Using the breaker index value of 0.7 and a total water depth of 5.5 feet at the toe of the revetment, the runup elevation for the revetment is calculated to be 11.2 feet above MLLW. For reference, the elevation of the property immediately landward of the existing seawall and revetment is approximately 18 to 20 feet above MLLW.

The above calculation is for a non-overtopping revetment during high prevailing wave conditions. The structure can also be designed as a hybrid structure composed of a revetment with a lower crest elevation and a retaining wall at the landward side of the revetment. This would result in the revetment having a smaller footprint and less visual impact, while the retaining wall would serve to protect the property from erosion during high wave events which may overtop the revetment. A revetment crest elevation of +10 feet MLLW is recommended.

6. MITIGATION MEASURES

1) The following Best Management Practices will be adhered to during construction.

   a. The contractor shall perform the work in a manner that minimizes environmental pollution and damage as a result of construction operations. Environmental resources outside the limits of construction shall be protected during the construction period.

   b. The contractor shall confine all construction activity to areas defined by the construction plans. No construction material shall be placed or stockpiled outside of the immediate area of construction.

   c. All construction materials shall be free of contaminants or pollutants No debris, petroleum products, or other construction-related substances or materials will be allowed to flow, fall, leach, or otherwise enter the coastal waters. No construction equipment shall operate in the water.

   d. A dust control program will be implemented , and windblown dust shall be prevented from blowing into the water by watering when necessary. All excavated material will be placed on the land behind the excavation and contained within soil or sandbag berms to prevent any runoff back into coastal waters.

   e. No discharge of dewatering effluent back into coastal waters will be permitted.

   f. Should iwi (bones) or Native Hawaiian cultural or traditional deposits be found during ground disturbance for construction of the hybrid revetment-seawall, work shall cease and the State Historic Preservation Division, Department of Land and Natural Resources notified immediately.

2) 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.

3) Public access along the shoreline during construction shall be maintained so far as practicable and within the limitations necessary to ensure safety. No impediment to public

access along the shore shall be placed in the State conservation district seaward of the certified shoreline.

4) Work would be limited to the hours between 7:30 am and 5 pm to reduce the disturbance to neighboring properties.

7. CONSTRUCTABILITY DISCUSSION

An important consideration in the design of coastal structures is the feasibility and general constructability of the project. While the construction methodology of each contractor can be expected to differ, certain issues pertaining to the physical condition of the site must be given some forethought.

Access to the site is a primary concern. At present, the most likely site access will be obtained from Parcel 5. In order to access the shoreline, one option is to construct a graded ramp down. This ramp, assuming a 2H:1V slope, would extend approximately 35ft to the southeast of the current erosion scarp, and could be centered between the eastern and western boundaries of Parcel 5. Once access to the shoreline is obtained, limited lateral access to Parcel 21 is possible. Access to Parcel 21 can be accomplished by removal of approximately 30 feet of the wall between Parcel 21 and Parcel 5. Due to concerns regarding slope stability, this cross property access will most likely not be attempted until the wall and revetment fronting Parcel 5 are completed. Access to Parcel 21 could be achieved from Parcel 1 to the west if the owners of this parcel deem this acceptable. For this reason, concurrent construction on the three parcels would be desirable.

Construction equipment will most likely include multiple excavators between 5 and 50 tons. At least one of these will work from the lower shoreline area in order to construct the revetment toe and CRM wall foundation. Additional equipment could include front-end loaders, concrete pump trucks, dump trucks, and flatbed trucks. All of these would be limited to operation at the finish grades of the properties.

A fraction of the armor and underlayer stone will most likely be obtained from dismantling the existing revetment fronting Parcel 21. The majority of stone materials as well as the wall backfill will be brought in from off-site. This material will probably be trucked in via Parcel 5, and moved vertically and laterally by appropriate equipment.

The footing of the proposed vertical CRM wall, at its nearest point, comes within 5 feet of the northeastern corner of the existing house on Parcel 21. Additional measures and precautions will be necessary during construction of this portion of the vertical CRM wall. Shoring measures such as sheet piles may be necessary, and rapid construction during this phase is desirable.

8. ORDER OF MAGNITUDE COST ESTIMATE

Table 8-1 below provides an estimate of construction costs for this project.

Item	Unit	Qty.	Cost/Unit	Total Cost
CRM Wall	LF	180	$3,000	540,000
Revetment	LF	155	$1,200	186,000
Compacted Fill	CY	100	$30	3,000
Mobilization	EA	1	$15,000	15,000
			Subtotal	744,000
			Contingency (20%)	148,800
			Total	**892,800**

9. REFERENCES

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APPENDIX A - PROJECT PLANS AND SECTIONS

APPENDIX B.

A Proposal to Conduct a Baseline Assessment and Monitoring of the Nearshore Marine Environment in the Vicinity of the Goetzman and Cohen Seawall, Marine Research Consultants, Inc., April 24, 2007

A PROPOSAL TO CONDUCT A BASELINE ASSESSMENT and MONITORING OF THE NEARSHORE MARINE ENVIRONMENT IN THE VICINITY OF THE GOETZMAN AND COHEN SEAWALL PAIA, MAUI, HAWAII

Prepared for:

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1039 Waakaua Pl.
Honolulu, HI 96822

April 24, 2007

1. INTRODUCTION AND PURPOSE

Planning and permitting is underway to construct a seawall revetment to mitigate shoreline erosion for two properties (owners Goetzman and Cohen) located on the north shore of Maui, east of the town of Pa'ia. Because the project is located on the shoreline, and has the potential to affect the nearshore ocean, the project will require compliance with State of Hawaii Section 401 Water Quality Certification procedures. One of these procedures requires water quality monitoring during a pre-construction period and for the duration of the in-water construction required by the project. The monitoring program conducted during the construction phase of the project will utilize the baseline assessment to determine if changes to water quality are a result of the project, or a result of natural variation of the marine environment. Presented below are the method proposed for the baseline and monitoring surveys. The methods presented below are based on criteria presented in the State of Hawaii Department of Health document "General Monitoring Guidelines for Section 401 Water Quality Certification Projects (hereafter referred to as 401 Guidelines."

2. METHODS

2.1 Marine Sampling Sites

Marine water chemistry will be assessed by sampling at stations fronting the seawall revetment construction site, as well as at control stations that are located in similar coastal habitats, but are deemed to be beyond the influence of the construction activities. Two stations will be established fronting the project site, one near the eastern end of the property, and one near the western end. Control sites will be located to the east and west of the project, beyond the influence of the construction activity. Exact location of sampling sites will be determined at the initiation of field sampling.

All field work will be conducted by divers swimming from shore. Water samples will be collected at two locations at each sampling station; one sample will be collected within one meter of the shoreline, and one sample will be collected approximately 10 m offshore. Sampling sites are located in the nearshore zone because this area is most likely to show the effects of inputs from construction activities on land.

2.2 Monitoring Constituents

As specified in the 401 Guidelines, projects with in-water work of one to four months duration require evaluation of "basic water quality standards" which include Total Suspended Solids (TSS), turbidity, and pH. As there will be no habitat loss or modification, monitoring constituents will be limited to these three constituents.

2.3 Analytical Methodology

Water samples will be collected in 1-liter polyethylene bottles by swimmers working from shore. Turbidity and pH will be measured immediately after collection using field meters. Turbidity will be measured using a Hach P2100 meter according to EPA Method 180.1, with a minimum detection limit of 0.01 nepthelometric turbidity units (ntu). pH will be measured using a field meter calibrated with 4.0, 7.0 and 10.0 buffers according to EPA method 150.1 with a minimum detection limit of 0.01 pH units. TSS will be determined by filtering a known volume of water and drying the filter to constant weight (EPA Method 160.2, minimum detection limit 0.1 mg/L).

2.4 Sampling Frequency

As specified in the 401 Guidelines, pre-construction monitoring will consist of ten samplings over a two-week period. During-construction activity is stipulated as requiring daily frequency for projects of less than 2 months duration, and three times per week for projects of 3-4 months duration. At this time, the duration of in-water construction is not known, but is likely to be less than 2 months, hence requiring daily monitoring. Post-construction monitoring is limited to one increment of sampling following the completion of construction.

3. DATA ANALYSIS and REPORTING

Following the pre-construction field sampling program, a written report will be prepared, which will contain all data collected during the field surveys, along

with appropriate statistical treatments and explanatory text to fully depict the water quality off the regions of study.

During the construction period, a brief (approximately 1-2 pages) written monitoring report shall be prepared for each sample day. Each of these reports shall list the project name; the date of sample collection; the date of laboratory analysis; the name of the laboratory performing the analysis; the initials of the analyst; sample analytical results; and a brief statement concerning the observed degree of compliance or noncompliance with state water quality standards as indicated by the laboratory results and associated field data (and the apparent reason(s), if known, for any observed violations); the date of the report; and the signature of the Principal Investigator (PI)responsible for the monitoring program. In reaching conclusions concerning degree of compliance with the state water quality standards and cause(s) of apparent violations, the PI shall consider the results of appropriate quantitative comparisons between the field data and baseline data from the pre-construction sampling. The method(s) to be used in conducting such comparisons shall include generally accepted statistical methods or other methods selected by the PI to be those which in his/her professional judgment are most appropriate for the purpose of ascertaining degree of compliance with the water quality standards.

A written final summary report will be prepared following completion of all construction activities which fully describes the results of analysis and supplemental information. This summary report shall, at the least, contain the following information:

(a) An introduction, which includes a statement of purpose and objectives and a brief description of the study design, including a figure or figures to show the project location and the locations of sampling stations relative to existing features and the construction project site.

(b) A description of the methods employed in collecting, transporting, and analyzing water samples.

(c) A discussion summarizing results of the laboratory analyses. Presentation of results shall include tabular and graphical presentations of the data by time, by location, and by depth if appropriate. Tabular presentations of data shall

include summary statistics (e.g., means, standard deviations) where this is judged by the PI to be appropriate.

(e) Conclusions, including a statement summarizing the degree of compliance or noncompliance with state water quality standards, and the probable causes of any apparent violations. In reaching conclusions concerning degree of compliance with the state water quality standards and cause(s) of apparent violations, the PI shall conduct and consider the results of appropriate quantitative comparisons between the field data obtained from project site monitoring stations and from control stations, and between the during construction period data and baseline data. The method(s) to be used in conducting such comparisons shall include generally accepted statistical methods or other methods selected by the PI to be those which in his/her professional judgment are most appropriate for the purpose of ascertaining degree of compliance with the water quality standards. The method(s) used and results considered shall be described.

ESTIMATE OF COSTS

GOETZMAN AND COHEN SEAWALL
WATER QUALITY MONITORING

Submitted by:
MARINE RESEARCH CONSULTANTS, Inc.

to:
Betsy Jacobsen
April 24, 2007

TASK	Per Survey	Pre-Construction (10 surveys)	During Construction (daily for 40 d)*	Post Construction (1 survey)	Total Cost
WATER QUALITY MONITORING					
Field Sample Collection/transport	$250	$2,500	$10,000	$250	$12,750
Water Chemistry Analyses (turb, TSS, pH) 8 @$25	$200	$2,000	$8,000	$200	$10,200
Data Analysis, QA/QC Report Preparation	$75	$750	$3,000	$75	$3,825
Travel Expenses	$100	$100	$100		
SUBTOTAL	$625	$5,250	$21,000	$525	$26,775
State Tax (4.725%)	$30	$248	$992	$25	$1,265
TOTAL	$655	$5,498	$21,992	$550	$28,040

* Construction period estimated at 8 weeks. If construction period is less, cost will be reduced accordingly.