ALAN M. ARAKAWA
Mayor

WILLIAM R. SPENCE
Director

MICHELE CHOUTEAU McLEAN
Deputy Director

FILE COPY

FEB 03 2014

COUNTY OF MAUI

DEPARTMENT OF PLANNING

January 16, 2014

'14 JAN 28 P1:46

Ms. Genevieve Salmonson, Interim Director
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, Hawaii 96813

Dear Ms. Salmonson:

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT (EA) FOR THE ARGYROPOULOS SHORELINE HAZARD MITIGATION PROJECT, LOCATED AT 475 HANA HIGHWAY, KUAU, ISLAND OF MAUI, HAWAII; TMK: (2) 2-6-009:005 (SM1 2013/0015) (EA 2013/0004)

The Department of Planning, on behalf of the Approving Agency (Maui Planning Commission), has reviewed the subject Draft EA and anticipates an Anticipated Finding of No Significant Impact (Draft EA-AFONSI) for the Argyropoulos Shoreline Hazard Mitigation Project situated at Tax Map Key (2) 2-6-009:005 in the Makawao District on the island of Maui, Hawaii. Please publish the notice of availability for this project in the next available publication of the Office of Environmental Quality Control (OEQC) *Environmental Notice*.

Enclosed is a completed OEQC Publication Form, two (2) copies of the Draft EA-AFONSI, and Adobe Acrobat PDF of the same, and an electronic copy of the publication form in MS Word. Simultaneous with this letter, we have submitted the summary of the action in a text file by electronic mail to your office.

Please contact Coastal Resources Planner James Buika, if there are any questions, at james.buika@mauicounty.gov or at (808) 270-6271.

Sincerely,

CLAYTON I. YOSHIDA, AICP
Planning Program Administrator

for WILLIAM SPENCE
Planning Director

Attachment
xc: James A. Buika, Coastal Resources Planner (PDF)
Samuel Lemmo, DLNR-OCCL (PDF)
Michael Summers, Planning Consultants Hawaii, LLC (PDF)
Project File
General File
WRS:CIY:JAB:cr
K \WP_DOCS\PLANNING\SM1\2013\0015ArgyropoulosShorelineHazardMitigation\OEQC TRANSMITTAL, JAN 2014\OEQC Transmittal Letter.doc

PUBLICATION FORM
THE ENVIRONMENTAL NOTICE

Project Name: Argyropoulos Shoreline Hazard Mitigation Project
Island: Maui
District: Makawao
TMK: (2) 2-6-009:005
Permits: Special Mangement Area Permit; Shoreline Setback Variance, Conservation District Use Permit

Approving Agency: Maui Planning Commission
Address:
C/O Department of Planning
County of Maui
2200 Main Street, One Main Plaza Building, Ste 315
Wailuku, HI 96793
Contact Person:
James Buika, Senior Planner
Telephone:
808-270-8205

Applicant: James P. Argyropoulos
Address:
1244 6th Street
Santa Monica, CA 90401
Contact Person:
Nico Argyropoulos
Telephone:
(310) 319-1966

Consultant: Planning Consultants Hawaii, LLC
Address:
2331 W. Main Street
Wailuku, HI 96793
Contact Person:
Mr. Michael Summers, President
Telephone:
(808) 249-6220
6

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Status (check one only):

X DEA-AFNSI	Submit the approving agency notice of determination/transmittal on agency letterhead, a hard copy of DEA, a completed OEQC publication form, along with an electronic word processing summary and a PDF copy (you may send both summary and PDF to oeqchawaii@doh.hawaii.gov; a 30-day comment period ensues upon publication in the periodic bulletin.
__FEA-FONSI	Submit the approving agency notice of determination/transmittal on agency letterhead, a hard copy of the FEA, an OEQC publication form, along with an electronic word processing summary and a PDF copy (send both summary and PDF to oeqchawaii@doh.hawaii.gov; no comment period ensues upon publication in the periodic bulletin.
__FEA-EISPN	Submit the approving agency notice of determination/transmittal on agency letterhead, a hard copy of the FEA, an OEQC publication form, along with an electronic word processing summary and PDF copy (you may send both summary and PDF to oeqchawaii@doh.hawaii.gov; a 30-day consultation period ensues upon publication in the periodic bulletin.
__Act 172-12 EISPN	Submit the approving agency notice of determination on agency letterhead, an OEQC publication form, and an electronic word processing summary (you may send the summary to oeqchawaii@doh.hawaii.gov. NO environmental assessment is required and a 30-day consultation period upon publication in the periodic bulletin.

__DEIS	The applicant simultaneously transmits to both the OEQC and the approving agency, a hard copy of the DEIS, a completed OEQC publication form, a distribution list, along with an electronic word processing summary and PDF copy of the DEIS (you may send both the summary and PDF to oeqc@doh.hawaii.gov); a 45-day comment period ensues upon publication in the periodic bulletin.
__FEIS	The applicant simultaneously transmits to both the OEQC and the approving agency, a hard copy of the FEIS, a completed OEQC publication form, a distribution list, along with an electronic word processing summary and PDF copy of the FEIS (you may send both the summary and PDF to oeqc@doh.hawaii.gov); no comment period ensues upon publication in the periodic bulletin.
__ Section 11-200-23 Determination	The approving agency simultaneous transmits its determination of acceptance or nonacceptance (pursuant to Section 11-200-23, HAR) of the FEIS to both OEQC and the applicant. No comment period ensues upon publication in the periodic bulletin.
__Statutory hammer Acceptance	The approving agency simultaneously transmits its notice to both the applicant and the OEQC that it failed to timely make a determination on the acceptance or nonacceptance of the applicant's FEIS under Section 343-5(c), HRS, and that the applicant's FEIS is deemed accepted as a matter of law.
__Section 11-200-27 Determination	The approving agency simultaneously transmits its notice to both the applicant and the OEQC that it has reviewed (pursuant to Section 11-200-27, HAR) the previously accepted FEIS and determines that a supplemental EIS is not required. No EA is required and no comment period ensues upon publication in the periodic bulletin.
__Withdrawal (explain)	

Summary (Provide proposed action and purpose/need in less than 200 words. Please keep the summary brief and on this one page):

The property is located in Kuau, along Maui's North Shore, and is 17,581 square feet. The Applicant proposes to construct a hybrid revetment-retaining wall to respond to severe erosion fronting the property. The project also requires the removal of the existing remnant seawall and related debris fronting the shoreline. The residential property contains a single-family home and an "Ohana" unit. Large boulders set in place by neighboring property owners fortify the shoreline to the east and an existing seawall fortifies the adjacent property to the west.

Approximately 28-feet of the Applicant's property has eroded into the ocean and the existing 18-feet high embankment is very unstable. The embankment poses an immediate threat to the safety of the public that uses the shoreline and to the occupants of the home. The eroding shoreline also negatively impacts coastal water quality by producing siltation in Tavares Bay during heavy erosion events. In addition, the existing remnant seawall impedes access along the shoreline. If the shoreline is not stabilized, ongoing erosion will continue, and may accelerate, punctuated by episodic events of the embankment's collapse. Coastal water quality may also continue to be impacted as the eroding shoreline produces siltation in Tavares Bay during heavy erosion events.

Draft
Chapter 343 Environmental Assessment
for the submittal of a
Special Management Area (SMA) Permit
and Shoreline Setback Variance

Argyropoulos Shoreline Hazard Mitigation

475 Hana Highway
Kuau, Maui, Hawaii
Tax Map Key No: (2) 2-6-009:005

Prepared for:
James P. Argyropoulos
1244 6th Street
Santa Monica, CA 90401
Phone: (310) 319-1966, ext. 108

Prepared by:
Planning Consultants Hawaii, LLC.
Urban and Regional Planning
2331 W. Main Street
Wailuku, Hawaii 96793
Phone: (808) 244-6231
email: msummers@planningconsultantshawaii.com

Planning
Consultants
Hawaii, LLC

January 2014

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Appendix A: Structural Engineering Report
Appendix B: Preliminary Drainage Report

LIST OF ACRONYMS AND ABBREVIATIONS

AEHR	Annual Erosion Hazard Rate
ALD	Average Lot Depth
asl	above sea level
BFE	Base Flood Elevation
BLNR	Board of Land and Natural Resources
BMPlan	Beach Management Plan
BMP	Best Management Practices
cfs	cubic feet per second
Chapter 343	Environmental Impact Statements Law
Commission	Maui Planning Commission, Maui County
CP	Community Plan
CPP	Countywide Policy Plan
CZMA	Hawaii Coastal Zone Management Act
DAR	Division of Aquatic Resources
DLNR	Department of Land and Natural Resources
DOH	Department of Health
DWS	Maui County Department of Water Supply
EA	Environmental Assessment
ER	Engineering Report
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FONSI	Finding of No Significant Impact
ft	foot/feet
ft/yr	foot/feet per year
HAR	Hawaii Administrative Rules
HRS	Hawaii Revised Statues
HRS 205A	Hawaii Coastal Zone Management Act
PHCP	Paia-Haiku Community Plan
m	meter
MCC	Maui County Code
MCPD	Maui County Planning Department
MECO	Maui Electric Company
MGD	millions of gallons per day
MIP	Maui Island Plan
MPC	Maui Planning Commission
Ms	(surface wave) magnitude scale
NPDES	National Pollution Discharge Elimination System
OCCL	Office of Conservation and Coastal Lands
OEQC	Office of Environmental Quality Control
ORMP	Ocean Resource Management Plan
OS	Open Space
PDC	Pacific Disaster Center
PK	Park
R-1	Residential
sf	square foot/square feet
SFHA	Special Flood Hazard Area
SHPD	State Historic Preservation Division
SOPs	Standard Operating Procedures
SMA	Special Management Area
SSV	Shoreline Setback Variance
SWD	Maui County Department of Environmental Management Solid Waste Division
T	Transect
TMK	Tax Map Key
U.S.	United States of America
USACE	U.S. Army Corps of Engineers

PROJECT SUMMARY

Project Name:	Draft Environmental Assessment (EA) for the Argyropoulos Seawall
Proposed Action:	Mr. James Argyropoulos proposes to construct shoreline hardening along the oceanfront at his single-family residential property located in Kuau, Paia, on the Island of Maui, Hawaii.
Applicant / Owner:	Mr. James Argyropoulos
Tax Map Key (TMK):	(2) 2-6-009:005
Location:	475 Hana Highway, Kuau, Maui, Hawaii
Approving Agency:	Maui County Planning Commission
	250 South High Street, Wailuku, Hawaii 96793
Trigger:	The use of the shoreline area triggers review and evaluation pursuant to Hawaii Revised Statutes (HRS) Chapter 343.
State Land Use:	Urban
Community Plan:	Single Family
Zoning:	R-1 Residential
Flood Hazard Area:	X (majority of the parcel), VE (seaward of the shoreline)
Special Designations:	Special Management Area, Shoreline Area
Property Size:	17,581 square feet (sf)
Project Representative:	Mr. Michael Summers
	Planning Consultants Hawaii, LLC
	2331 W. Main Street
	Wailuku, HI 96793
	Tel: (808) 244-6231

Project Summary: Mr. Argyropoulos proposes to construct a hybrid revetment-retaining wall to respond to acute coastal erosion of a clay embankment fronting his oceanfront property. The project also requires the removal of the existing remnant seawall and related debris fronting the shoreline. The property is Lot 3 of the Kuau Tract Subdivision, which received final subdivision approval in 1947. The residential property contains a single-family home and an "Ohana" unit that are both located inland from the shoreline and out of immediate harm's way. There are large concrete and rock remnants of a seawall strewn along the shoreline fronting the project site. Large boulders set in place by neighboring property owners fortify the shoreline to the east and an existing seawall fortifies the adjacent property to the west.

Over several years the property has experienced severe erosion from the high northeast swells that impact Maui's north shore. Approximately 28-feet of the Applicant's property eroded into the ocean and there is an 18-feet high concave embankment fronting the property. This cliff is very unstable and is an immediate threat to the safety of the public that uses the shoreline and to the occupants of the home. The

eroding shoreline also negatively impacts coastal water quality by producing siltation in Tavares Bay during heavy erosion events.

This Environmental Assessment (EA) evaluates and summarizes the potential impacts of the proposed action. The EA evaluates alternative actions and measures that can be taken to avoid, minimize and mitigate adverse impacts to the environment. The EA has been developed pursuant to Hawaii Revised Statutes (HRS) 343 and the significance criteria provided in Hawaii Administrative Rules (HAR) 11-200. This informational document is intended to assist decision makers in determining whether the proposed action is anticipated to have a significant impact. The document describes potential adverse impacts on the environment and if such impacts can be appropriately mitigated. The EA also offers an opportunity for input and participation by the public, stakeholders, government agencies, and nearby landowners and invites their comment and participation in decision-making. Should a Finding of No Significant Impact (FONSI) be determined by the accepting authority, additional discretionary permitting involving public hearings would be sought including a Shoreline Setback Variance, Special Management Area Major Permit and Conservation District Use Permit.

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CHAPTER 1
PURPOSE AND NEED FOR THE PROPOSED ACTION

1.1 PURPOSE OF ANALYSIS

This Draft Environmental Assessment (EA) is being prepared for the Proposed Action in accordance with the State of Hawaii requirements in Chapter 343 of Hawaii Revised Statutes (HRS) and Chapter 200 of Hawaii Administrative Rules (HAR) from the Department of Health describing the contents of an EA (HAR 11-200-17).

The purpose of HRS Chapter 343 is to establish a system of environmental review to ensure that environmental concerns are given appropriate consideration in decision making along with economic and technical considerations. Within the law are seven 'triggers' or uses that necessitate environmental review. Environmental review is required for any program or project that contains specified land uses or administrative acts, including use of State or County lands or funds other than for feasibility studies, the use of any land classified as Conservation District by State law, and the use of the shoreline setback area, among others.

The Proposed Action is subject to review under HRS Chapter 343 because a portion of the project site is within the shoreline setback area. The approving agency for the EA is the Maui County Planning Commission because they are the designated discretionary authority for approving major uses within the shoreline setback area.

HAR § 11-200-5(D) requires that for all proposed actions not exempt from environmental review, an environmental assessment is required that must assess the significance of the potential impacts of its action on the existing environment. The existing environment includes the physical and socio-economic environment as well as infrastructure systems and services. Potential impacts may be direct, indirect, or cumulative (HAR § 11-200-2).

This document presents the existing state of the environmental resources from the perspective of the preferred alternative. It presents the findings and discussion of the potential direct, indirect, or cumulative impacts the proposed action may have on existing resources and identifies any necessary mitigation measures.

Direct (or primary) impacts are those impacts that are caused by the action and occur in the same place and time. Indirect (or secondary) impacts are impacts caused by the action that are later in time or farther removed in distance, but still reasonably foreseeable. These may include impacts to land use patterns, population density or growth rate, or air, water, and other natural systems. Cumulative impacts are defined as those impacts on the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions. Such impacts can result from individually minor but collectively significant actions taking place over a period of time (HAR § 11-200-2 1996).

This environmental assessment considers the affected environment, potential for environmental impacts, and proposed mitigation within a time horizon of approximately 20 years. Short-term impacts are considered within a range of a few days to a few months, relative to the time a specific action occurs. For example, long-term erosion impacts are based on the presence of the project within the littoral cell, while short-term noise impacts are based on ephemeral activities such as construction. Because the proposed location is in a residential area, the region of influence is the subject property and immediately surrounding properties, unless otherwise noted.

This EA was prepared in accordance with HRS Chapter 343 and HAR Chapter 11-200, to provide sufficient information, evidence and analysis for determining whether to prepare an EIS or to issue a Finding of No Significant Impact (FONSI) pursuant to HRS Chapter 343.

1.2 PUBLIC AND GOVERNMENT AGENCY INVOLVEMENT

As part of the EA process, a 30-day public notice period begins with an announcement of availability of the Draft EA in the Hawaii Office of Environmental Quality Control (OEQC) *Environmental Notice* and publication of a notice in the *Maui News*. Copies of the Draft EA are made available at public libraries near the affected area, including the State library in Honolulu and online at http://oeqc.doh.hawaii.gov. Interested parties are given 30 days to provide comments on the Draft EA (**Figure 1-1**).

Through the process of coordination for environmental planning, relevant federal, state, and local agencies would be provided copies of the Draft EA and requested to evaluate and comment on the potential environmental impacts associated with the proposed action. Comments from agencies would be addressed and subsequently incorporated into the Final EA. In addition, comments from the Maui Planning Commission (Commission) would be solicited during one of its regularly scheduled public hearings. The proposed action and Draft EA would be listed on the agenda and publicly noticed. Public testimony on the matter would be encouraged during the Commission's hearing of the matter.

The Applicant's contractor, Planning Consultants Hawaii LLC, would be responsible for compiling responses to public, government agency, and Commission comments. Comments and responses would be collated and included in an Appendix of the Final EA. A Notice of Availability of the Final EA and anticipated FONSI, should it be appropriate, would be distributed by Planning Consultants Hawaii LLC in the same manner as the Draft EA.

Thereafter, the Commission would review the Final EA during a regularly scheduled and noticed public hearing. The Commission may determine that a full Environmental Impact Statement (EIS) is needed, defer their decision pending additional, itemized information, or issue a FONSI. Should the Commission issue a FONSI determination, a 30-day challenge period to the decision would begin. No action may be taken until the public 30-day period is complete. Thereafter, the applicant would be required to apply for discretionary permits before any action could begin. These permits include a Special Management Area permit, Shoreline Setback Variance, and State Conservation District Use Application.

1.3 DISCRETIONARY PERMITTING

A Special Management Area permit (SMA) and Shoreline Setback Variance (SSV) would be required for the proposed action in accordance with Hawaii Revised Statutes (HRS) Chapter 205A, Coastal Zone Management; and § 12-202, Special Management Area Rules and § 12-203, Shoreline Setback Rules of the Maui Planning Commission.

This document is intended to provide supporting information for the SMA/SSV should a FONSI determination be made by the Commission. An SMA/SSV application requires a detailed analysis of the proposed action, how it could potentially affect regulated resources, and an evaluation of the action based on specific criteria. In particular, § 12-202-12(c) (2) (F) requires a description that addresses or describes:

- The environmental setting,
- Alternatives to the proposed action,
- The probable impact, including cumulative impacts, of the proposed action,
- Any probably adverse environmental effects that can be avoided,
- Mitigating measures proposed to minimize impact,
- Any irreversible or irretrievable commitment of resources, and
- The relationship of the proposed action to land use plans, policies, and control of the affected area.

Additionally, a Conservation District Use Permit (CDUP) could be required depending on the design of shoreline hardening selected. A CDUP would be required for those portions of shoreline hardening that

are located seaward of the shoreline (i.e., base of the embankment) and landward of the ocean. This area is regulated by the State Department of Land and Natural Resources (DLNR) Office of Conservation and Coastal Lands pursuant to Hawaii Administrative Rules (HAR) Chapter 183. The rules require an analysis of coastal hazards and potential impacts to public trust resources, Indigenous Hawaiian customs, access and rights, among other considerations. Should a FONSI, SMA and SSV be approved for the project, approval of a CDUP would be sought from the Board of Land and Natural Resources (BLNR) through a public hearing and public participation process.

1.4 DOCUMENT ORGANIZATION

Chapter 1 provides a description of the proposed action, the Applicant, and the subject property.

Chapter 2 examines alternatives to the proposed action and summarizes the probable impact of each.

Chapters 3 through 7 describe the environmental setting, the anticipated impacts, including cumulative and avoidable or impacts that can be mitigated. Chapter 3 focuses on the physical environment of the subject property and surrounding area. Chapter 4 examines public services and site infrastructure. Chapter 5 describes shoreline and coastal hazards. Chapter 6 discusses social and cultural considerations, while Chapter 7 explores the relationship of the proposed action to land use plans.

Chapters 8 and 9 evaluate the proposed action relative to coastal criteria. Chapter 8 discusses the criteria provided in the coastal zone management act, whereas Chapter 9 focuses on the County's criteria for issuing shoreline setback variances.

Chapter 10 summarizes adverse environmental effects the proposed action may have and describes any irreversible or irretrievable commitment of resources. Chapters 11, 12 and 13 evaluate the proposed action relative to criteria and guidelines provided by the DLNR, OEQC, and HRS 343 pursuant to HAR 11-200 rules for environmental assessments. Concluding chapters provide recommendations, permits and government authorizations anticipated, individuals contacted and references or sources of information used in the development of the document.

1.5 PROJECT INTRODUCTION

Mr. James Argyropoulos purchased TMK (2) 2-6-009:005, also known as Lot 3 of the Kuau Tract Subdivision, from the Gaddis family in June 2004. The property is located on the north shore of the Island of Maui (Maui), Hawaii (HI) and is 17,581 square feet. The long flat rectangular lot extends approximately 225 feet from the makai edge of Hana Highway to the sea and is roughly 76 feet wide. An approximate 18-feet high concave clay cliff runs parallel to the ocean. A moderately sized residential home and "Ohana" unit, which were built before 1960, are located towards the mauka, Hana Highway, end of the lot.

The remains of a remnant concrete and stone seawall and crumbling stairway border the lot along its ocean frontage, which will be removed as part of the proposed action Based on the date that the lot was subdivided, the date that the existing residences were constructed, and the types of materials and construction methods used to construct the seawall, the seawall was likely built before 1960.

The subject property has experienced acute erosion because high surf has penetrated the old seawall. This penetration saturated the clay soil behind the shoreline hardening. When wet the clay would swell and when dry it would contract. Unlike sandy shorelines that slowly migrate in response to waves and storm surge, clay embankments collapse in episodic fashion from the loss of cohesion when expansion / contraction exceed the soils binding threshold. This repeated cycle of swell / contraction of the clay embankment allowed seawater to further penetrate behind the seawall leading to scour and erosion of the embankment. As the embankment eroded, the face of the seawall remained intact, however a large hole formed behind the seawall. Large storm waves during the winters of 2004 and 2005 caused further

erosion of the embankment and separation of the seawall from the clay behind it, leading to its eventual structural failure.

More recent high surf and winter storms have led to the structures collapse; although portions of the seawall remain intact as rubble along the shoreline. During the winter of 2011 a large portion of the now fully exposed clay embankment collapsed, forming a wide concave-shaped cliff along the edge of the property. Two mature ironwood trees succumbed to the underscour of the embankment and were removed as a precaution. Presently, a substantial debris field consisting of the remnant seawall, rocks and portions of the trunk of the ironwood trees remain along the edge of the shoreline. An approximate18-feet high overhang has developed along the clay embankment and its collapse is eminent. The bank's collapse poses an immediate danger to the occupants of the property as well as the public that regularly uses the nearshore area to access surf breaks, fish, and swim.

If the shoreline is not stabilized, ongoing erosion will continue, and may accelerate, punctuated by episodic events of the embankment's collapse. Coastal water quality may also continue to be impacted as the eroding shoreline produces siltation in Tavares Bay during heavy erosion events.

The purpose of the EA is to evaluate stabilization responses and the debris removal. Stabilization responses include allowing the embankment to erode naturally, sand nourishment, and construction of a singular seawall, terraced seawall, revetment, or hybrid revetment-seawall. The latter is the preferred alternative, construction of a hybrid revetment-seawall.

1.6 PROJECT LOCATION

The proposed action is located on a single-family lot in Kuau, Maui, HI. Kuau is a residential neighborhood located along Hana Highway between Paia and Ho'okipa Park on Maui's north shore. Ho'okipa Park, to the east of Kuau, is a major board, wind, and kite surfing recreational area. The town of Paia, which lies to the west, is a historic plantation town. The town has become a hub of tourism commerce on the north shore of Maui owing to the international attraction of wind surfing and ocean recreation. Paia has a number of upscale clothing shops, restaurants and bars, a post office, and two gas stations. The town attracts numerous international tourists and transient vacationers.

The subject property is a long, narrow rectangular lot stretching from the ocean to Hana Highway. The lot and its adjacent neighboring properties have been used for residential purposes since their creation by subdivision in 1947. Lands mauka of the home and across Hana Highway have been in sugar cane cultivation for decades.

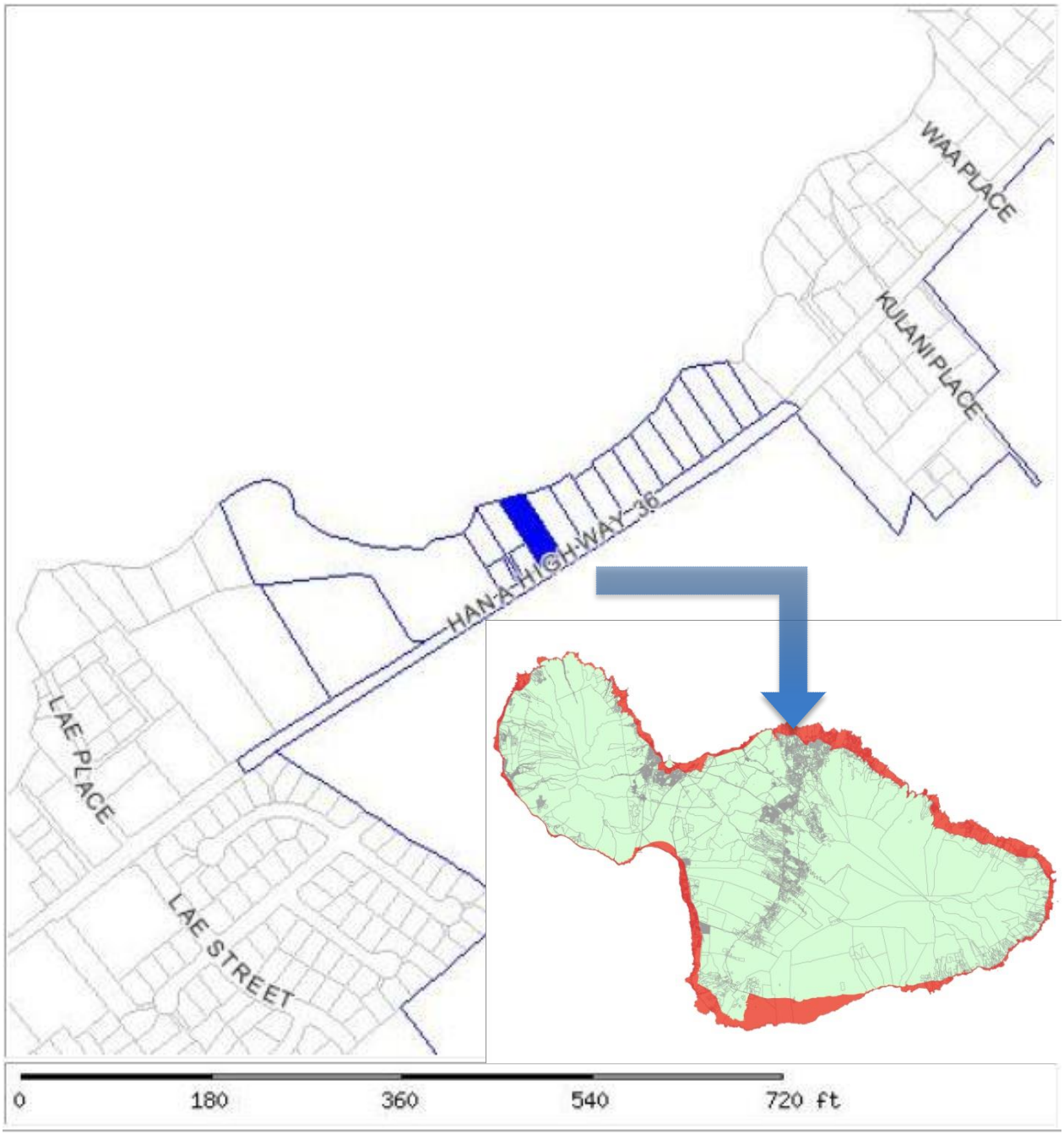

Figure 1-1: Project Location, Kuau, Maui, HI.

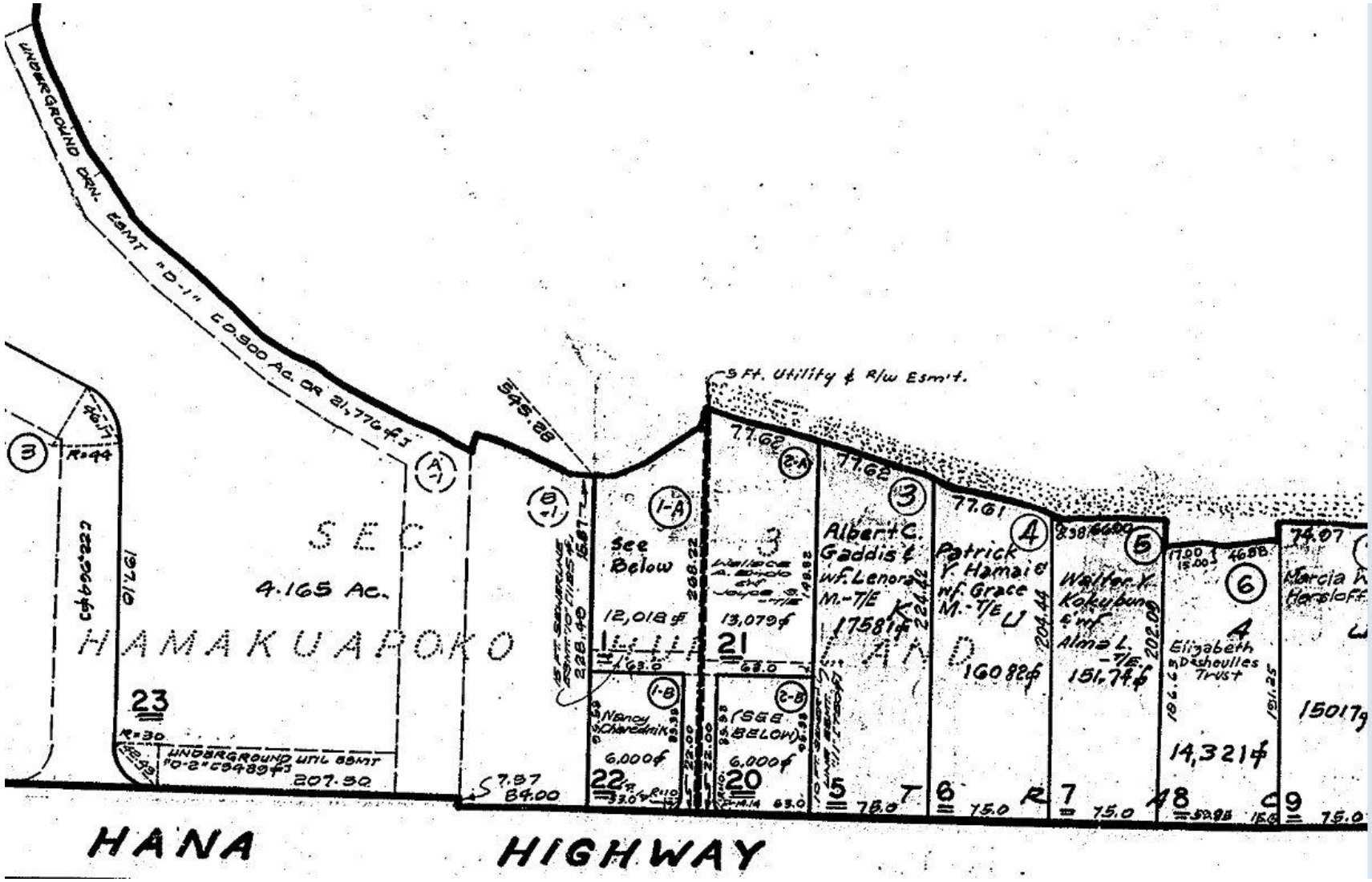

Figure 1-2: Project Tax Map Key (2) 2-6-009:005, Kuau, Maui, HI.

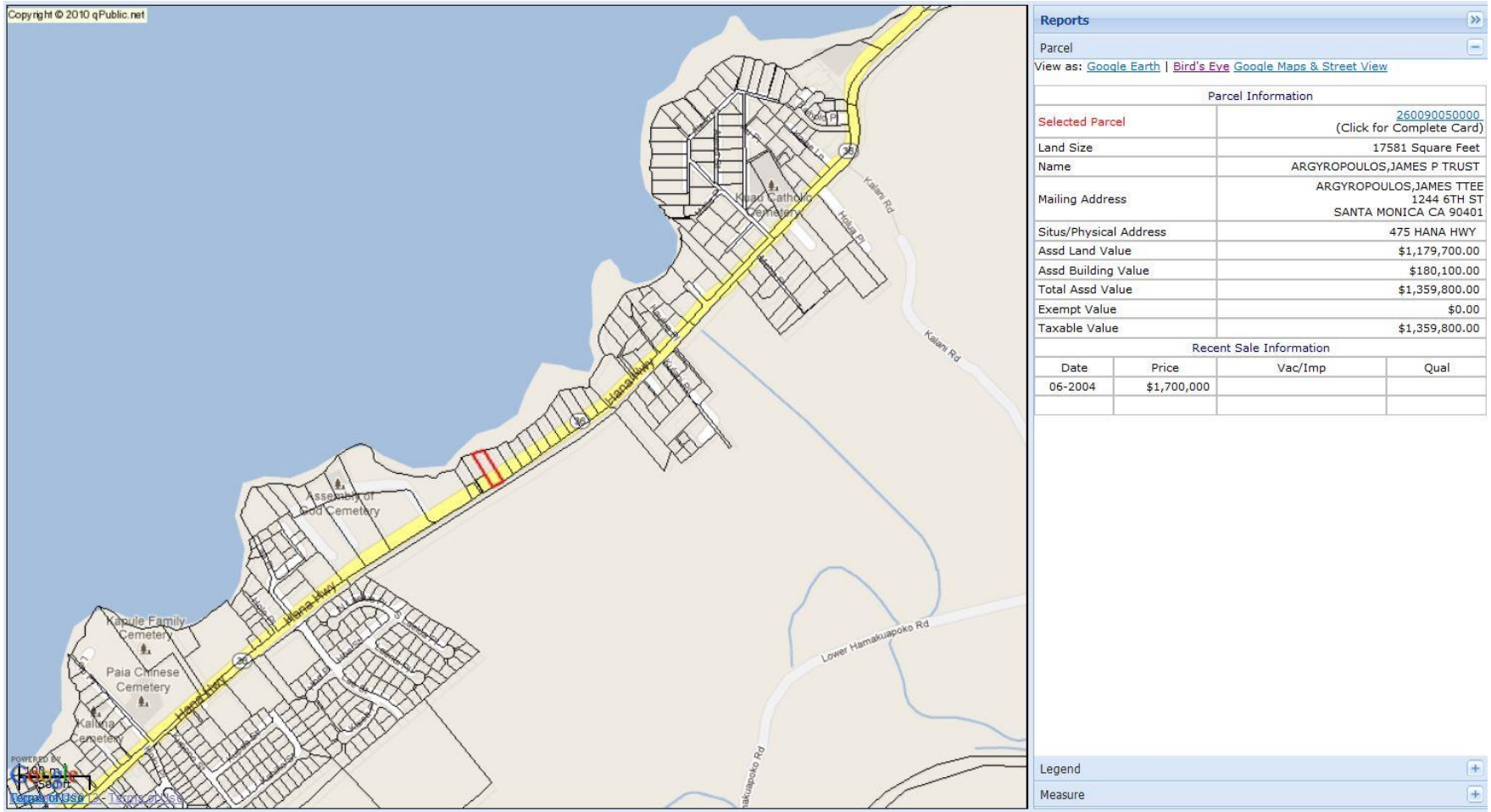

Figure 1-3: Project Location, Kuau, Maui, HI.

1.7 DEVELOPMENT TIMELINE AND CONSTRUCTION COSTS

The EA process is anticipated to take up to eight months. Thereafter, and if a FONSI is granted, a Special Management Area Major Use Permit and Shoreline Setback Variance would be requested necessitating two to four months. Ministerial permits, such as building, grading and grubbing permits would be sought afterwards and are anticipated to take three months. Construction is anticipated to take six months. The total development time is anticipated to be about two years for the estimated $450,000 seawall.

1.8 SURROUNDING USES

North: Open ocean and Tavares Bay is to the northeast, which has a good surfing spot. A reef shelf is located just offshore and in front of Kaulahao Beach and the subject property forming a small, protected channel. The channel offers a swimming area frequently used by keiki and families, as well as access for surfers to the surf breaks at Tavares Bay. The channel fronts three properties stretching from the blue-tile roof house to the subject property. As such, debris along the shoreline from the failed seawall, or collapse of the clay escarpment, could enter the nearshore channel and injure ocean users or block the channel.

South: Sugar cane fields extend from Hana Highway mauka to the Haliimaile area.

East: Ho'okipa Park is 2.25 miles to the east, whereas a series of mostly oceanfront single-family homes are located to the immediate east of the subject property. The homes are on lots fronting Hana Highway generally extending to the ocean. Most of the properties are located on high escarpments similar to the subject property and there is limited access to the ocean.

West: The town of Paia is located 0.5 miles to the west. Paia Park is located just beyond the town of Paia and 0.75 miles from the subject property. Immediately adjacent to the western side of the subject property are two homes, one of which is the so-called 'blue-tile roof' house. Both homes to the west have shoreline hardening that is failing. Adjacent to the blue-tile roof house is Kaulahao Beach. The wide, crescent shaped beach is undeveloped to its west creating a natural allure. The beach has portable comfort facilities and an unpaved parking lot adjacent to the beach.

Beyond and inland of the beach is a series of mostly agricultural designated lots with single-family residences.

Adjacent to the beach on its west end is a cemetery located high on a sandy loam bluff. The bluff is eroding from wind and waves and has receded to the extent that human remains are frequently exposed. Many of these are believed to be indigenous in origin and the State Historic Preservation Office has studied the area extensively. The 1.2-acre parcel is dedicated to open space and is currently protected by a conservation easement through the Hawaiian Islands Land Trust.

Figures 1-4 to 1-8 provide aerial views of the subject property and its surroundings.

1.9 PROPERTY HISTORY

When Antone Ferreira and his wife Mathilda S. Tavares passed away in the 1940's, the heirs of the estate subdivided a 5.48-acre parcel into several smaller oceanfront parcels along Hana Highway. One of those parcels is the subject property and it was sold to Frank and Jessie Munoz on August 13, 1947. The sale provided for residential use of the property and covenants lasting 21 years prohibited commercial activities, raising livestock, Quonset huts or unsightly structures. The Munoz family sold the property to Jutara and Chiyoko Okuda who sold the property to Albert and Nancy S. Gaddis. Their heirs took possession of the property in November 1991 and sold it to Mr. Argyropoulos in June 2004. The original deed listed the seaward property line as following the seashore but was changed when the property adopted a horizontal property regime for delineating property lines. As a result, the property boundary is lineal, running directly between the seaward corners of the neighboring lots.

Figure 1-4: Seaward view of the subject property with the Blue Tile Roof House to the left (east).

Figure 1-5: View of Kaulahao Beach to the west of the subject property, Kuau, Maui, HI.

Figure 1-6: Shoreline view of the subject property, Kuau, Maui, HI.

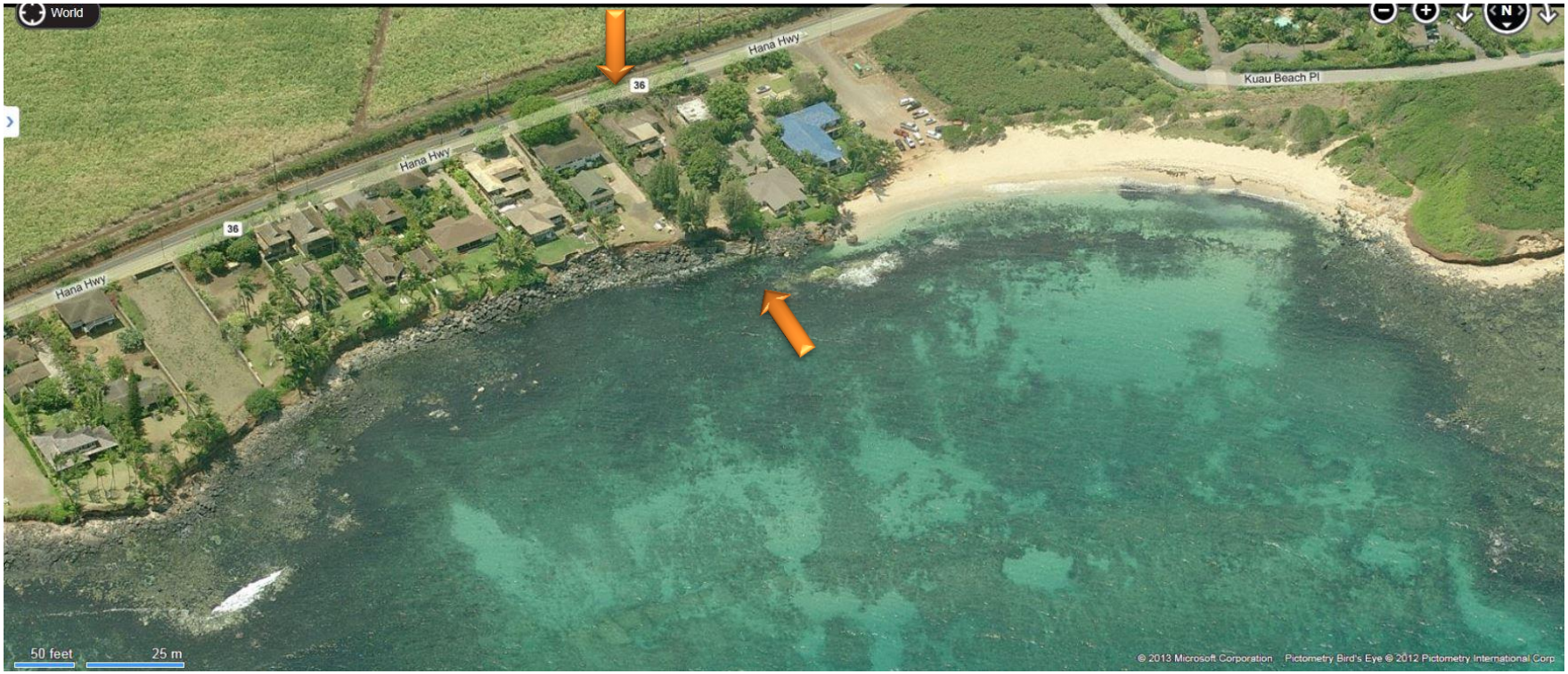

Figure 1-7: Littoral cell including Kaulahao Beach and headland, Kuau, Maui, HI.

Figure 1-8: Predominant wave direction and surf break in Tavares Bay, Kuau, Maui, HI.

Figure 1-9: View of the shoreline facing east, Kuau, Maui, HI.

Figure 1-10: View of the nearshore reef and quiescent area facing west, Kuau, Maui, HI.

Figure 1-11: View of the nearshore reef and quiescent area facing west, Kuau, Maui, HI.

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CHAPTER 2
ANALYSIS OF ALTERNATIVES

2.1 STRUCTURAL ENGINEERING REPORT

To better evaluate alternatives for the site, a professional structural engineer certified in the State of Hawaii prepared a Structural Engineering Report (ER), which is enclosed in the appendices (See Appendix A - "Preliminary Structural Engineering Report for Shoreline Improvements"). The purpose of the ER was to evaluate options to prevent continued erosion of the clay embankment and offer various alternative shoreline structures that address coastal hazards at the site. Five structures were proposed (ER Alternatives 1 – 5) and were evaluated relative to their practicality, potential adverse impacts on coastal resources, and relative merits. The engineering analysis also takes into account the extensive excavation that will be required to remove the existing remnant seawall, and subject debris field, fronting the shoreline. It is anticipated that the debris removal will be a condition by the State for the proposed shoreline hardening improvements. This will require the excavation of a long and wide down ramp from the existing grade to the shoreline level so that excavators can reach, break-down, and remove the debris.

2.2 NO ACTION ALTERNATIVE

Under the No Action Alternative, the clay embankment, some 18-feet high, would continue to be subject to severe erosion from high waves and storm surge. The present residence is located well inland of the sheer embankment and would not be immediately jeopardized by erosion or the embankment's collapse. However, the No Action Alternative presents an immediate threat to public health and safety, the environment, and neighboring property owners. An estimated 438 square feet of rear yard has already been lost to erosion. The threats to the public health and safety and the environment are further described below.

- ***Impact to public health and safety.*** The area fronting the subject property is popular with surfers, swimmers and fisherman. It contains a narrow channel between the boulder-strewn shoreline and clay escarpment and a reef outcropping that is just offshore. This channel provides a quiescent pool that is frequently used by recreational users. First, surfers and paddle boarders use the channel to access the surf break at Tavares Bay, traversing from the beach park to Tavares Bay. Second, swimmers and keiki use the quiescent area as a protected swimming pool and bathing area. Third, several large rocks along the nearshore headlands on the adjacent property to the east [TMK (2) 2-6-009:001] offer a place for children to jump into the protected pool. Fishermen access this area of shoreline for pole and spear fishing. Should the clay embankment fail, the channel could be inundated with sediment and debris. This could block the channel or create a safety hazard to recreational users from falling debris, floating debris or submerged rocks and non-buoyant materials. Additionally, sediment contains colloids that due to their rough, porous surface can harbor pathogens. Humans can become sick from these pathogens entering the ear, mouth, nose, or open cuts when swimming. Thus, most people prefer to swim in clear ocean seas, both from a health standpoint and an aesthetic perspective.
- ***Impact to the environment.*** As discussed, clay expands when wet and contracts when dry, resulting in cracks in the yard and soil that are evident onsite. At some juncture, the clay's cohesiveness is exceeded by gravitational pull and the escarpment will again collapse in episodic fashion. Predicting the stability of the embankment relates to the materials absorption capacity, long-term bluff retreat, and uncertainty in the analysis (Johnsson, 2005). When clay erodes it creates sediment inputs to marine waters just offshore and in the shoreline area.

Clay is light, settling slowly in the water column and is easily resuspended. Clay acts like an ice cube floating and suspended in the water column rather than sinking quickly to the bottom like sand typically does. Accordingly, turbidity and water temperature increase in the nearshore waters with increased clay inputs, which in turn diminish marine life diversity and coral vitality. Corals consist of a coral cell encapsulating an algal cell in a symbiotic relationship. Corals require sunlight for photosynthesis generated by the symbiotic algal that lives within the coral cell. Increases in temperature beyond certain limits can cause the algal cell to be expelled leaving the coral without a food source and susceptible to disease. Furthermore, corals are covered with mucus that sluffs off sediment and foreign materials that land on its surface. An excessive amount and/or continued inputs of sedimentation can lead the coral to expend a significant amount of energy removing the sediment, reducing the corals vitality, increasing its vulnerability to disease and degrading its ability to incur stress. Healthy coral reefs support a diverse array of marine life, including diverse and abundant populations of fish. As such, coral reefs are the so-called 'rainforests' of the sea and require clear, clean water to thrive. Excessive amounts of sediment and/or clay can cloud the water in which they live leading to their loss and the eventual collapse of the coral colony. A loss in nearshore coral reefs translates to a loss in marine life diversity, reduced fisheries catch and harvest, and lost capacity to absorb and dissipate wave energy, leading to greater exposure of the shoreline to wave swell, erosion and storm surge.

- ***Impact to neighboring properties.*** Neighboring properties could risk additional exposure if the erosion continues to cause the shoreline to retreat and as a result flanking erosion encroaches into these properties.

Allowing erosion of the clay embankment to continue unabated represents a public safety hazard and is a key basis for the proposal. Safe public recreational use along the shoreline, lateral access to surf sites, and nearshore reef and marine resources would continue to be at risk of degradation under the No Action Alternative.

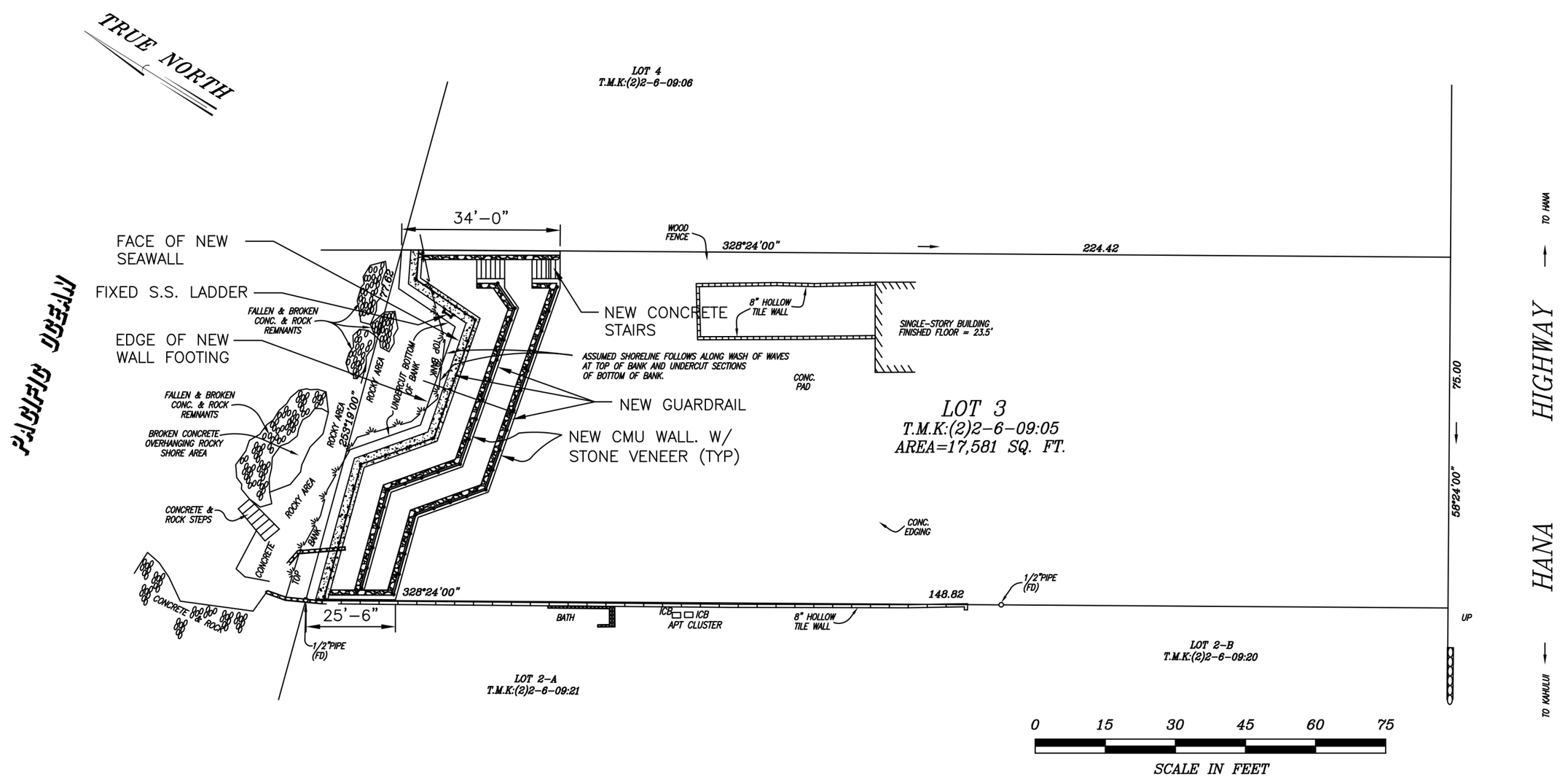
2.3 ANALYSIS OF ENGINEERING ALTERNATIVES

Five alternatives for shoreline hardening are presented in the ER. These alternatives are evaluated in the following order below:

- ***ER Alternatives 1 through 4***. These four alternatives follow the existing shoreline located at the base of the clay embankment. The design would tend to channel wave energy into the pocket formed by the structure following the concave shoreline. The options result in a concave structure. State permits (i.e., CDUP) for construction in the conservation district and easements for the structure's encroachment would not be required with these four alternatives (**See:** Figure 2-1, "Relative Layout of Proposed Terraced Seawall").
- ***ER Alternative 5***. This alternative follows the property line, which runs in a straight linear fashion between the makai points of the neighboring properties. Correspondingly, a portion of the shoreline hardening would be mauka of the present shoreline. This would require state-permits and require purchasing an easement for the seaward portion of the structure that encroaches upon lands within the state's jurisdiction but within the owner's deeded property lines (**See**: Figure No. 2-2, "Relative Layout of Proposed Hybrid Revetment-Retaining Wall").

2.3.1 Construct a Conventional Seawall following the Shoreline (ER Alternatives 1 & 2)

Constructing a seawall would harden the shoreline, permanently fix its location, and prevent continued erosion of the clay embankment. A seawall would have to be at least 18-feet high to protect the clay embankment from further erosion and limit wave and storm surge inundation of the property. Such a



SITE PLAN – RELATIVE LAYOUT OF PROPOSED TERRACED SEAWALL

SCALE: 1" = 25'-0"

Figure 2-1

CONCEPTUAL DRAWING
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KIUMARS SIAH
LICENSED PROFESSIONAL ENGINEER
No. 9446-S
HAWAII, U.S.A.

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Signature

Project: SHORELINE PROTECTION CONCEPTUAL OPTIONS TMK: (2) 2-6-009:05

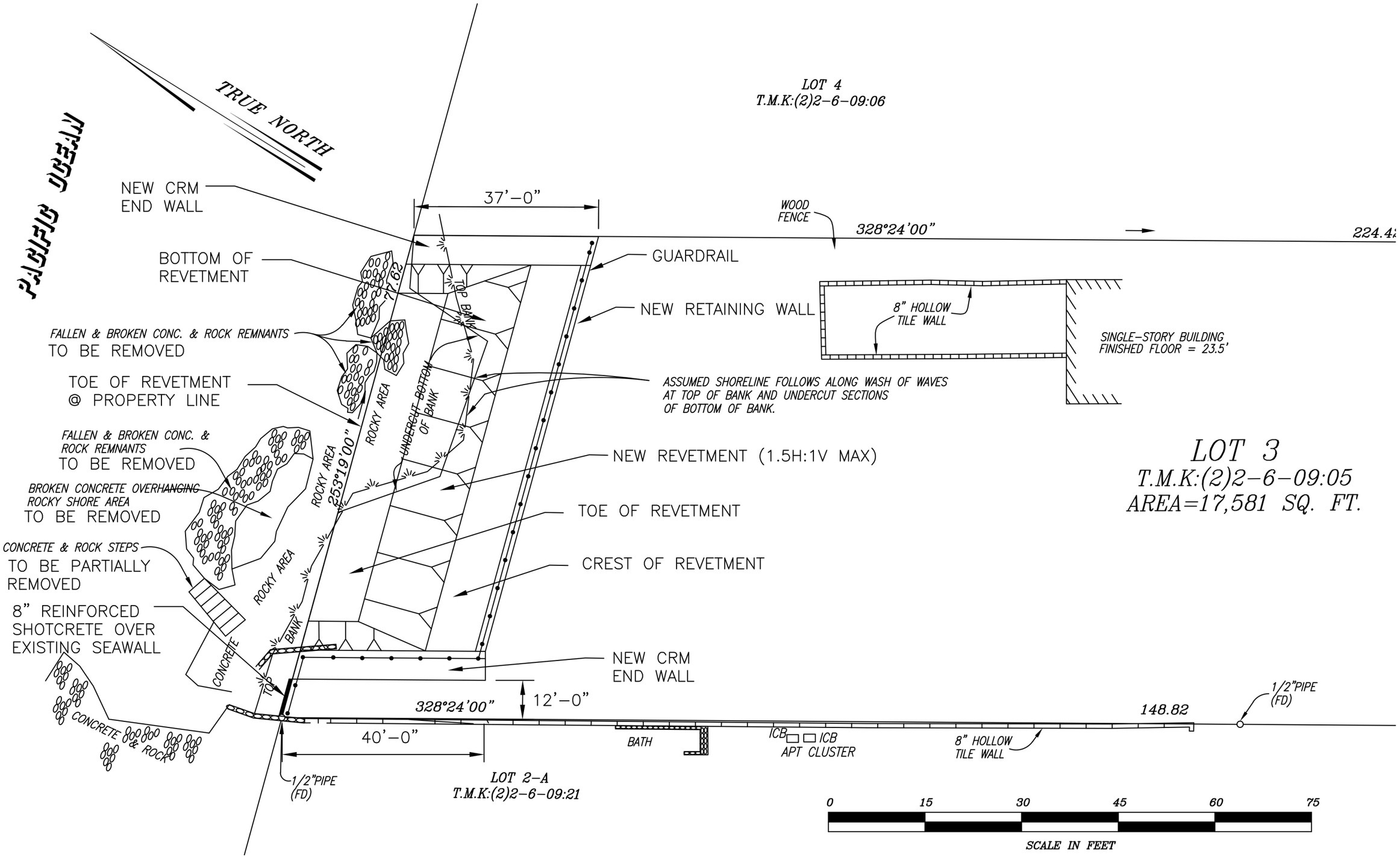
Title: SITE PLAN & RELATIVE LAYOUT

Revisions		
No.	Description	Date

Scale:	NTS
Date:	March 2013
Drawn by:	JAS
Designed by:	KS

Drawing No.: S-1

Sheet 1 of 9



RELATIVE LAYOUT OF PROPOSED HYBRID REVETMENT-RETAINING WALL

SCALE: 1" = 15'-0"

Figure 2-2

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Signature

Project: MAUI MARBLE AND GRANITE SOLAR PANEL INSTALLATION TMK: (2) 3-4-044:-031

Title: HYBRID REVETMENT-RETAINING WALL

Revisions		
No.	Description	Date

Scale:	NTS
Date:	April 2013
Drawn by:	JAS
Designed by:	KS
Drawing No.:	S-3

large, flat face may also substantially increase reflection of waves and wave energy into the nearshore environment. This may increase erosion of the nearshore reef shelf and create a choppier environment in the channel used by keiki, swimmers, paddle boarders and surfers accessing surf breaks at Tavares Bay. A seawall of this size would also have the potential to create a visual impact both from off- and on-shore vantage points by significantly changing the character of the shoreline.

Alternative 1 would be to construct a conventional reinforced concrete cantilevered seawall that would be anchored into the substrate **(**See**:** Figure 2-3, "Reinforced Concrete Cantilever Retaining Wall"). The seawall would follow the shoreline and the structure would be concave. This would tend to focus wave energy into the pocket formed by the structure following the shoreline. This alternative would not require an easement form the state and would have fewer permits overall.

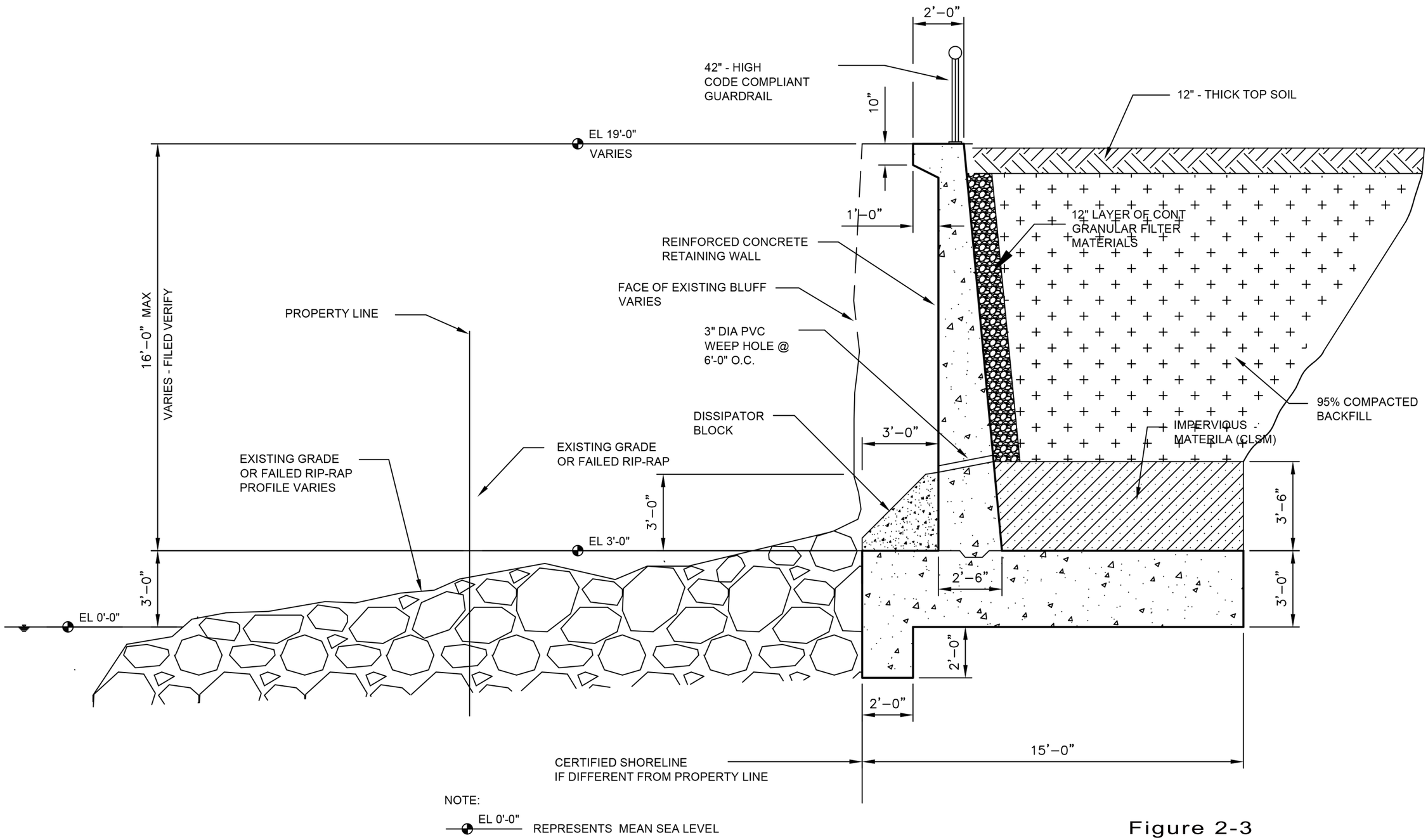
Specific to this location, constructing a seawall would require considerable excavation at the neighboring property lines. The excavation, nearly 19 feet deep with footing, would require extensive shoring along neighboring property lines given the sensitive and unstable conditions of the embankment (See ER in Appendix A). The footings for a seawall would have to encroach onto the adjacent property to the east (parcel 6). In addition, because of the close proximity to the embankment of the existing residence to the west (parcel 21), the footings would be prohibitively restrictive at that side of the property. Constructing a seawall increases the risk of the embankments collapse during excavation and the potential for adverse impacts to neighboring properties. In addition, a seawall has the potential to adversely affect nearshore recreational quality, increase wave reflection and erode the nearshore reef shelf, and create a visual impact to users offshore.

> Advantages: strongest option, anchored to substrate, no encroachment into State jurisdiction.
>
> Disadvantages: Extensive excavation, encroachment into eastern property, shoring required at western neighbor, and higher risk of water pollution due to deep excavation for anchoring. The design would tend to focus wave energy into the pocket formed by the structure following the concave shoreline.

Alternative 2 is a conventional seawall with three tiered or terraced walls that would follow the shoreline and be concave (**See**: Figure 2-4, "Reinforced Concrete Cantilever Wall W/ Terraced Retaining Walls"). Like Alternative 1, Alternative 2 would harden the shoreline, permanently fix its location, and stop continued erosion of the clay embankment. A terrace would consist of a series of flat walls separated by a bench or level area between the top of the lower wall and the base of the upper wall. Similar to a vertical seawall, the multi-tiered structure would reflect waves, storm surge and surf, but with less reflectivity and less visual effect than a continuous tall flat wall. Similar to a revetment, wave energy would dissipate as it moved up and inland along each terrace.

The first or lowest tier would be a conventional reinforced concrete wall and the upper two walls reinforced masonry walls. The design would require considerable excavation at the neighboring property lines. The excavation, nearly 19 feet deep with footing, would require extensive shoring along neighboring property lines given the sensitive and unstable conditions of the embankment (see the ER, page 4). The footings for a multi-tiered terrace would encroach onto the adjacent property to the east (parcel 6) and would be prohibitively restrictive given the close proximately of the residence to the embankment to the west (parcel 21).

> Advantages: Relatively strong in comparison to shotcrete, large footing for durability, less massing and more attractive landscaping potential, dissipates wave energy with its step-wise progression and inland extent.
>
> Disadvantages: Extensive excavation, shoring required at western neighbor, and higher risk of water pollution due to excavation.



NOTE:

EL 0'-0" REPRESENTS MEAN SEA LEVEL

Figure 2-3

OPTION NO. 1: REINFORCED CONCRETE CANTILEVER RETAINING WALL

SCALE: 1/4"= 1'-0"

CONCEPTUAL DRAWING
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LICENSED PROFESSIONAL ENGINEER
No. 9446–S
HAWAII, U.S.A.

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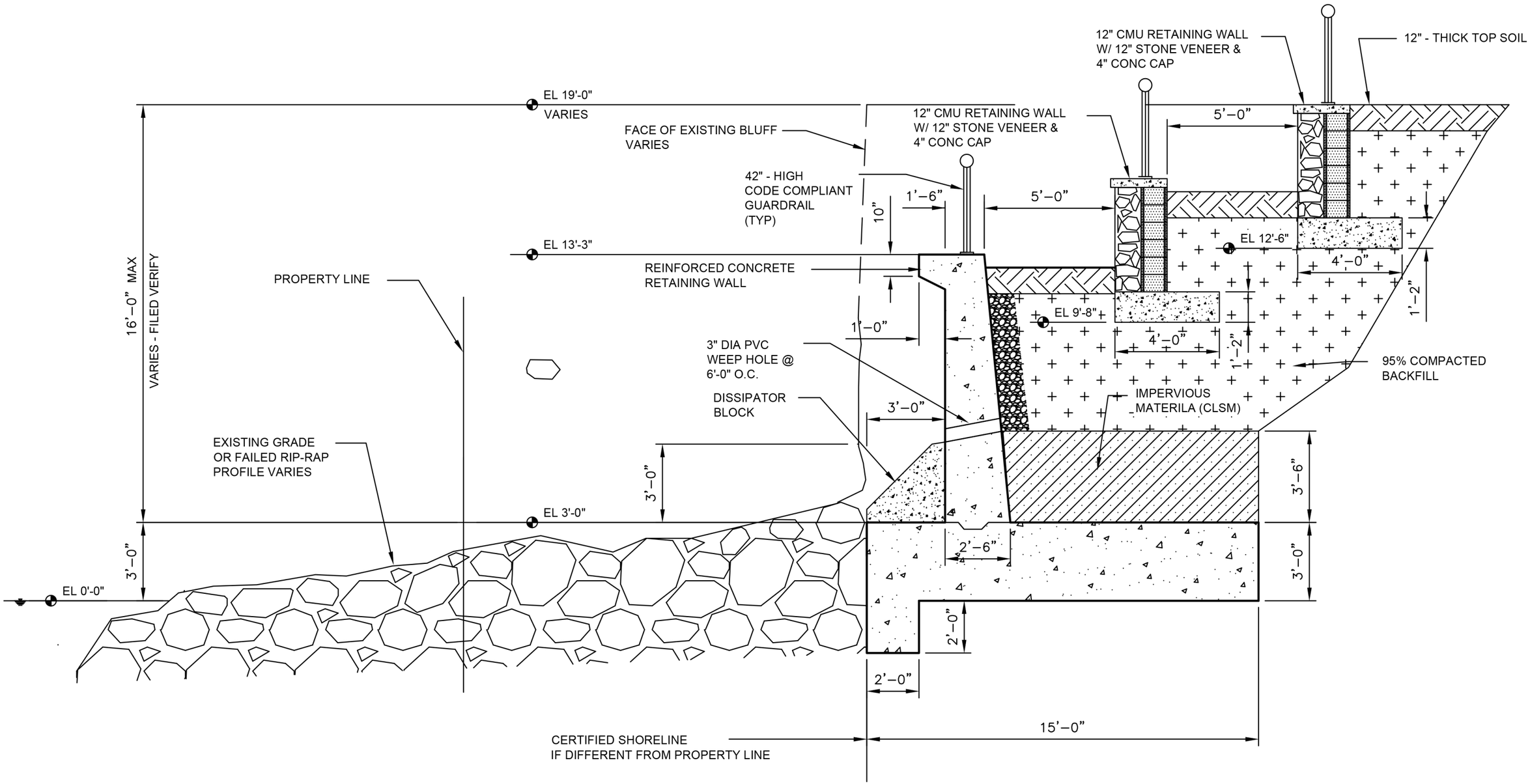
Title: OPTION NO. 1

Revisions		
No.	Description	Date

Scale:	NTS
Date:	March 2013
Drawn by:	JAS
Designed by:	KS

Drawing No.: S-4



NOTE:

EL 0'-0" REPRESENTS MEAN SEA LEVEL

Figure 2-4

OPTION NO. 2: REINFORCED CONCRETE CANTILEVER WALL W/ TERRACED RETAINING WALLS

SCALE: 1/4"= 1'-0"

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Revisions		
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Scale:	NTS
Date:	March 2013
Drawn by:	JAS
Designed by:	KS

Drawing No.: S-5

2.3.2 Construct a Shotcrete Seawall following the Shoreline (ER Alternatives 3 & 4)

Alternative 3 would be to construct an anchored reinforced shotcrete wall that follows the existing concave shoreline (**See**: Figure No. 2-5, "Anchored Wall with W/Reinforced Shotcrete Facing"). This alternative would not require an easement from the state and would require fewer permits overall. However, the design would create a pocket along the length of the seawall that would tend to focus wave energy to the center portion of the structure. Fortunately, the design would not require extensive excavation where the ends of the structure meet the neighboring properties. In turn, the reduction in excavation would reduce the chance of nearshore water pollution.

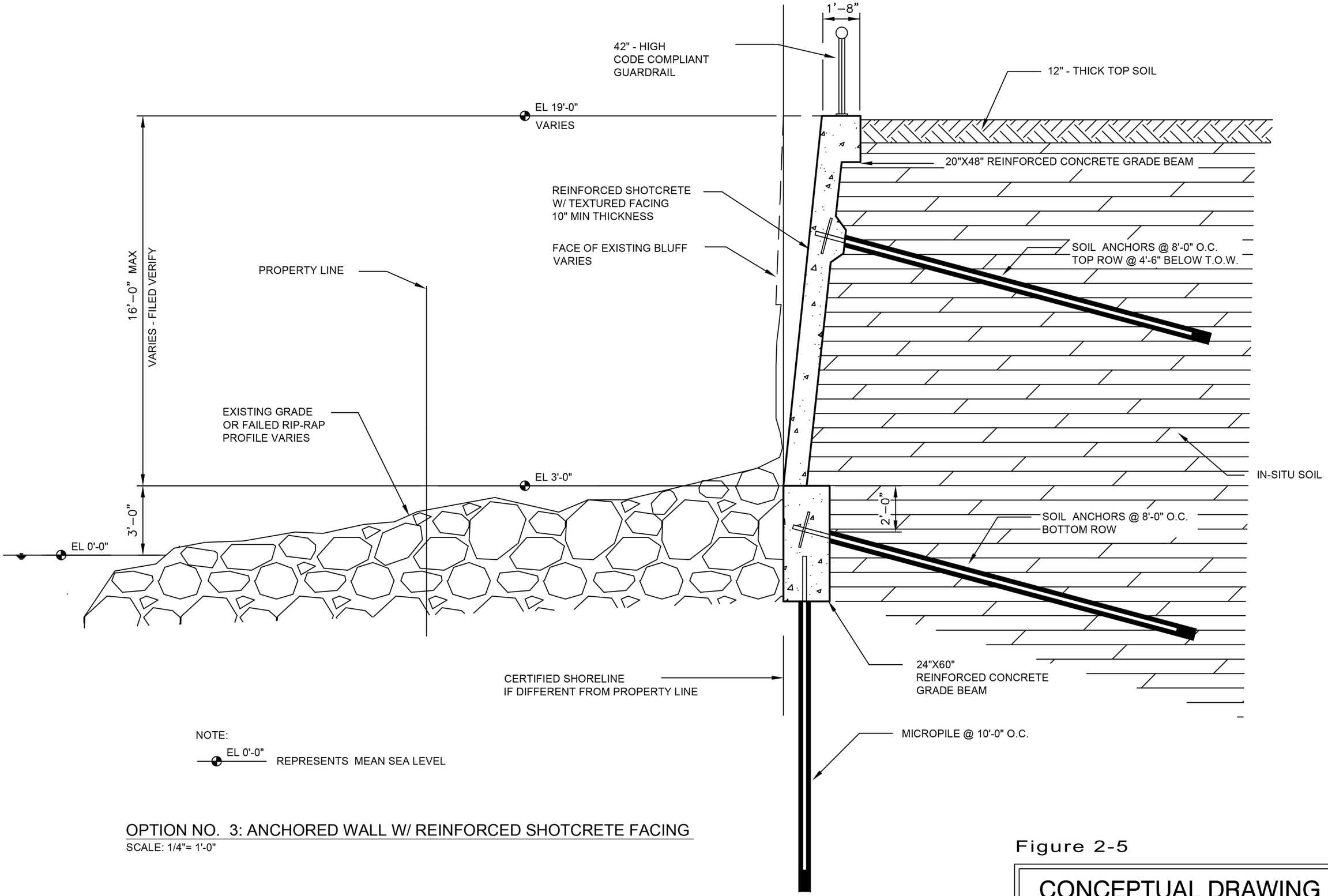
The Shotcrete could be applied to the face of the present embankment but would need to have additional anchoring in the form of micropiles drilled into the embankment as illustrated in **Figure 2-3.** Shotcrete is not as long lasting and durable as poured concrete and has less capacity to withstand high wave and surf over time. However, if the State requires the removal of the remnant debris fronting the property, then the required anchoring of the micropiles into the existing clay embankment would not be possible since much of the clay embankment would need to be excavated for the debris removal. Moreover, the existing remnant seawall currently shields the shoreline from the full force of the waves and the structural engineer is concerned about the long-term durability of using shotcrete at this location if it is not buffered by the existing remnant wall.

> Advantages: Minimal excavation along neighboring properties, reduced water pollution potential, preserves rear yard space, no encroachment into State jurisdiction, least costly.
>
> Disadvantages: Weaker than other alternatives proposed, shorter lifespan. The design would tend to focus wave energy into the pocket formed by the structure following the concave shoreline. Not viable if the remnant seawall fronting the shoreline needs to be removed.

A similar alternative would be to construct a seawall behind (mauka or inland) of the escarpment's face and allow the escarpment to erode. This would allow the shoreline to retreat a short distance to the face of the wall and would reduce some State permitting requirements. A trench some 16 to 19 feet deep would have to be excavated down to hard substrate where the seawalls footing could be properly anchored to an immovable base (i.e., bedrock or coral substrate). This creates both technical and safety challenges, such as preventing the thin clay barrier between the trench and shoreline from collapsing during the work.

For the reasons discussed above, the construction of a seawall in front, along or behind the escarpment is not a preferred alternative and is not carried forward in the analysis.

Alternative 4 is a shotcrete terraced seawall (**See**: Figure No. 2-6, Anchored Wall W/Terraced Retaining Wall). This alternative includes three tiered walls, which is similar to Alternative 2. The first or lowest tier would consist of an anchored reinforced shotcrete wall and the upper two walls reinforced masonry walls. Alternative 4 does not require extensive excavation where the ends of the structure meet neighboring properties. In turn, the reduction in excavation would reduce the chance of nearshore water pollution. Constructing a series of tiered walls would require substantially more rear yard space than a conventional flat seawall. However, the terraced design and landscaping elements would help to mitigate the massing of the structure and could potentially create a more pleasant visual experience for users of nearshore waters. Terracing would harden the shoreline, permanently fix its location, and stop continued erosion of the clay embankment. A terrace would consist of a series of flat walls separated by a bench or level area between the top of the lower wall and the base of the upper wall. Similar to a seawall, the multi-tiered structure would reflect waves, storm surge and surf, but with less reflectivity and less visual effect than a continuous tall flat wall. Similar to a revetment, wave energy would dissipate as it moved up and inland along each terrace.



NOTE:

EL 0'-0" REPRESENTS MEAN SEA LEVEL

OPTION NO. 3: ANCHORED WALL W/ REINFORCED SHOTCRETE FACING

SCALE: 1/4"= 1'-0"

Figure 2-5

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Title: OPTION NO. 3

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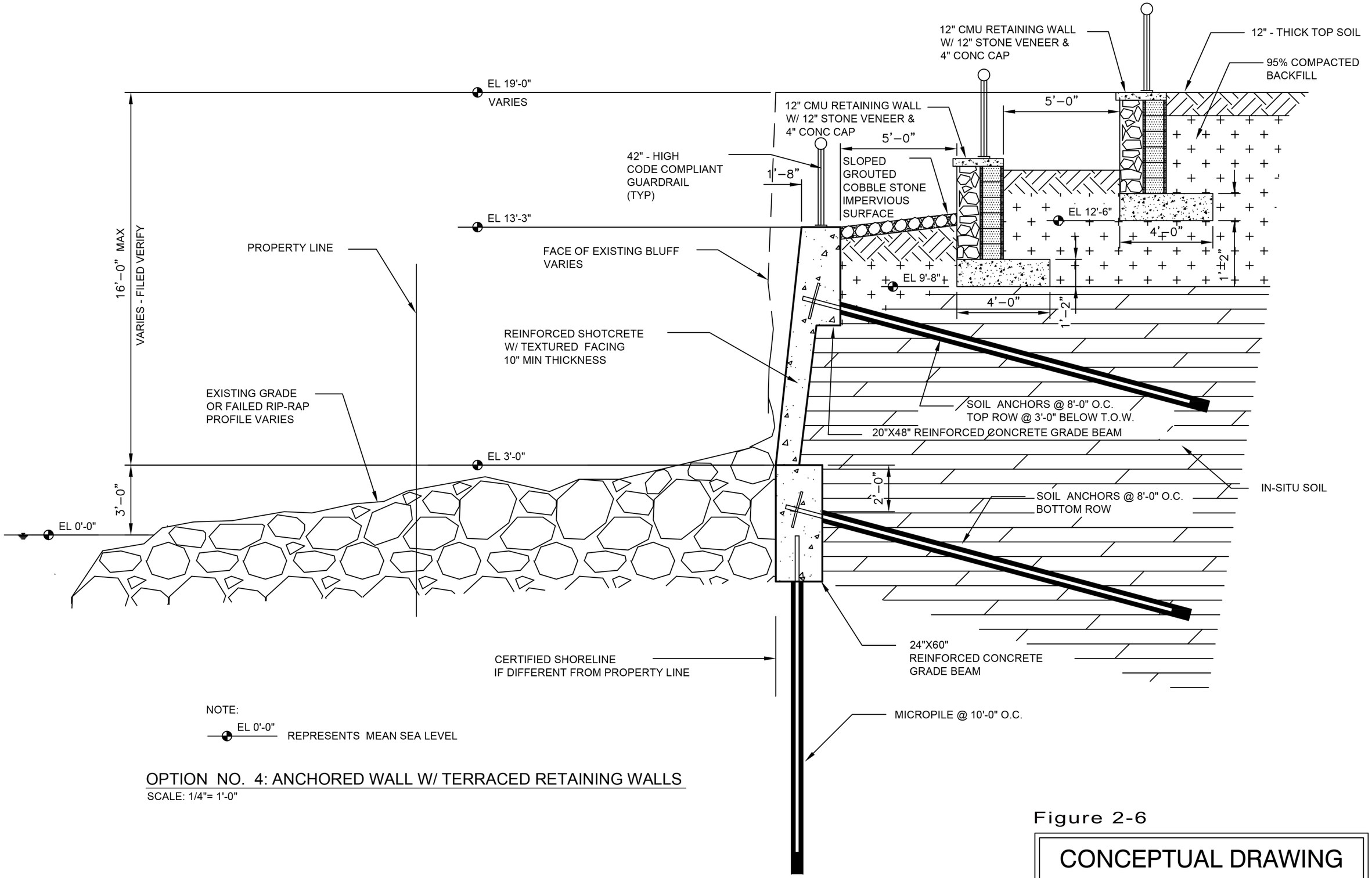
Drawing No.: S-6



NOTE:

EL 0'-0" REPRESENTS MEAN SEA LEVEL

OPTION NO. 4: ANCHORED WALL W/ TERRACED RETAINING WALLS

SCALE: 1/4"= 1'-0"

Figure 2-6

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Title: OPTION NO. 4

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Scale:	NTS
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Designed by:	KS
Drawing No.:	S-7

The terrace would follow the property line connecting directly between the neighboring properties. The shape would be linear rather than convex and would encroach seaward of the shoreline (i.e., base of the present embankment) but would be contained wholly on the applicant's property. The structures footprint would have to be wide, given the overall step-wise angle of the terracing and would use a substantial portion of the rear yard. A hardened bench would exist between each consecutively tiered wall. This level area would provide space for landscape plantings, potted flowers, or could accommodate chairs or benches for users to enjoy the ocean view. Despite its many advantages, Alternative 4, like Alternative 3, is not viable if significant excavation is required to remove the remnant seawall debris fronting the shoreline. Moreover, there is concern about the long-term durability of the shotcrete wall when exposed to the full force of the sea waves at this location.

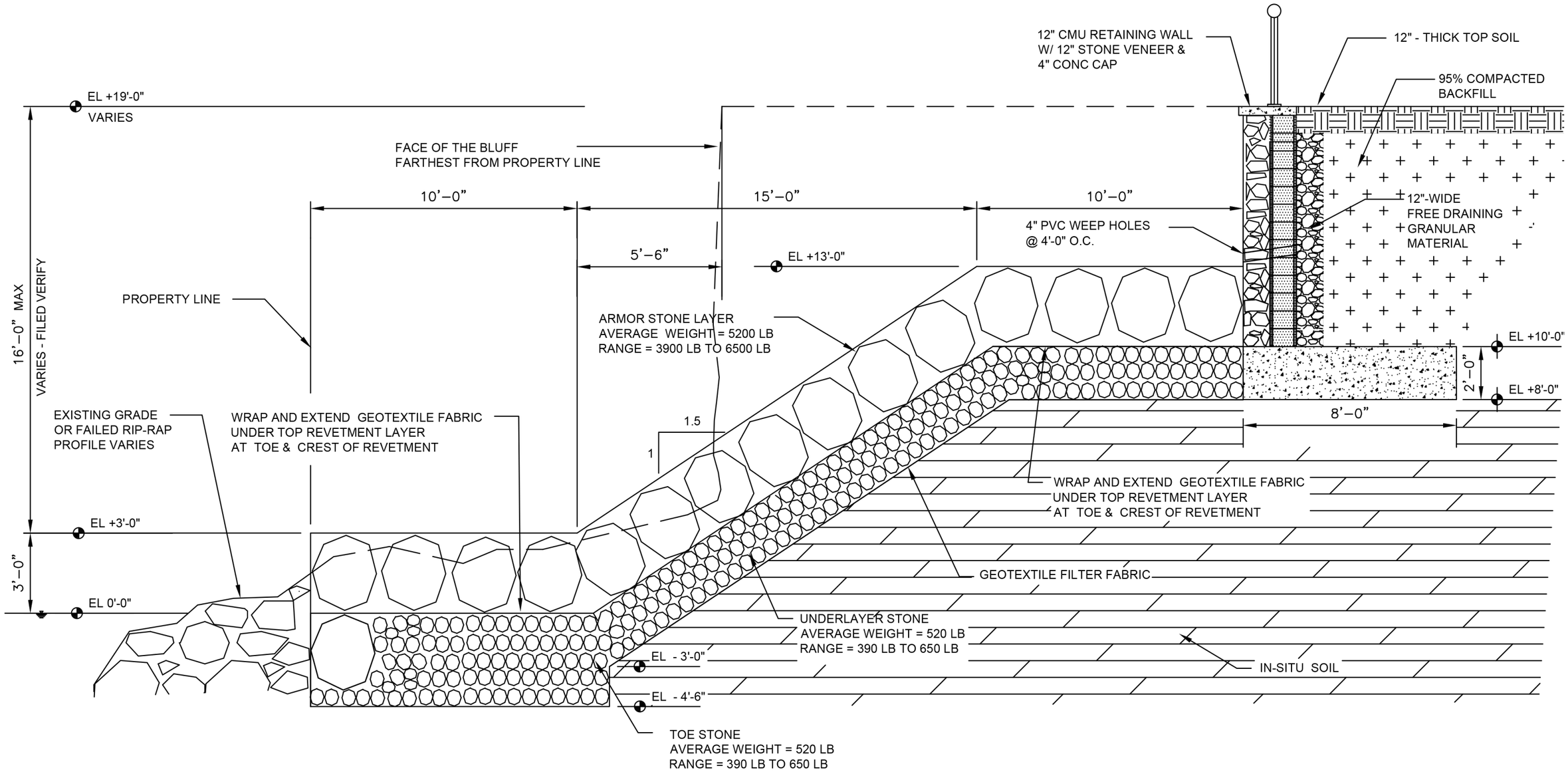
> Advantages: Minimal excavation along neighboring properties, reduced water pollution potential, preserves rear yard space, no encroachment into neighboring properties, acts like a long-stepped revetment, less massing and more attractive landscaping options, more resilient to large storm surf and high waves than Alternative 3 (i.e., shotcrete seawall).
>
> Disadvantages: Requires consumption of larger amount of the rear yard. Concern from the structural engineer about the long-term durability of the shotcrete wall when exposed to the full force of the waves at this location. Not viable if significant excavation is required to remove remnant seawall debris.

2.3.3 *The Preferred Alternative,* Construct a Hybrid Revetment-Seawall following the Property Line (ER Alternative 5)

A hybrid revetment-seawall would harden the shoreline, permanently fix its location, and prevent erosion of the clay embankment. The revetment portion would consist of an armor stone layer placed on top of a stone under layer that would have geotextile filter fabric underneath it to prevent erosion and transport of sediment and clay. A single, short concrete seawall would be located atop of the revetment and at the end of the revetment where the structure abuts neighboring properties. Such a hybrid structure would have a smaller footprint than a regular revetment (**See**: Figure No. 2-7, Hybrid Revetment-Retaining Wall).

The hybrid design takes advantage of the revetments slope ratio of 1:1.5 to mitigate and disperse wave energy and storm surge as shown in Figure No 2-7. A small wave's energy would dissipate as it ran up the revetment and back, whereas a large wave would reflect off the seawall atop the revetment. Small waves would backwash to the swimming channel between the revetment and nearshore reef shelf. However, the amount of turbulence created in the channel would be substantially less than the wave reflection caused by a flat-surfaced seawall. During large wave events, the nearshore reef shelf is overtopped, negating the protection afforded to swimmers and surfers by the channel. During these types of events, the seawall would protect the upper embankment and any wave reflection would have minimal impact on the reef shelf since it is submerged by high waves. Also, since this structure will be linear, it will not direct wave energy into a pocket. This may reduce water turbulence that could result from waves reflecting off a pocket or concave structure.

Like Alternatives 1 and 2, this structure will require extensive excavation. However, because the revetment is located at the property line, rather than along the shoreline, the excavation will be significantly less because of the existing erosion. Moreover, because the structure is approximately 10 feet further seaward than Alternatives 1 and 2, the amount of excavation at the property lines will be less. As such, Alternative 5 will not require an encroachment onto parcel 6 and the risks to the existing residence on parcel 21 is reduced. Because the structure will have an approximate 1 to 1.5 slope, its massing from the shoreline will be less than both the vertical conventional and shotcrete seawalls. Also, a hybrid revetment-seawall is a more environmentally-friendly alternative. However, because Alternative



NOTE:

EL 0'-0" REPRESENTS MEAN SEA LEVEL

OPTION NO. 5: HYBRID REVETMENT-RETAINING WALL

SCALE: 1/4"= 1'-0"

Figure 2-7

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Title: OPTION NO. 5

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No.	Description	Date

Scale:	NTS
Date:	April 2013
Drawn by:	JAS
Designed by:	KS
Drawing No.:	S-8

Sheet 8 of 9

5 would be linear in nature and follow the shoreline; it will require the issuance of a State Conservation District Use Permit (CDUA) and the purchase of an easement from the DLNR.

Advantages: Very strong in comparison to other alternatives, offers excellent dissipation of wave energy, and maximizes the advantages of a revetment or seawall by their combination. Reduces wave reflection that would come from a flat seawall or pocket created by following the shoreline thereby reducing nearshore turbulence. This reduction in turbulence would help preserve the existing reef shelf located just offshore and the nearshore swimming channel used to access surf breaks in Tavares Bay. Reduces amount of excavation at the side-yard property lines because it's located along the property line rather than along the shoreline. The generous 10-foot exposed revetment toe provides an easy lateral access for surfers frequenting the area. From a long-term maintenance and durability perspective, the hybrid revetment outperforms other options analyzed.

Disadvantages: State approval and easement required, extensive excavation necessitating the implementation of additional best management practices, shoring required at western neighbor, larger footprint and loss of rear yard than straight seawall alternatives.

2.4 OTHER ALTERNATIVES CONSIDERED

2.4.1 Construct a Revetment

A revetment would harden the shoreline, permanently fix its location, and stop erosion of the clay embankment. A revetment at a 1.0 to 1.5 ratio would require substantial more consumption of the rear yard (~24 feet) to address the ~ 18 feet rise in elevation of the embankment. Additionally, geotextile filter fabric would be required as an underlay to the rock revetment to prevent extraction of clay and sediment from the embankment and to prevent continued erosion of the site. A revetment of this size would also have substantial massing and no landscaping, making it less visually attractive.

A revetment could be constructed to follow the base of the embankment and shoreline. However, a concave revetment would be technically challenging to design and build. A more practical design would follow the property line in straight, linear fashion. A revetment would present the advantage of slope to dissipate wave energy, but it would require shoring and seawalls along the shared property lines of both neighbors where its rise in angle was lower than the neighboring lot's grade. This would be necessary to prevent wave scour and erosion of the neighboring side yards. Such walls would also have to retain the neighbors land and could present both safety and aesthetic issues for the adjacent homeowners.

In consideration of its very large footprint, along with technical design challenges and potential adverse impacts on neighboring properties, this alternative is not carried forward in the analysis.

2.4.2 Install Sheet Pile

Sheet pile installation would harden the shoreline, permanently fix its location, and stop continued erosion of the clay embankment. Similar to a seawall, the sheet pile would have to be 16 to 18 feet high to protect the clay embankment from further erosion and would prevent wave and storm surge inundation of the property. Sheet pile consists of corrugated steel or vinyl plates that are pounded into the ground usually with a pneumatic jackhammer until it reaches substrate. Sheet pile is commonly used on backwaters or embayment's where wave energy is nominal, such as shown in **Figure 2-9**. The equipment used creates substantial acute noise that would be temporary in nature. The sheet pile must enter the substrate to be effective, which can be problematic if coral or volcanic "blue rock" substrate was encountered. Elsewise, seawater can penetrate below the sheet pile and erode the material behind it causing its eventual failure.

The large, flat face of the sheet pile would increase reflection of waves and wave energy into the nearshore environment. This would increase erosion of the nearshore reef shelf and create a choppier environment in the channel used by keiki, swimmers and surfers to access surf breaks at Tavares Bay. Sheetpile of this height could likely be installed behind the current escarpment, minimizing installation costs for the landowner and negating the need for some State permits. However, sheetpile does not last as long as stone in high-energy coastal environments such as this one, and its lifespan would probably be much shorter than concrete or a stone revetment as a consequence.

Sheet pile could adversely impact nearshore recreational sites and cause a potential visual impact to users offshore similar to a seawall. Given its limitations on high wave energy coastlines, potential noise from installation, technical challenges if 'blue rock' or impenetrable coral substrate is encountered, and limited lifespan, the use of sheet pile is not carried forward in the analysis.

2.4.3 Create an Unconsolidated Rock Pile

An unconsolidated rock pile would harden the shoreline and reduce further erosion of the clay embankment. Because the rocks would be unconsolidated they would not permanently fix the location of the shoreline. Many oceanfront properties have used boulders excavated from cane fields to protect the

shoreline. However, the rocks erode over time by the impact of large storm waves and storm surge. They can also be dislodged and tumble into the nearshore channel or seaward of the shoreline. Without a geotextile fabric liner, the embankment behind the rocks would continue to erode, albeit more slowly, and release clay and sediment into nearshore waters. Placing a geotextile fabric liner is possible; however the rocks movement could easily damage the liner since they would not be engineered to resist being dislodged. Over time, the rocks would also have to be replenished as they erode and/or become dislodged into the nearshore environment. Unconsolidated rock piles give a landowner the false impression that their property is protected, when in fact it is not.

This alternative would slow, but not stop the embankments erosion or potential for collapse. Clay and sediment would still leach into the nearshore marine environment reducing water quality. Further, the alternative could place nearshore recreational users at risk if a boulder became dislodged and rolled into the water. For these reasons, the alternative is not carried forward in the analysis.

2.4.4 Undertake Beach Restoration

Beach or sand replenishment would not harden the shoreline, fix its location, or prevent continued erosion at the site. Adding sand to a littoral cell that is depleted of its normal sand budget can reduce the negative effects of erosion, but not eliminate or prevent continued erosion. In some cases, beach replenishment can reduce cliff erosion and collapse, a management technique that has been successful in Portugal (Cruz de Oliveira, 2008). However, beach nourishment typically is effective on wide beaches or where a sandy shoreline presently exists.

This section of Kuau has not had a sandy shoreline since the tsunami of 1946. That event fundamentally changed the shoreline environment along many of the northshore's coastlines. On more practical terms, the amount of sand that would have to be added to absorb wave energy along the steep embankment would be considerable and would have to be replenished regularly. Moreover, the spatial area required to establish an active beach zone would be considerably more than is presently available. Sand dunes and beaches should have a profile of 26 degrees to maximize effectiveness. This translates to a horizontal area of approximately 72 feet of seaward of the escarpment. Since the existing area seaward of the escarpment is less than 25 feet, establishing a sand dune or beach buffer seaward of the embankment would be spatially challenging. Additionally, creating a sandy beach fronting one parcel that is bordered by a rocky shoreline on both sides would not be consistent with the adjacent shoreline environment and would have a high likelihood of being washed away during high surf and wave events.

Beach nourishment would, at best, temporarily absorb wave energy but would not necessarily prevent continued erosion of the clay escarpment during high wave and storm surge events. As a consequence, beach nourishment is not carried forward as it is not a practical alternative and is not in keeping with the natural environment along this portion of the shoreline.

2.4.5 Relocate the Residence

Relocating the residence would not address the ongoing erosion and public safety issues associated with the 18 feet high, sheer, unstable clay embankment. Since relocating the residence would not increase its safety, nor address the public safety issues for nearshore recreational users, this alternative is not carried forward in the analysis.

2.5 SUMMARY

The "No Action" alternative, serves as a baseline by which to compare the various alternatives presented. The alternative is commensurate with existing conditions at the site that present a safety hazard to the property's residents and ocean recreational users.

The preferred alternative is to construct a hybrid revetment-seawall along the property line. The hybrid structure is advantageous because it takes advantage of a revetment's ability to dissipate wave energy

through wave run-up and a seawall's ability to minimize a structure's physical footprint. The majority of waves would run-up the structure and backwash against themselves diminishing wave reflection that could disturb the nearshore reef shelf and ocean recreational users. The impact of reflection from the seawall from large wave would be reduced because the reef shelf would typically be submerged during such large storm events. This minimizes bio erosion of the nearshore reef and most recreational users are likely to be absent during such inclement weather conditions. The design does not present a concave pocket that would tend to direct wave energy into the middle of the structure that could create added turbulence in nearshore waters. Furthermore, the design reduces the overall footprint of a shoreline hardening structure, reduces the considerable amount of property already lost (~438 square feet), and avoids the potential for scour and adverse impacts to neighboring properties.

Based on the aforementioned, the preferred alternative is carried forward in this analysis.

CHAPTER 3
PHYSICAL ENVIRONMENT

3.1 CLIMATE

3.1.1 Existing Conditions

Climate in Maui ranges from wet Hana to the dry plains of Makena. The Island has an abundance of sunshine and comfortable temperatures year round. Trade winds predominate from the northeast, moderating temperatures and humidity to a relatively comfortable zone for human habitation. Maui's climate is relatively uniform year-round given its tropical latitude and position relative to storm tracts and the surrounding ocean influence. The north shore, where the subject property is located, experiences heavy winds predominantly coming out of the north to northeast. Average temperatures at nearby Kahului Airport range from the 71.5 in January to the 79 degrees Fahrenheit in August. Precipitation in the form of rainfall at the nearby Kahului Airport ranges from 0.07 inches in November to 4.07 inches in May (Maui County Data Book, 2012)., The north shore is subject to large surf and storm swells, primarily during the winter season owing to its northern exposure.

3.1.2 Potential Impacts and Mitigation Measures

No specific mitigation measures are proposed and no adverse effects are anticipated.

3.2 TOPOGRAPHY AND SOILS

3.2.1 Existing Conditions

The study area slopes from approximately 33 feet above mean sea level at the property's southeasterly corner to approximately 18 feet above mean sea level at the property's northwesterly corner, averaging approximately 6.40%. There is also an eroded area along the northern boundary of the property, which encompasses approximately 438 square feet.

According to the "Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii (August, 1972)," prepared by the United States Department of Agriculture Soil Conservation Service, the soils within the project site are classified as Paia silty clay, 3 to 7 percent slopes (PcB) and Paia silty clay, 7 to 15 percent slopes (PcC). PcB is characterized as having moderate permeability, slow runoff, and slight erosion hazard. PcC is characterized as having slow to medium runoff and slight to moderate erosion hazard.

3.2.2 Potential Impacts and Mitigation Measures

The property was previously graded in connection with the construction of the existing single-family residences and associated landscaping. The removal of the debris along the shoreline and construction of the proposed shoreline protection improvements will require further ground disturbances. Any cut into the existing clay escarpment would be disposed of properly at a government-approved landfill. Grading would reduce portions of the makai extent of the property. However the use of clean, well-drained, fill would be necessary in any construction along the ocean frontage. With the implementation of best management practices (BMPs) no adverse impacts are anticipated.

Figure 3-1: Clay escarpment fronting the coastline of the property.

Figure 3-2: Clay escarpment and remnant seawall with person for size reference.

3.3 HYDROLOGY

3.3.1 Existing Conditions

The hydrology at the property exhibits no wetlands or low-lying areas, in which water may pool or remain standing after rain events. Storm and rainwater flow across the flat terrain of the property and either percolates into the groundwater table or, with distance, flows to the ocean. There are no drainage ditches, diversions, dry wells, street works, or other stormwater infrastructure that would direct and/or treat stormwater sheet flow. As noted in Appendix B, the Preliminary Drainage Report prepared by Otomo Engineering, Inc. in August 2013, it is estimated that the existing 50-year, 1-hour storm runoff from the project site is 0.99 cfs, corresponding to a runoff volume of 653 cubic feet.

3.3.2 Potential Impacts and Mitigation Measures

The Preliminary Drainage Report concludes that the proposed project will not create any additional runoff from the 50-year, 1-hour storm (See: Appendix B - "Preliminary Engineering and Drainage Report"). Thus, no adverse impacts are anticipated based on minimal change to existing drainage patterns at the site.

3.4 NEARSHORE WATER QUALITY

3.4.1 Existing Conditions

Nearshore ocean water quality is generally good at the site, although turbidity is higher along the north shore than southern coastlines in Maui. Turbidity increases naturally during periods of strong wind and currents along the coastline. The majority of ocean waters off of Maui's shorelines, as well as the project site, are listed as Class AA waters by the DOH. The objective of class AA waters is that these waters remain in their natural pristine state as nearly as possible with an absolute minimum of pollution or alteration of water quality from any human-caused source or action (DOH, 2011). These areas may not be degraded by the addition of specific point sources of water pollution without obtaining a National Pollution Discharge Elimination System (NPDES) permit. Overall, the purpose of the NPDES is to ensure that anthropogenic inputs do not exceed the natural assimilative capacity of the environment.

Anthropogenic inputs that degrade water quality include sediment, fertilizers, pesticides, herbicides, oil and metals, trash and debris. Sediment from barren ground and organic waste can be captured by overland flows of stormwater, leading to pollution of nearshore waters. These types of nonpoint source pollution are among the major contributors to impaired water quality in Hawaii (DOH, 2000). Inappropriate application of fertilizer and chemical treatments to lawn and grass areas can contribute to nearshore algal growth (DAR, 2004). Pesticides and herbicides that are toxic to benthic organisms can wash off treated areas during rain events and enter the nearshore environment. Fecal matter from untreated and/or uncontained waste can also adversely affect marine environments and increase public health risks (Vermeij, 2008). Combined, these forms of nonpoint pollution can degrade water quality ultimately contributing to algal blooms, reef decline, and degraded coral reefs (DAR, 2007). Presently, there are no chemical treatments of the lawn or landscaping on the property and none are planned.

3.4.2 Potential Impacts and Mitigation Measures

Implementation of best management practices (BMPs) can help avoid or reduce the potential for adverse impacts to nearshore water quality. The use of silt fences, absorbent geo-tubes, and watering of barren areas or stockpiled soils during ground altering activities can reduce the potential for sediment impacts. Minimizing ground altering during the rainy season is also a means to reduce the potential for sediment inputs to the nearshore environment. As required by MCC 20.035, an erosion control plan would be fully implemented and adhered to during ground-altering activities to ensure protection of the nearshore environment.

During construction, a suite of government-approved BMPs to control erosion and diminish potential water pollution would be implemented. The Maui County Department of Public Works reviews the proposed BMPs to ensure sufficiency and protection of near shore water quality, during the issuance of grading, cut and fill plans.

Using climate-adapted drought-tolerant native plant species in landscape plans can reduce the need for pesticides, herbicides and fertilizer use and thereby avoid potential impacts to nearshore waters and benthic organisms. Reducing impervious surface areas and re-directing roof top drainages away from the shoreline are also effective means of reducing the potential for adverse impacts to water quality.

The project would fully implement the BMPs described above during all phases of the proposed action to preserve water quality and reduce the potential for adverse impacts to nearshore waters and benthos.

No adverse impacts are anticipated.

3.5 FLORA AND FAUNA

3.5.1 Existing Conditions

Flora and fauna at the site is typical of northshore Maui area. The existing residential site is landscaped. Plant species on the property 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.

Table 3-1 lists endangered, threatened, or rare species, or species of special concern (T&E) found in Maui's coastal environment. No T&E species (plant or animal) have not been encountered at the subject property, as it doesn't harbor preferred habitat for these species. Transient protected species such as whales are occasionally observed well offshore. The site is not a haul out area or breeding area for turtles or monk seals and exhibits no preferred habitat for these protected species. Exterior lighting is not directed to illuminate the beach, shoreline, or ocean as this can disorient marine and/or wildlife (DAR, 2005).

Hawaiian Stilts are not commonly observed at this location, as there is seldom standing water, which they prefer. Wedge-tailed shearwater or 'ua'u kani (*Puffinus pacificus*) are not known to use the clay embankment as it does not present sandy soils preferred by the species for nesting purposes (DAR, 2005). However, a sandy escarpment suitable for shearwater habitat does exist west of Kaulahao Beach. A high, sandy escarpment along the headland to the west offers favorable sheerwater habitat. Presently occupied by a small cemetery, this open area is being protected and managed by the Hawaii Island Land Trust for conservation and cultural protection purposes.

3.5.2 Potential Impacts and Mitigation Measures

The proposed shoreline hardening would not cause a deleterious effect on flora and fauna. The removal of two ironwood trees along the escarpment and portions of the existing lawn and landscaping from the property due to the proposed project would not create negative impacts on flora or fauna or T&E species. In the event protected species were observed in the immediate vicinity of the project site, such as a monk seal fronting the shoreline, work would cease until the individual left.

No adverse impacts are anticipated.

3.6 MARINE BENTHOS

3.6.1 Existing Conditions

The marine and benthic environment at Kaulahao Beach, near the project site, is typical of north Maui's coastal areas. Rare and protected species, such as turtles, whales and monk seals can occasionally be observed off shore and transiting along the coastline (**Table 3-1**). Turtles are not uncommon, foraging on

algal growth along nearshore reefs. The sandy beach to the west of the project site offers suitable habitat for turtle and seal haul out and resting.

However relative to the project site there are no known haul-out, breeding or nesting areas in the immediate vicinity. Monk seals have not been observed using the nearshore environment most likely due to the steep embankment fronting the project site and its immediate neighbors and the lack of suitable haul out space for their use. Whales may be observed as transient species during the winter season when they migrate to Maui from Alaska.

Reef fish, corals, and marine life are regularly observed offshore of Kaulahao Beach to the west of the project site. Immediately offshore of the project site is a reef shelf that dissipates swell and surf and provides sufficient rigosity to offer holes or other puka's for predator avoidance. Given high exposure to strong swell and currents, branching types of coral such as *agropora*, do not predominate the nearshore area and coral coverage is limited to tongue and groove formations interspersed with sand channels.

Table 3-1. Federally and/or locally listed endangered and threatened species

T	Green Sea turtle, (except where endangered) (*Chelonia mydas*)
E	Sea turtle, hawksbill (*Eretmochelys imbricata*)
E	Sea turtle, leatherback (*Dermochelys coriacea*)
T	Sea turtle, loggerhead (*Caretta caretta*)
E	Seal, Hawaiian monk (*Monachus schauinslandi*)
E	Stilt, Hawaiian (Himantopus mexicanus knudseni)
	Wedge-Tailed Shearwater
E	Whale, humpback (*Megaptera novaeangliae*)

T = Threatened; E = Endangered

3.6.2 Potential Impacts and Mitigation Measures

During construction activities, BMPs would be fully implemented such as the use of silt and debris fencing, to ensure no pollution or sediment enters nearshore waters. Grading and ground-altering activities would only occur inland of the shoreline setback area to provide an additional buffer between marine waters and the proposed residential construction. Any drywells or stormwater discharge would also be located inland of the shoreline setback area and would be located above the groundwater table to ensure that sediment is captured and stabilized. Furthermore, the use of drought tolerant locally adapted plants for landscaping avoids the need to use chemical fertilizers and pesticides and further reduces the potential for adverse impacts to nearshore water quality or the aquatic species living within it.

Figure 3-3: A rocky headland extends into the ocean at end of Kaulahao Beach.

Figure 3-4: Nearshore Kaulahao Beach.

Figure 3-5: A rocky headland extends into the ocean one parcel south of the property.

Figure 3-6: A rocky headland extends into the ocean west of the subject property.

3.7 INVASIVE SPECIES

3.7.1 Existing Conditions

Two iron wood trees are located at the top edge of the clay escarpment. The trees would be removed to accommodate construction activities. The lawn and landscaping at the residence has ornamental vegetation common to the area, some of which are non-native species. Portions of the rear yard would be converted from vegetated area to accommodate the construction of shoreline hardening. The loss of these individual plants would not affect the natural environment. None of the work proposed would encourage the growth or propagation of non-native or invasive species.

Rodents and feral ungulates are not known to populate or inhabit the property with regularity and the residential use of the property has not created preferred habitat for these types of invasive animal species.

3.7.2 Potential Impacts and Mitigation Measures

During ground-altering and construction activities, BMPs for rodent and vector control would be fully implemented. Due care would be taken to ensure that construction wastes are handled, stored and disposed of properly so as to avoid creating habitat or areas that would attract and/or harbor rodents and other vectors or pest species. Landscaping would be replanted with native plant species and those species that are salt-water tolerant.

No adverse impacts are anticipated.

3.8 AIR QUALITY

3.8.1 Existing Conditions

Air quality along Maui's north shore is good given the lack of point sources and consistent trade winds that disburse air pollution. Airborne pollution in the area can be attributed primarily to automobile exhaust and particular matter from sugar cane burning. Cane fields are located across Hana Highway to the south of the subject property. During cane burns and when fields have been harvested, particulate matter and dust can impair local air quality. However, these effects are temporary in nature. Additionally, the property is upwind of most cane burn areas given the predominant wind direction is from the north and northwest. Thus, the project site's exposure to impaired air quality during cane harvesting is minimal. There are also no populations that are sensitive to air pollution or known receptors in the vicinity of the property.

Salt spray from the ocean also influences air quality, particularly in close proximity to the sea. Vog, a word combining "volcanic" and "smog" to refer to air pollution resulting from volcanic activity, can also affect Maui as a result of volcanic activity on the island of Hawaii. However, these are natural sources of air quality impairment and are not a result of the proposed action or anthropogenic activities.

3.8.2 Potential Impacts and Mitigation Measures

Site work would include the removal of earth, excavation and fill, clearing of debris from the shoreline area, and grubbing of vegetation. These activities could generate fugitive dust and air-borne particulates that could affect ambient air conditions. Maui County requires the implementation of BMPs during these activities to ensure that dust, dirt, and debris do not enter the ocean, waterways, neighboring properties or create airborne pollution. BMPs, such as regular watering and sprinkling, covering soil mounds, reducing and/or stabilizing barren areas, and the use of wind-fences, would control dust and minimize wind-blown emissions. Additionally, construction activities would be temporary in nature and the resulting structure would have no long-term effect on air quality.

The proposed action is not anticipated to impact air quality.

3.9 NOISE

3.9.1 Existing Conditions

Noise can be detected from short-term, acute actions of disturbance and longer-term increases in background nuisance noise levels. Breaking waves, wind and surf create background noise at the site. However, as this is a natural element, it is not considered an adverse effect and is part of the coastal environment. There are no specific sources of noise in the immediate vicinity and there are no sensitive receptors, such as child-care facilities, near the project site.

During construction activities, ambient noise conditions would be temporarily impacted. Construction equipment such as dump trucks, bulldozers, front-end loaders, and trailers would create noise during active construction periods. However, these would be temporary and transitory in nature and would be limited to normal daylight working hours during the workweek. In compliance with government regulations, a Community Noise Control permit would be obtained, where applicable.

3.9.2 Potential Impacts and Mitigation Measures

Residential use of the subject property would not create undue or excessive noise, nor add to background noise levels perceptively. Acute noise impacts may occur during construction activities from power and earth-moving equipment; however, these effects would be temporary and transient in nature and their effect would be minimized with the implementation of BMPs.

Excessive noise and nuisance is not anticipated as a result of the proposed project.

3.10 LIGHT POLLUTION

3.10.1 Existing Conditions

There are presently no lights or artificial lighting at the site. Lighting at the residence is down-turned and shielded. No artificial light from floodlights, up-lights, or spotlights would be used during construction activities as all construction is anticipated to occur during daylight hours.

3.10.2 Potential Impacts and Mitigation Measures

No lighting would be used to illuminate the shoreline and ocean waters, except where necessary for public safety purposes, in compliance with HRS 205A-71. No construction is anticipated to occur in the evening or at nighttime; however, there may be intermittent use of lighting for safety purposes. These impacts would be temporary and any safety lighting would be removed at the completion of construction. Consequently, no adverse impacts are anticipated.

CHAPTER 4
PUBLIC SERVICES AND SITE INFRASTRUCTURE

4.1 SCHOOL AND EDUCATION SERVICES

4.1.1 Existing Conditions

Educational services are provided by the State Department of Education and private schools in the region. This includes the Paia and Haiku Elementary and the Doris Todd Memorial and Horizon Academy private elementary schools. Maui High School and Maui Community College are located in nearby Kahului (DOE, 2012). As of 2010, Maui had 20,430 public school students (Goya, 2010). The continued residential use of the property would not substantially increase the need for educational services or impact the capacity of local or public school systems.

4.1.2 Potential Impacts and Mitigation Measures

No specific mitigation measures are proposed.

4.2 MEDICAL SERVICES

4.2.1 Existing Conditions

Medical services are provided by a number of clinics and individual physicians in nearby Paia and Kahului. The Maui Memorial Medical Center is located in Kahului / Wailuku and is the only major medical facility on Maui. It is located less than 20 miles from the project site and offers a full range of medical services. Given existing capacity, there would be no adverse impact to services.

4.2.2 Potential Impacts and Mitigation Measures

No specific mitigation measures are proposed and no adverse impacts are anticipated.

4.3 POLICE, FIRE AND EMERGENCY RESPONSE

4.3.1 Existing Conditions

Maui County provides first responders and public safety services to the Kuau area.

The Police Department has three patrol divisions located in Wailuku, Lahaina and Hana with headquarters at the Wailuku Station. The Wailuku division covers Central Maui, Pa'ia-Ha'iku, Kihei-Makena, and Upcountry Maui. Given existing capacity, the proposed action is not anticipated to impact services.

The County Department of Fire and Public Safety provides fire protection, prevention, and suppression services for the subject property. The Paia Fire Station is located in close proximity to the east of the property on Hana Highway just before entering the town of Paia. The Makawao and Kahului Fire Stations are situated approximately 11 miles and 6 miles away from Pa'ia Town, respectively. Fire hydrants are also in the vicinity. Fire and emergency response services would not be affected by the project.

4.3.2 Potential Impacts and Mitigation Measures

No specific mitigation measures are proposed and no impacts are anticipated.

4.4 TRAFFIC AND TRANSPORTATION

4.4.1 Existing Conditions

Hana Highway is a two-lane, two-way, State roadway that follows the coastline and provides the primary access between Paia and Haiku. An existing driveway from the highway provides access to the residence along the southern edge of the property. The residential property has ample vacant yard area in which construction equipment and work crews could park vehicles, trucks and equipment. These areas are sufficiently large and far enough away from the shoreline, neighbors, and Hana Highway to ensure safety.

4.4.2 Potential Impacts and Mitigation Measures

Construction activity and the delivery of construction materials would temporarily increase large truck traffic on the state roadway. Similarly, dump trucks delivering or removing soil and fill could affect traffic flow if not properly managed. To ensure orderly traffic flow, monitors and or flagmen would be used at times when construction equipment and/or materials enter or leave the project site. Dump trucks would be covered as appropriate, and wheels cleaned as needed, to minimize dust and dirt escaping the bed during transport, ingress and egress. With the implementation of standard operating procedures and BMPs, no adverse impacts to traffic are expected.

4.5 SOLID & CONSTRUCTION WASTE

4.5.1 Existing Conditions

The Maui County Department of Environmental Management Solid Waste Division (SWD) provides waste collection services. The SWD collects residential refuse from six districts, Paia and Kuau among them. County refuse crews provide curbside collection service to the area Monday through Friday. Refuse is disposed of at the Central Maui Landfill located about one mile mauka of Hansen Road on Pulehu Road in Puunene. The landfill is to the southeast of Kuau and about four miles southeast of the Kahului Airport, so access from the project site would not involve long transport times or distances. The landfill facility also provides household refuse and recycling drop off, motor oil drop off, and yard trimming / green waste composting.

4.5.2 Potential Impacts and Mitigation Measures

Presently, the landowner pays SWD for residential solid waste services and no increase in residential solid waste is anticipated as a result of the project.

Construction waste would be directed to a government-approved landfill such as the Maui County Central Landfill, or the Decoite landfill in Kihei, as appropriate. The proposed construction would seek to minimize the creation of construction waste to the extent practicable and would recycle materials to the extent feasible. Soil and debris resulting from excavation at the site and construction activities, would be disposed of in a government-approved manner. A solid waste management plan would be developed, as appropriate and in accordance with SWD protocols. Once completed, no additional solid waste or construction materials are anticipated from the project. The proposed action would not adversely impact County solid waste services or infrastructure capacity.

4.6 ELECTRICAL AND CABLE TELEVISION

4.6.1 Existing Conditions

Electrical, telephone, and cable television services are provided to the site by overhead lines and distribution systems along Hana Highway. The project does not involve any connection to these services and would not impact present service capacity.

4.6.2 Potential Impacts and Mitigation Measures

No mitigation measures are proposed and no adverse impacts are anticipated.

4.7 WATER SERVICE

4.7.1 Existing Conditions

Water Service is provided to the site by the Central Maui District Drinking Water System (DWS). The DWS services five districts: Central, Upcountry (i.e., Makawao district), West Maui (i.e., Lahaina district), Molokai and East Maui (i.e., Hana district). The County's actual water systems do not always align with DWS district designations. For example, the Central and West Maui districts each have one water system, whereas the Upcountry district has four interconnected water systems. In addition, private water systems serve several areas of the county.

The Central Maui System serves over 17,000 customers and is supplied by a mix of groundwater drawn from the Iao and Waihee aquifers, Mokuhau Wells located in Wailuku and filtered surface water from the Iao-Waikapu Ditch (DWS, 2006). The total sustainable yield of hydrologic units in the Central Maui System is ~27 MGD (DWS, 2009).

The property in question is serviced by an existing 12-inch water line along Hana Highway. The proposed structure would not require additional water or place excessive demand on water services.

4.7.2 Potential Impacts and Mitigation Measures

None are proposed since no impacts are anticipated.

4.8 WASTEWATER TREATMENT

Maui County offers centralized wastewater treatment and collection systems to the Kuau area. An 8-inch sanitary sewer line currently serves the subject property. Wastewater is conveyed to the Wailuku-Kahului Wastewater Treatment Plant located in Kahului. The treatment plant has capacity to treat 7.9 million gallons per day (MGD) and based upon population projections treatment capacity should be available through 2030Maui Island Plan, December 2012).

4.8.1 Potential Impacts and Mitigation Measures

None are proposed since no impacts are anticipated.

4.9 STORMWATER & SITE DRAINAGE

4.9.1 Existing Conditions

Otomo Engineering prepared a Preliminary Drainage Report in August 2013 for the subject property (See: Appendix D - "Preliminary Drainage Report"). The property is relatively flat, sloping slightly towards the ocean from north to south. Rooftop rainwater on the residential home collects in the yard areas and percolates into the ground naturally. There are no stormwater treatment systems on site or drainage channels. The adjacent Hana Highway to the south has no drainage improvements fronting the subject property. Stormwater runoff currently sheet flows across Hana Highway, collects or flows underground off the subject property and any excess eventually flows to the ocean following the natural grade and topography of the site. The property is heavily vegetated with trees, shrubs and grasses and sheet flow from upland locations and the property itself are not readily apparent.

4.9.2 Potential Impacts and Mitigation Measures

The only improvement proposed for this project is the construction of a hybrid revetment seawall to mitigate the erosion of the seaward boundary. The post project runoff will remain unchanged. Runoff will continue to sheet or subsurface flow through the property. In the event rainfall exceeds natural assimilative capacity, excess sheet flow would flow over the proposed structure, and down an armor stone

layer, which will lead towards the ocean. The proposed structure will provide protection from further erosion of the shoreline.

4.10 LANDSCAPING

4.10.1 Existing Conditions

Presently, vegetation consists primarily of species typically found within coastal environments of the north shore of Maui. Several trees provide shade for the home or are decorative, such as Plumeria trees. Shrubbery primarily serves as a boundary between adjacent properties. The rear yard is mostly grass. Irrigation and chemical treatments are not used or necessary at the location and all vegetation are adapted for the local climate. Two iron wood trees were located at the edge of the embankment but these have suffered damage as a result of the embankment's collapse. The crowns and trunks were cut chest high and removed given the significant danger of them falling over and potentially causing injury.

4.10.2 Potential Impacts and Mitigation Measures

The area on and around the subject property's ocean frontage would be planted with climate-adapted, salt-water tolerant, local vegetation. Irrigation may be used to establish these plants but no long-term irrigation or chemical treatments are anticipated. No adverse impacts are anticipated as a result.

CHAPTER 5
COASTAL HAZARDS

5.1 OVERVIEW

Maui's shoreline is dynamic and can change rapidly in response to natural forces such as storms, high winds and large surf. The island has 56 km of sandy shoreline that are eroding at 0.3 m/year on average (Fletcher et. al., 2003a). Since 1950, beach width has decreased 19 percent with 8 km of beach lost and nearly 4.2 km of highway threatened by coastal erosion (Fletcher et. al., 2003b). Moreover, Maui's coastline is subject to a wide variety of coastal hazards including storm surge, high surf, flood inundation with wave action, stream and subsurface rise in floodwaters, and tsunamis generated both locally from volcanic activity and those generated from overseas (Collum and Pogue, 2006).

The Federal Emergency Management Agency (FEMA) has created Federal Insurance Rate Maps (FIRM) delineating flood zones and base flood elevation (FEMA, 2000). A property's topography and elevation above sea level indicates its vulnerability to flooding. The FIRM's for the Island of Maui have been updated to incorporate digital elevation models that are more accurate than previous inundation models. Any building proposed to be located in a flood zone must be designed to withstand inundation (break-away walls, sealed utilities, absence of living areas, etc.). Alternatively, the building can be raised (post and pier) to allow floodwaters to pass unimpeded below the building. In flood zones, a Flood Development or Flood Way permit may be required, which influences the structure's design and building materials. Without the permit, the property owner may not be able to obtain insurance or a bank loan for the building.

In contrast to fortifying buildings to withstand coastal hazards, locating inland based on projections of shoreline erosion seeks to avoid coastal hazards. Locating out of harm's way is an effective means of avoiding coastal hazards (Hwang, 2005). For example, sandy beaches serve as natural buffers dissipating wave energy and mitigating the potentially damaging effects of coastal hazards (MOE, 1991). Theoretically, locating inland reduces the need to harden the shoreline in response to site erosion.

Recognizing the loss of valuable beach resources, the county augmented its average lot-depth shoreline setback policy (ALD) in 2003. The new setback policy incorporates site-specific annual erosion hazard rate based setbacks (AEHR) based on historic shoreline positions. The policy is more scientific than an arbitrary number based on lot depth or size (Abbott, 2013). Shoreline setbacks are intended to reduce risks to structures from coastal hazards, protect shoreline access, and conserve beach and sand resources. Based on erosion data, site configuration and lot-depth, locations can be calculated for building construction that avoid erosion-prone areas and those areas predicted to erode or be flooded in the future.

5.2 FLOOD HAZARD

5.2.1 Existing Conditions

There are no streams, wetlands, ponds, drainages or watercourses on the property that could flood or pose a flood hazard and there are no floodways on the property. Portions of the property are subject to risk of flooding.

According to Panel Number 150003 0408E of the Flood Insurance Rate Map, revised September 19, 2012, prepared by the U.S. Federal Emergency Management Agency (FEMA), the parcel is situated in Flood Zone X. Flood Zone X represents areas outside the 0.2% annual chance floodplain. Based on the FIRM the area seaward of the property is in the Flood Zone VE. The VE Flood Zone is the flood insurance rate zone that corresponds to the 100-year coastal floodplain. This SFHA category has additional hazards associated with storm waves. Zone VE includes areas that may experience coastal flooding with velocity and/or wave action. The base flood elevation for Zone VE is derived from detailed

hydraulic analyses. Mandatory flood insurance purchase requirements apply in the VE Zone when building habitable structures. In this instance, the requirement is inapplicable since the dwelling is located above BFE and within Flood Zone X. Extending inland of the escarpment is Flood Zone X, which is defined as an area that is outside of the 100-year floodplain. Zone X also includes areas where the 100-year sheet flow flooding is less than one foot in depth, and areas of 100-year stream flooding where the contributing drainage area is less than one square mile. No BFE's or depths of flooding are listed within the X zone on FIRM maps.

Figures 5-1 to 5-3 illustrate the flood hazard zones for the property and shoreline area. The property is perched atop an approximate 18 feet high escarpment on a long, rectangular, flat lot. The vast majority of the property is located well above the 13 feet asl base flood elevation established along the shoreline. Specifically, the lot is in flood hazard zone X, which is an area outside of the 0.2% chance flood plain, as indicated above. The probability of flood inundation to the residence is very low.

In contrast, the shoreline area is the VE flood hazard zone. The VE zone is an area subject to both rising waters and wave action. The base flood elevation for this SFHA is 13 feet asl along the shoreline based on the September 19, 2012 FIRM. However, the height of the clay escarpment is 18 feet asl. Thus, the narrow area between the inland edge of the ocean and the escarpment's face is subject to fairly intense flooding and erosive waves. These natural forces have contributed to the cliff slumping and failure, as well as the failure of the rock wall that formerly buttressed the rear yard. MCC 19.62 regulates construction of structures in flood prone areas. New structures in the VE zone must meet special standards of design and strength. A Flood Development Permit (FDP) may be required before the structure can be built and is normally obtained at the building permit stage. The FDP application may require a no rise analysis to ensure neighboring properties will not be flooded by water redirected by the structure. The FDP also requires an elevation certificate (a detailed delineation of site elevations, SFHAs, and base flood elevation) and a site survey conducted by a licensed surveyor.

5.2.2 Potential Impacts and Mitigation Measures

The existing residence has a low risk of flooding and no mitigation measures are proposed for the home. In contrast, the proposed shoreline hardening would occur within the Flood Zone "VE" portion of the subject property. The shoreline structure would be designed in compliance with MCC 19.62 requirements and an FDP would be obtained, where applicable, during the building permit stage of the project. No adverse impacts to existing drainage conditions or downstream properties are anticipated in connection with the proposed project. Further, no adverse impacts are anticipated relative to flood hazards.

Figure 5-1: Aerial View of Present and Preliminary Flood Hazard Zone Maps.

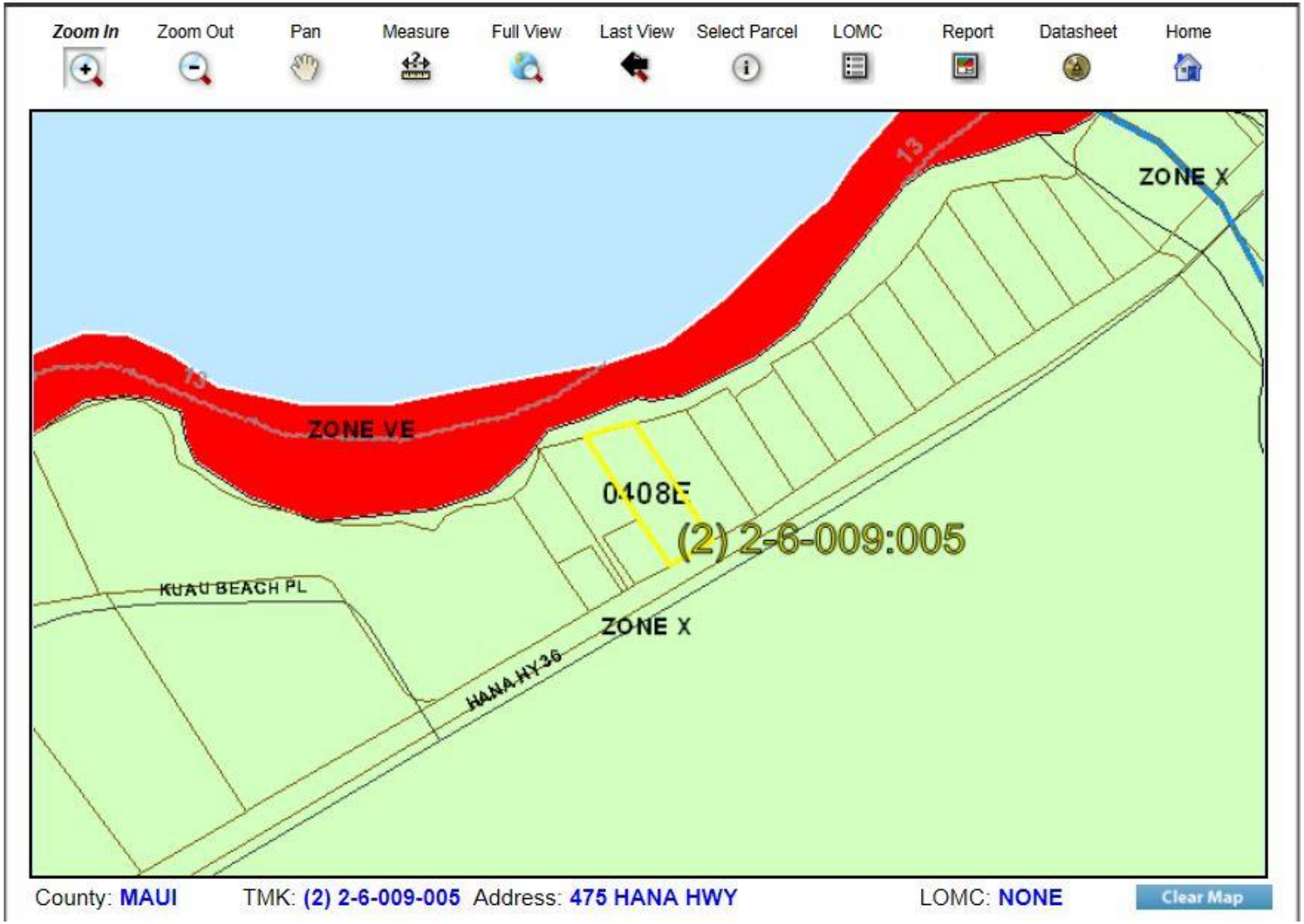


Figure 5-2: Aerial View of Present and Preliminary Flood Hazard Zone Maps.

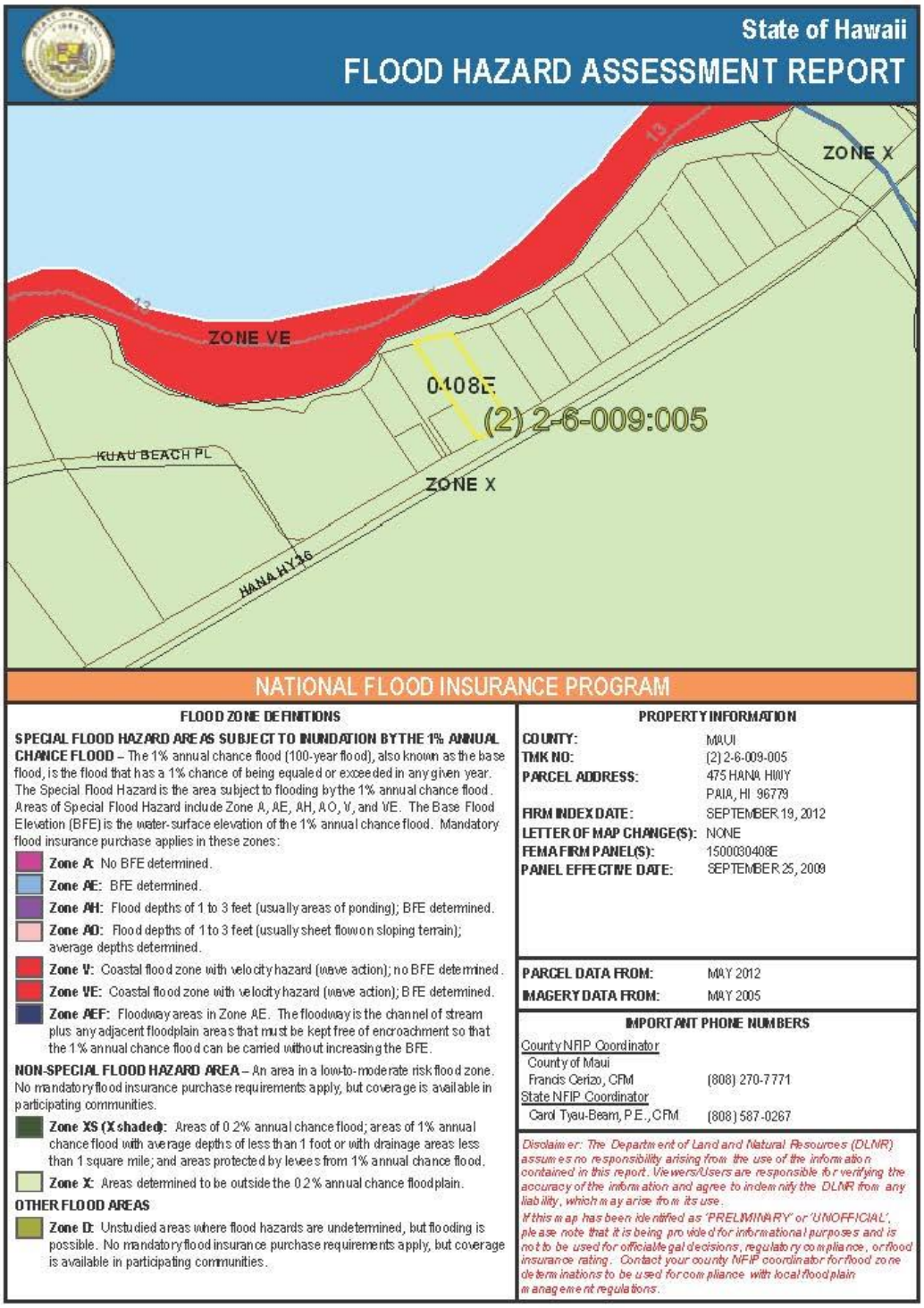


Figure 5-3: Flood Hazard Zones and the Preliminary Site Plan.

5.3 TSUNAMI HAZARD

5.3.1 Existing Conditions

Tsunamis can result due to geologic events that occur distant from the area. A tsunami (Japanese for "harbor waves") is a series of ocean waves produced by a sudden rise or fall in the earth's crust, most commonly caused by an earthquake or underwater landslide (PTM, 2013). In the open ocean, tsunami waves cannot be seen or felt by ships or airplanes because the un-breaking waves are actually hundreds of miles wide with a height of only a few feet. But as the waves approach the coast their height increases dramatically and can be very destructive when they reach the shore (NOAA, 2013).

The Hawaiian Islands are vulnerable to localized and Pacific-wide tsunamis. These tsunamis result from landslides or subterranean activity of the Kilauea volcano on the Island of Hawaii (i.e., Big Island) and distant earthquakes or landslides in places like Chile, Alaska, and Japan. Earthquakes and landslides off the coast of the Big Island pose a very real, serious local tsunami hazard. Locally generated tsunami's can arrive at Hawaiian shores within minutes depending on its origin (Hilo or Kona) as **Figure 5-4** illustrates. Seismic activity along the Pacific Rim can arrive in Hawaii in hours (**Figure 5-5**) providing some time for evacuation and preparation. While the north shore of Maui is less likely to be impacted by a locally generated tsunami than other parts of the island, it risks exposure to both local and Pacific Rim generated tsunamis and there are risks associated with this coastal hazard.

On April 1, 1946, a Pacific-wide tsunami was caused by a magnitude 7.3 (MS) earthquake that occurred south of Unimak Island, Alaska. The first waves arrived in Hawaii in less than 5 hours causing extensive destruction along the shorelines of the Hawaiian Islands. Wave heights across the Islands reached an estimated maximum of 55 feet, 36 feet and 33 feet on Hawai'i, Oahu, and Maui, respectively. Waves also reached a half a mile inland in some locations. A total of 159 people were killed as a result of the tsunami in Hawai'i, 96 in Hilo alone, where the city`s entire waterfront was destroyed (CSC, 2010).

Maui is also vulnerable to locally generated tsunamis. Earthquakes and landslides off the coast of the Big Island pose a very real, serious local tsunami hazard. The first wave of such a tsunami would reach the southern shores of Maui in less than 30 minutes (ibid.). The Hawaii State Emergency Alert System (EAS) is used to notify the public of a possible approaching tsunami. A steady three-minute siren tone is the attention alert signal. The State and County Civil Defense Agencies test the EAS at 11:15 a.m. on the first workday of the month. Evacuation routes are published in the phone book for the area (ibid.).

There are two types of tsunami advisories: a watch and a warning. A watch means that a hazardous condition may be a serious threat to life and property within a particular time. A warning means that hazardous, life-threatening conditions are about to occur or are occurring. A watch means to get prepared and listen for further information from Civil Defense, whereas a warning means to take action and move immediately to higher ground.

There are four emergency centers in that serve the Paia-Haiku region (Civil Defense, 2007). These include the:

- Haiku Elementary School at 105 Pauwela Road, Haiku, shelter capacity 260 people, and
- Paia Elementary School at 955 Baldwin Avenue, Paia, shelter capacity 691 people.

Recently, there have been tsunami warnings and subsequent evacuations in Hawaii over the past two years. The first resulted in minimal wave inundation and no damage. The second was caused by a 9.0 MS earthquake that occurred just offshore of Japan on March 3, 2011. The earthquake created an enormous tsunami that devastated villages and coastal towns in northern Japan and caused significant loss of life.

Here in Hawaii, wave run up was experienced on all the islands with Maui experiencing the most significant inundation but little damage to structures. While the north shore and Kahului area experienced

the greatest inundation, both south and western shores of Maui were also affected. For example, portions of South Kihei Road were covered with seawater leaving debris, reducing beach width, and causing minor damage to low-lying and improperly anchored structures. Several boats in both Maalaea Harbor and Lahaina Harbor were also damaged as water levels in the harbor quickly rose and dropped and displaced the boats from their moorings.

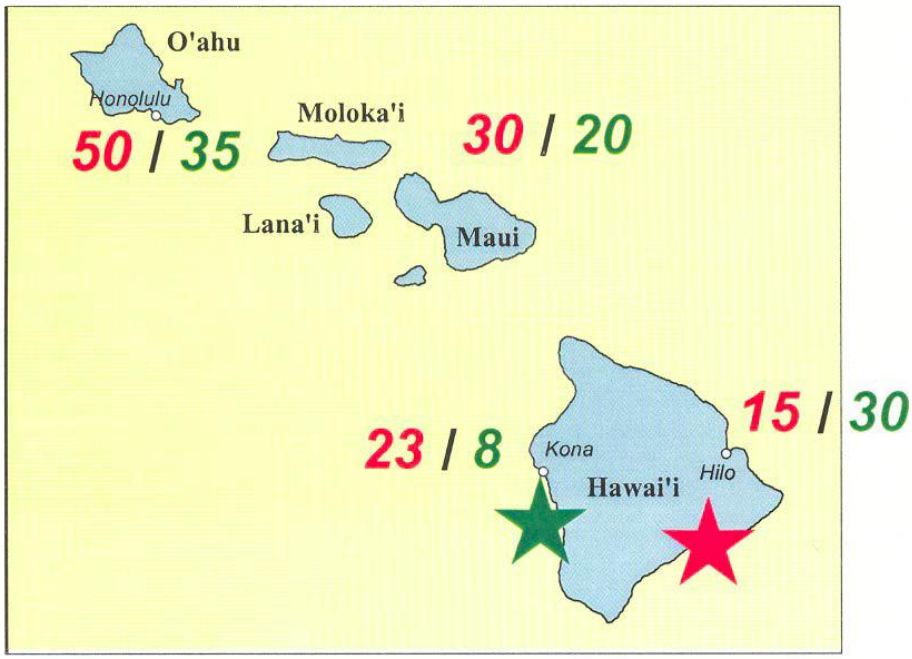


Figure 5-4: Tsunami travel times in minutes from Hilo (red) and Kona (green), Island of Hawaii.

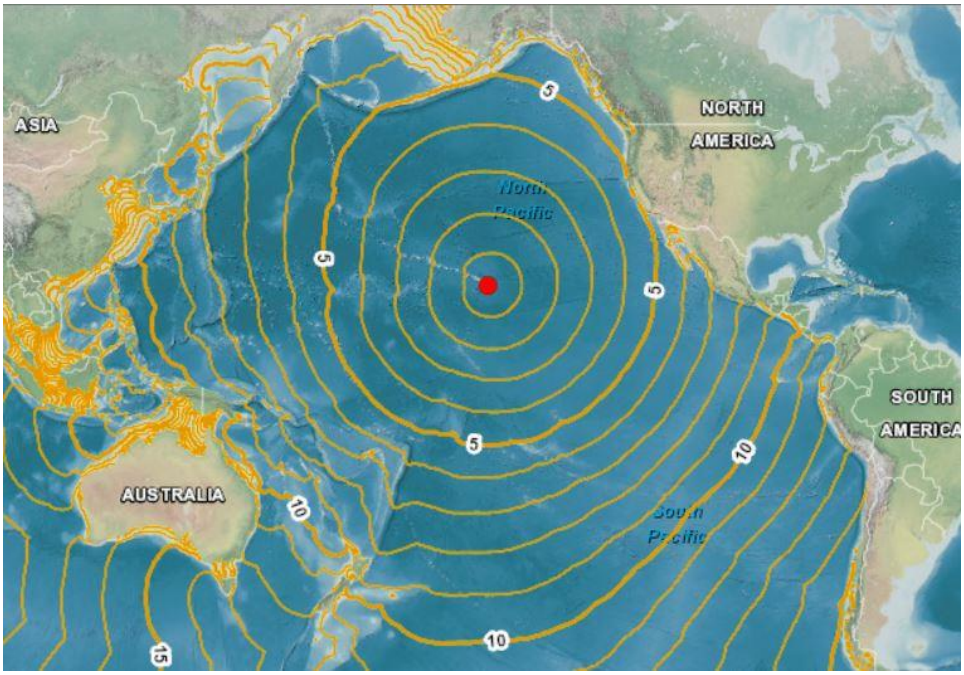


Figure 5-5: Tsunami travel times in hours to Hawaii from the Pacific Rim.

The Pacific Disaster Center (PDC) provides an online Natural Hazards and Vulnerability Atlas (PDC, 2012). According to the PDC's Kuau Map for Maui, most of the properties located makai of Hana Highway in the vicinity of Kuau are located within the tsunami zone. The north coast of Maui has been impacted by severe tsunami wave run-up in the past. The most significant of these were in 1946 with wave run-up of 17 feet asl in 1946, 1957 with wave run-up of 10 feet asl, and 1960 with wave run-up of 11 feet asl (Loomis, 1976). Of these, the 1946 tsunami scoured a large amount of sand resources away from the shoreline significantly reducing the width and volume of sandy beach areas, diminishing nearshore areas buffering capacity, and deflating beaches beyond their natural ability to recover from the episode. Since that time, many areas in the Kuau region, particularly those along cliff lines, have lacked sandy beaches of meaningful width.

5.3.2 Potential Impacts and Mitigation Measures

The existing residence is located at the mauka extent of the property and inland to the extent practical given zoning restrictions (**Figure 5-6**). Furthermore, the residence is located on high ground at an elevation of 18 feet asl and buffered both by distance from the shoreline and the height of the clay escarpment along the oceanfront portion of the property. If necessary, travelling along Hana Highway could serve as an evacuation route connecting to the Baldwin Avenue that leads uphill to much higher elevations. However, the most expedient evacuation route given uncertainty would be to move directly inland and uphill by foot by crossing Hana Highway and moving directly inland and up the slopes of the mauka agricultural fields, which are predominantly in sugar cane production. Consequently, there are adequate upland areas in the immediate vicinity for evacuation on foot should a tsunami event occur. Furthermore, no additional habitable buildings are being proposed within the tsunami inundation zone. The proposed shoreline hardening would not increase exposure, particularly of the residence, to tsunami inundation. Therefore, the project would not negatively affect or increase risk of damage or loss of life from a tsunami.

Conversely, the existing clay escarpment could have increased potential for collapse, should a tsunami inundate the ocean frontage of the property.

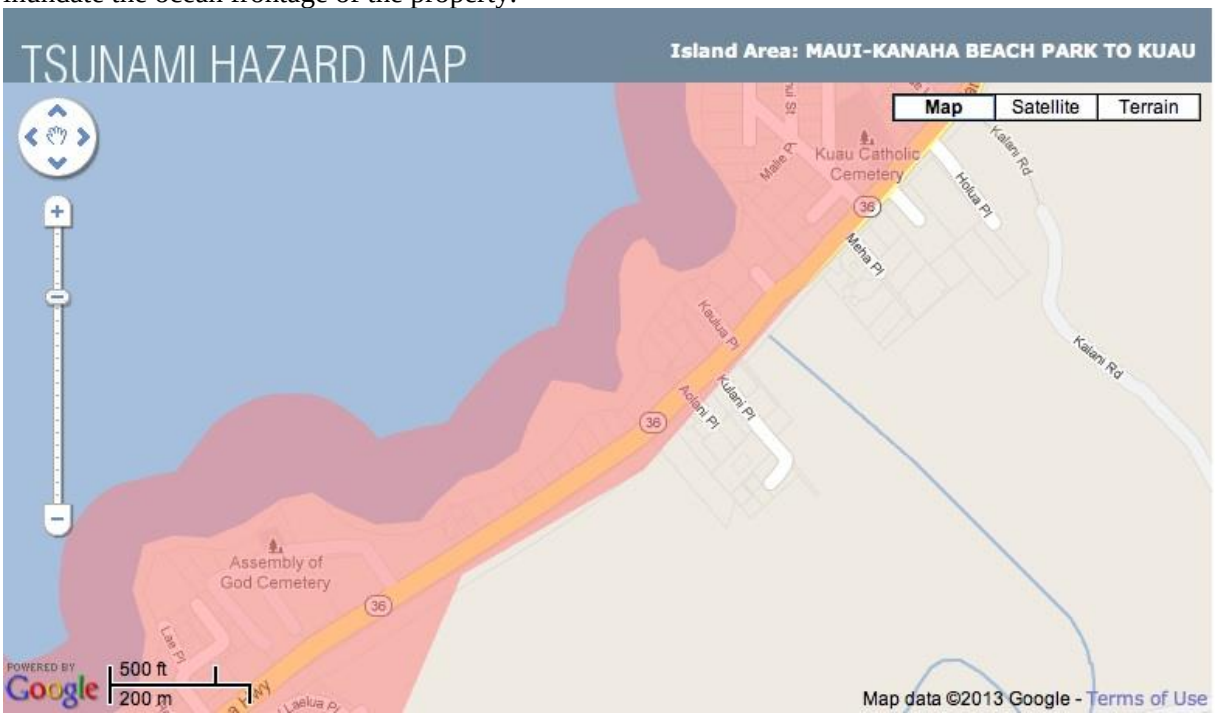


Figure 5-6: Tsunami inundation zone, Kuau, Maui, HI**.**

5.4 WAVE AND STORM SURGE

5.4.1 Existing Conditions

Hawaii's relative exposure to winds, waves and swell are depicted in **Figure 5-7**. Average wave height for the north, west and south shorelines of Maui relate to exposure to prevailing wind and swell direction, which changes throughout the year, with the winter season generating large waves along the north shore.

During the winter of 2007, a rogue wave was captured on security video at Parcel 1. The property is located immediately to the west of the subject property. The Sea Grant Extension Agent and regulatory planners for the county reviewed the video and estimated the wave to be approximately 24 feet high. The wave crested the unconsolidated rock revetment fronting the home and inundated the relatively small rear yard. The force of the rogue wave scoured all grass, irrigation lines, tiki torches, and fencing off the rear yard and carried these materials as debris into the nearshore area. The rogue wave was estimated to be 6 to 8 feet higher than the lot's rear yard elevation, which is similar to the subject property at approximately 18 to 20 feet asl. The rogue wave is evidence that the area is subject to unpredictable large waves and storm surge, particularly from north pacific swell during the winter months.

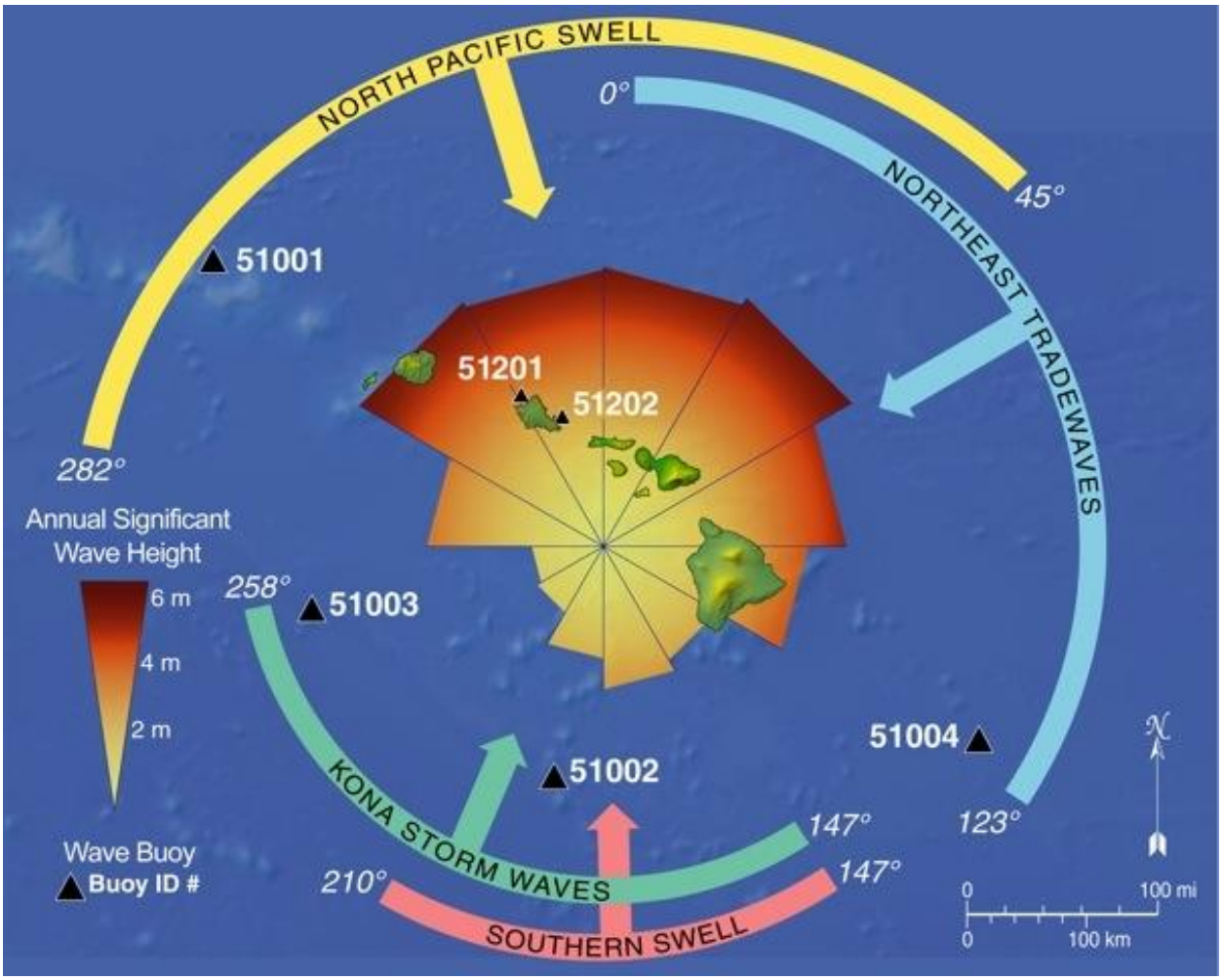


Figure 5-7: Swell Direction and Wave Height in Hawaii**.**

(*Source:* Eversole and Norcross-Nu'u, 2007)

5.4.2 Potential Impacts and Mitigation Measures

The U.S. Army Corps of Engineers' Wave Information Studies (WIS) has datasets on wave height and swell. The property is exposed to north swell as depicted in **Figure 5-7** particularly during winter months. Swell regularly exceeds deep-water wave heights of 20 feet according to the WIS data (Sea Engineering, 2009). Annual highest wave heights range from 19.6 feet to 31.9 feet and the corresponding wave periods range from 14.8 seconds to 19.9 seconds. Wave hindcast data was used in Sea Engineering's report to calculate proper height for shoreline hardening at this and an adjacent property (parcel 001). Their resultant design, a hybrid seawall-revetment, was based on a 25-year wave and a wave period of 18 seconds. Similarly, the shoreline hardening structure for the subject property would be designed to withstand an extreme north swell wave, such as the ones described above. With the use of appropriate data and structural engineering standards, the shoreline hardening would not be adversely affected by wave and storm surge, and would not adversely impact neighboring or down-drift properties.

5.5 SEA-LEVEL RISE AND CLIMATE CHANGE

5.5.1 Existing Conditions

Climate change would have three predominant effects: more rainfall (i.e., stormwater), bigger and higher storm surge, and rising seas (i.e., sea-level rise or SLR). The climate in arid locations is predicted to become dryer over time and wet areas would tend to have more intense and frequent rainfall events (IPCC, 2007). Severe rainfall events are likely to occur more frequently and with more intensity, generating more stormwater and rainwater sheet flow. However, predicting the extent, nature and outcome of climate change at this juncture presents many uncertainties.

Tide gauge measurements provide a historic record of the ocean's level at the Honolulu Harbor and neighboring islands of Hawaii (**Figure 5-8**). The data shows an upward trend in the level of the sea in Hawaii. This is primarily caused by the thermal expansion of seawater as it increases in temperature.

Overall, the Pacific Ocean is warming and Hawaii will continue to experience the effects from seawater expansion. Similar in process to a full glass of ice and cold water sitting in the sun, when the cooler water warms it expands, resulting in the water reaching the brim and overtopping the glass.

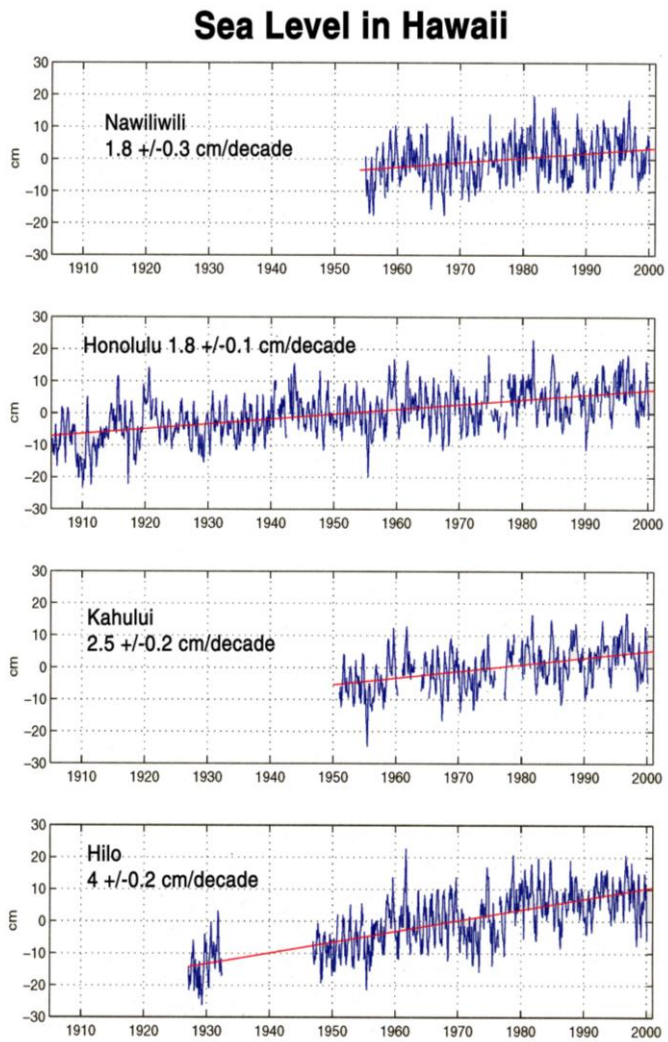


Figure 5-8: Historic tide gauge readings in Hawaii.

Source: Fletcher et al., 2012

The Pacific Ocean is likewise warming, resulting in higher tides, more frequent episodic storm surge events, more acute episodes of beach erosion, and a trend towards higher rates of chronic coastal erosion. Although the exact amount of SLR is still in question, a majority of scientists estimate that SLR of one meter (3.3 feet) by the end of the century (i.e., year 2100) is probable (Norcross et al., 2008). Some local experts anticipate a meter of SLR in the Hawaiian Islands as early as year 2050 (Fletcher et al., 2009). Importantly, SLR will occur in an exponential, non-linear fashion with small changes at first, but increasingly significant events over time. This would result in bigger storms, greater storm surge, and higher surf.

Ascertaining the impacts from climate change and sea level rise is challenging, but the most prudent way of avoiding these impacts is to build out of harm's way. In this case, the residence is located inland of erosion-prone areas and areas subject to flooding, well inland of the shoreline, inland of the shoreline setback area, inland of the flood hazard zone, and above the base flood elevation established by FEMA. However, the clay embankment would continue to erode and collapse without protection and this erosion would increase with SLR if an appropriate response is not implemented.

5.5.2 Potential Impacts and Mitigation Measures

The residential structure is located near Hana Highway and well inland of the shoreline and shoreline setback for the property. This mauka portion of the property where the house is located ranges from 18 to 20 feet asl, which is above the 13 feet base flood elevation established for the property. Accordingly, the residential home is located well inland and above any potential coastal hazard areas including potential sea-level rise. Thus, the residential use of the property has been planned prudently in light of SLR and additional mitigation is not necessary.

5.6 SHORELINE RETREAT

5.6.1 Existing Conditions

Coastal erosion is a natural process whereby the shoreline retreats inland over time as a result of wind, waves, prevailing currents, and storms. Shorelines are highly dynamic and shift frequently through time. In Hawaii, shoreline retreat may occur rapidly as a result of acute or episodic erosion events, normally associated with large surf, storm events and seasonal changes in wave regime (i.e., winter). The shoreline retreat at the subject property is the result of a culmination of episodic erosion events over the past few winters. This has resulted in a loss of approximately 438 square feet of the rear yard as the seaward edge of the embankment has moved inland by an estimated 28 feet.

In contrast to episodic erosion, chronic coastal erosion occurs over long periods of time where the shoreline retreats inland as a result of sea level rise, wind and wave action. Chronic coastal erosion can be exacerbated when sand supplies are confined, sand transport hindered, or sand reservoirs are constrained behind groins, seawalls, revetments and other man-made hardening structures. On a healthy beach where sand transport is not hindered, the beach typically recovers as seasonal wave and current regime returns the previously displaced sand (i.e., summer).

The majority of Maui's beaches are experiencing chronic coastal erosion and an average of 1.1 feet of shoreline retreat per year (Abbott, 2013). Prior to 2003, site selection for the construction of oceanfront houses, condominiums and resorts in Maui did not account for the dynamic nature of the shoreline, nor incorporate site-specific factors such as erosion-prone areas. Consequently, Maui has lost ¼ of its beaches over the last 50 years, primarily due to inappropriate shoreline hardening and site development that did not properly account for chronic erosion patterns.

In October 2003, the Maui Planning Commission passed rules that require setbacks for construction along the shoreline to be based on site-specific erosion rates. Rates of erosion have been estimated for Maui's north, west and southern shorelines and published in the Maui Shoreline Atlas (Fletcher et.al. 2003a). The Shoreline Atlas consists of transects located 66 feet apart overlaid onto ortho-rectified photographs, which

are photographs corrected to have the same scale and to remove any distortions. A shoreline reference feature was used to estimate the shorelines location. For Maui's northern shorelines, there are seven maps that begin at Waihee and stretch to Kuau. Using nationally accepted methodologies, annual erosion rates were calculated from these positions for each transect and plotted on bar-histograms for each beach. Data for Kuau starts with a 1912 T-sheet and includes aerial photographs from 1960, 1975, 1987, 1988, 1997 and 2002. The resulting erosion rates based on historic shoreline position are delineated on the Kuau Map an excerpt of which is shown in **Figures 5-8**.

Long-term erosion rates at the site have been estimated for Kuau Bay and its vicinity (**Figure 5-9**). Erosion rates range from 0 to 1.8 feet/year with the latter being at the far western extent of Kaulahao Beach (Transect 8), where the sandy beach ends at the base of a headland. The 1912 shoreline shown in pink was established using "T" sheets and indicates that the shoreline's location was substantially seaward of its present location (Fletcher et.al. 2003b). However the 1946 tsunami scoured sand from much of the north shore changing its natural features and moving the shoreline inland (Fletcher et.al. 2003a). As a result, much of the area is absent of sandy shorelines and is comprised of bluffs and cliffs that do not exhibit chronic shoreline retreat.

As illustrated below, Transects 18 to 20 have a zero erosion rate for each of these transects applicable to the subject property and the box plot data shows no movement of the shoreline over the past 50 years (accretion or retreat).

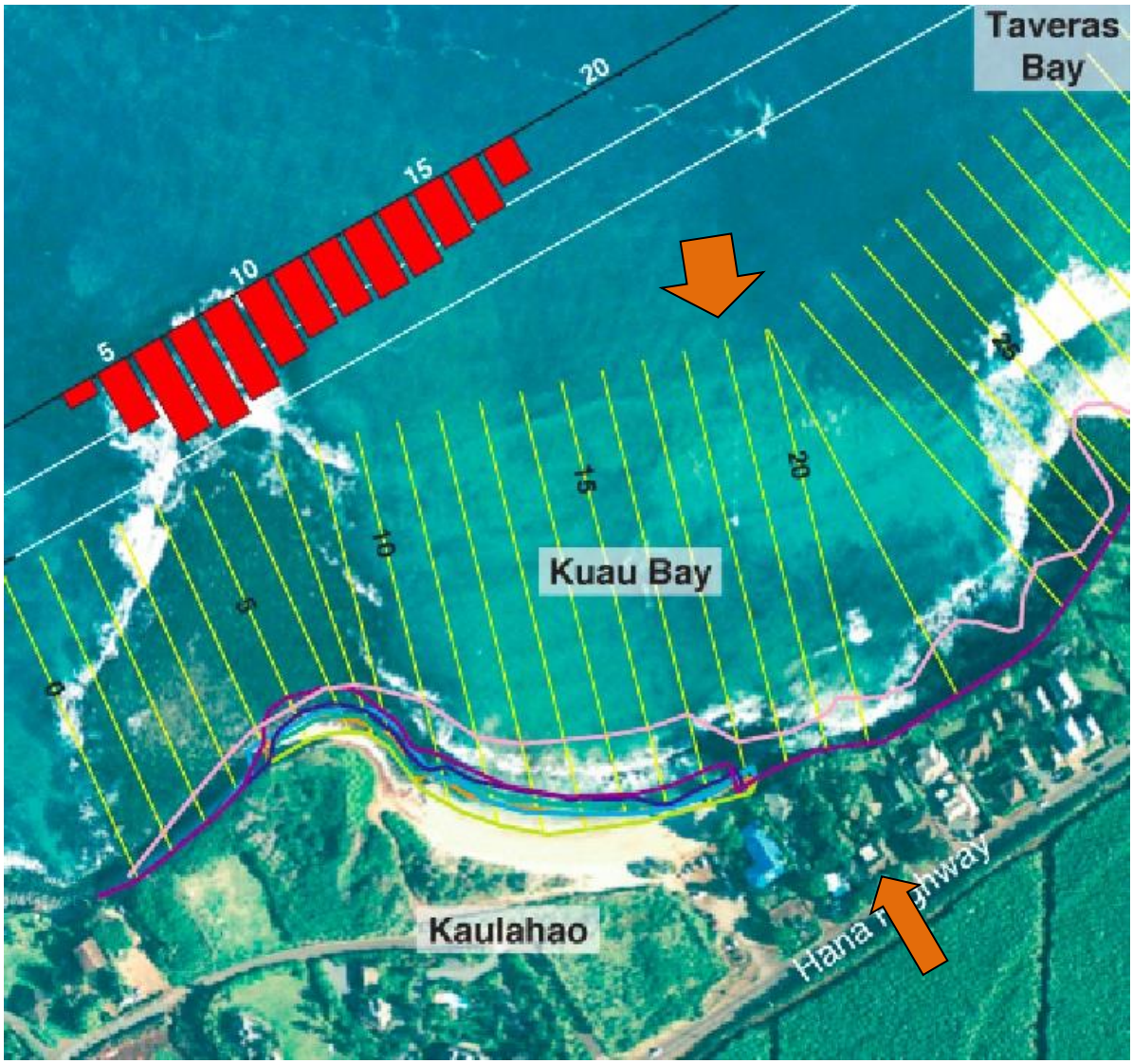


Figure 5-9: The subject property (arrow) is located between Transects 18 and 20 of the Kuau Map.

5.6.2 Potential Impacts and Mitigation Measures

Transects 18 to 20 have a zero erosion rate for each of these transects and box plot data shows no movement of the shoreline over time (accretion or retreat). Accordingly, the erosion-based shoreline setback for the property would be 25 feet, based on the AEHR x 50 + 25 feet as a buffer. However, the AEHR rates reflect long-term erosion and do not capture episodic events such as those that have recently occurred at the property.

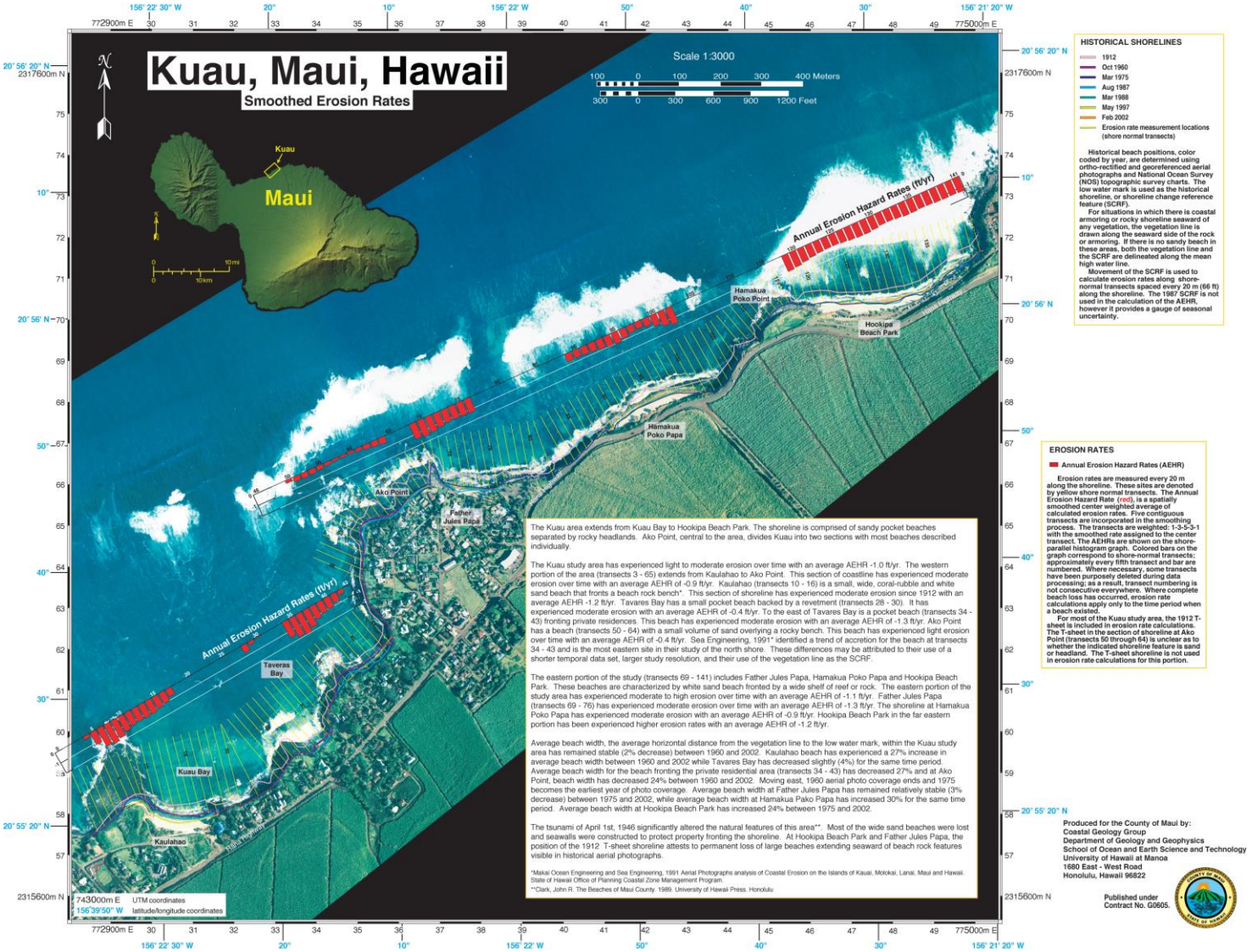


Figure 5-10: Kuau Map of the Maui Shoreline Atlas (2003).

5.7 BLUFFS & ESCARPMENTS

5.7.1 Existing Conditions

Many of Maui's shorelines consist of clay banks or volcanic bluffs and this particular situation exhibits such as circumstance (**Figure 5-10**). These may erode rapidly or slump unexpectedly due to soils being saturated with water from over-irrigation, sumps, poorly designed drainage, heavy rainfall or the pounding of large surf from storm waves. Delineating the shoreline or the setback area may be dangerous and even impossible in locations with sheer cliffs, rocky overhangs, sea caves and eroding clay banks or bluffs. In this case, the shoreline assumedly follows the base of the escarpment and the area seaward of the escarpment would be under the jurisdiction of the DLNR OCCL, as conservation area.

Determinations of cliff or bluff stability should account for the stability of the bluff, long-term bluff retreat, uncertainty in the analysis (Johnsson, 2005). In some cases, beach replenishment could help reduce cliff erosion and collapse, a management technique that has been successful in Portugal (Cruz de Oliveira, 2008). However, beach nourishment typically is more effective on wide beaches or where a sandy shoreline presently exists. The 2003 Shoreline Atlas, which estimates annual erosion along the shoreline, lacks a formula to estimate cliff or bluff erosion. The Atlas primarily measures retreat along sandy shorelines on the Island of Maui. In cases where no sand exists, encapsulating clay or sediments that could erode into marine waters may reduce the deleterious effects of these stressors on water quality and marine life. As a consequence, there are circumstances where shoreline hardening would be preferable to allowing natural erosion processes to dominate (Norcross-Nu'u and Abbott, 2008).

5.7.2 Potential Impacts and Mitigation Measures

In the near-term, BMPs would be implemented to avoid erosion and catastrophic failure of the clay embankment. In the long-term, sealing the clay with a hardened surface would eliminate potential inputs of sediment, and particularly clay, into marine waters and the water column. By doing so, turbidity and water temperature would be reduced which in turn enhances marine life diversity and coral vitality. Additionally, public use of the nearshore water channel is better protected through encasement of the pali than if it were exposed to large waves, storm surge, and high surf that frequently occurs on the north shore of Maui and could result in the pali's collapse. Such an episodic failure has the potential to injure recreational users and block or hinder access along the shoreline and within the nearshore channel.

Figure 5-11: Bluff erosion in human perspective at the subject property, Kuau, HI

5.8 SAND DUNES

5.8.1 Existing Conditions

Primary coastal dunes are a natural landform that serves as a sand reservoir during storm and erosion events, and buffer the effect of wave run-up and storm surge along beaches and oceanfront properties. Protecting coastal dunes is critical to preserving a healthy beach and ensuring the dynamics within the littoral cell persists unhampered. Accordingly, primary or frontal coastal dunes are protected under MCC. Coastal dunes are defined by MCC 20.08.020 as:

> "one of possibly several continuous or nearly continuous mounds or ridges of unconsolidated sand contiguous and parallel to the beach, situated so that it may be accessible to storm waves and seasonal high waves for release to the beach or offshore waters."

A stable, sandy berm is evident inland of the backshore of Kaulahao Beach. Berms are a physical feature usually located near mid-beach and characterized by a break in slope, separating the flatter backshore from the seaward-sloping foreshore (Norcross-Nu'u, Fletcher and Abbott, 2008). Berms can also be described as a terrace formed by wave action, or a mound or accumulation of sand. The backshore of the beach is generally a dry portion of the beach between the berm crest and the vegetation line that is submerged only during very high sea levels and eroded only during moderate to strong wave events (ibid.).

There are no dunes, berms or sandy shorelines fronting the subject property. The proposed residence is located inland of a clay escarpment over 16 feet high. The nearest sandy beach, sand berm or sand dune is located on the far western end of Kaulahao Beach.

5.8.2 Potential Impacts and Mitigation Measures

The proposed project would have no adverse impact on beaches, berms or dunes and is in full compliance with MCC 20.08.

5.9 KAULAHAO BEACH RESTORATION

5.9.1 Existing Conditions

The nearest sandy shoreline is Kaulahao Beach, two properties to the east of the subject property, and down drift in the littoral cell. Kaulahao is a small, wide, coral-rubble and white sand beach that fronts a beach rock bench. The beach has experienced chronic beach erosion with an average erosion rate of 1.2 feet per year when including the 1912 T-sheet. However, the April 1st, 1946 tsunami significantly affected the natural features along the north shore, including the beaches in the vicinity.

Long-term erosion rates at the site have been estimated to range from 1 feet/year (Transect 16) to 1.8 feet/year (Transect 7) according to the Maui Shoreline Atlas Kuau Map (Fletcher et.al. 2003a). However, since 1960, the average width of the beach has increased 27%, where beach width is a measure of the horizontal distance from the vegetation line to the low water mark (ibid.).

The beach and adjacent headland are designated as Park and Open Space in the Paia-Haiki Community Plan. Atop the headland is a cemetery that contains both modern burials and Indigenous Hawaiian burials. The latter are considered 'iwi and are protected by historic preservation law.

Malama Kaulahao is a community-based organization that worked over the past decade to protect and enhance the beach, park, cemetery and open space. Their mission is to restore, protect, and return north shore lands to their natural state; maintaining coastal views, public access and cultural values. Malama Kaulahao was formed to restore the area by removing invasive plants, clean up dumping of rubbish, deter drug dealing and illegal camping and protect Hawaiian burials from neglect. In 2008 they removed invasive shrubbery and trees, replanting with native species through 2009. This was followed with a sand

dune replenishment project in 2010. They also provided a portable comfort station in the parking lot of the beach park until the County Parks Department took over its management.

A bend in Kuau Beach Place, a small roadway off of Hana Highway located to the east of the Beach Park and project site, offers access to the back of the beach (**Figure 5-11**). In collaboration with the Maui County Planning Department and Sea Grant, Malama Kaulahao placed clean, Maui inland sands behind the beach crest of the crescent bay. Sand was piled, spread, and planted with native grasses at a site to restore dune function and will gradually contribute to the sand budget of the littoral system (**Figure 5-12**).

In April 2013 they celebrated the granting of a perpetual easement to the Maui Coastal Land Trust (Malama Kaulahao, 2013). The easement serves to protect the 1.2-acre oceanfront property in perpetuity as open space and park for public use and the protection of Hawaiian burials (**Figure 5-13**). Today, the site provides the community with beautiful views, coastal access, seabird habitat, and safe access to explore cultural areas of importance (**Figure 5-14**). The organization has received upwards of $40,000 in grants from Maui County and the A&B Foundation to assist their efforts. More about the organization can be found at https://www.facebook.com/MalamaKaulahao/info.

5.9.2 Potential Impacts and Mitigation Measures

While the community efforts are laudable, the potential for sand replenishment fronting the subject property are minimal for several reasons. The sandy beach littoral cell doesn't extend to the subject property. Second, there has not been a history of sandy shorelines or beach fronting the subject property during the past 67 years. Third, the addition of sand to the littoral system could make the channel fronting the property shallower and potentially impassable. Fourth, the prevailing wave / current regime would move any sand added to the system downdrift to Kaulahao Beach. While this would help replenish the beach generally, the placement of sand would be less effective than the direct dune replenishment efforts that have been conducted by the community organization.

As such, sand replenishment would not be an effective deterrent or buffer to wave action at the subject property. The construction of shoreline hardening is not anticipated to have an adverse impact on Kaulahao Beach or community efforts to restore dunes along the active sandy beach.

Figure 5-12: Kuau Beach Place borders the beach park and offers access for beach replenishment.

Figure 5-13: Maui inland sands used for dune restoration at Kaulahao Beach

Figure 5-14: Sign at the entrance to the cemetery.

Figure 5-15: Kaulahao Beach and the cleared cemetery atop the headland.

5.10 SHORELINE SETBACK

5.10.1 Erosion-based setback calculation

The shoreline setback line is derived by multiplying the annual rate of erosion by fifty years to reflect expected building lifespan and adding a 25-foot buffer to accommodate for sea-level rise, storm surge, high waves, run up, and uncertainty in the data. The shoreline setback based on the 2003 Maui Shoreline Atlas (Fletcher et. al. 2003a) is calculated below:

Transect 18	AEHR (0.0) x 50 years + 25 foot buffer = 25 feet setback
Transect 19	AEHR (0.0) x 50 years + 25 foot buffer = 25 feet setback
Transect 20	AEHR (0.0) x 50 years + 25 foot buffer = 25 feet setback

5.10.2 Lot depth setback calculation

Section 12-203-6 of the Shoreline Rules also requires a setback based on the depth of the parcel. In light of the embankments collapse, the use of the deeded property lines would be a conservative approach to determining the setback. In this case, the southwest property boundary would be on the left side when facing makai. Based on the property's boundaries as recorded on the deed, and as shown in **Figure 5-16**, the following calculations can be made:

Lot Lines:

Northeast (right) side	244.40 feet
Middle (center) line	234 feet
Southwest (left) side	224.42 feet
Total	702.82

Divided by 3 to obtain average = 234.27 feet
The Average Lot Depth (ALD) is 234 feet

If:

ALD	0-100 feet	Setback = 25 feet
ALD	101-160 feet	Setback = 40 feet drawn parallel to the shoreline
ALD	>160 feet	Setback = 25% of ALD up to 150 feet

Thus:

234 feet ALD x 25% = 58.6 feet shoreline setback

The shoreline setback based on the property's Average Lot Depth (ALD) is calculated to be 58.6 feet.

5.10.3 Shoreline setback line

Section 12-203-6 of the Shoreline Rules requires that both the AEHR setbacks (25 feet) and the ALD setback (58.6 feet) with the greater of the two, or their overlay, forms the setback line. Accordingly, the shoreline setback area extends from the shoreline inland 58.6 feet and is bounded on either side by the property's side boundaries.

5.10.4 State-certified shoreline

The certification process ensures that any encroachments onto the public domain are resolved, determines what subzone is involved, and serves as the basis from which the shoreline setback line is measured. The shoreline is established by the DLNR OCCL and certified by the BLNR during a public meeting. The shoreline delineates the jurisdiction between the counties (mauka) and the State (makai). A survey completed by a licensed surveyor is submitted to the DLNR OCCL and verified with a site visit by DLNR staff. A notice of the survey and its purpose is published in the OEQC Environmental Notice and offers the public an opportunity to comment. The DLNR DAGS also posts pictures and copies of the survey on

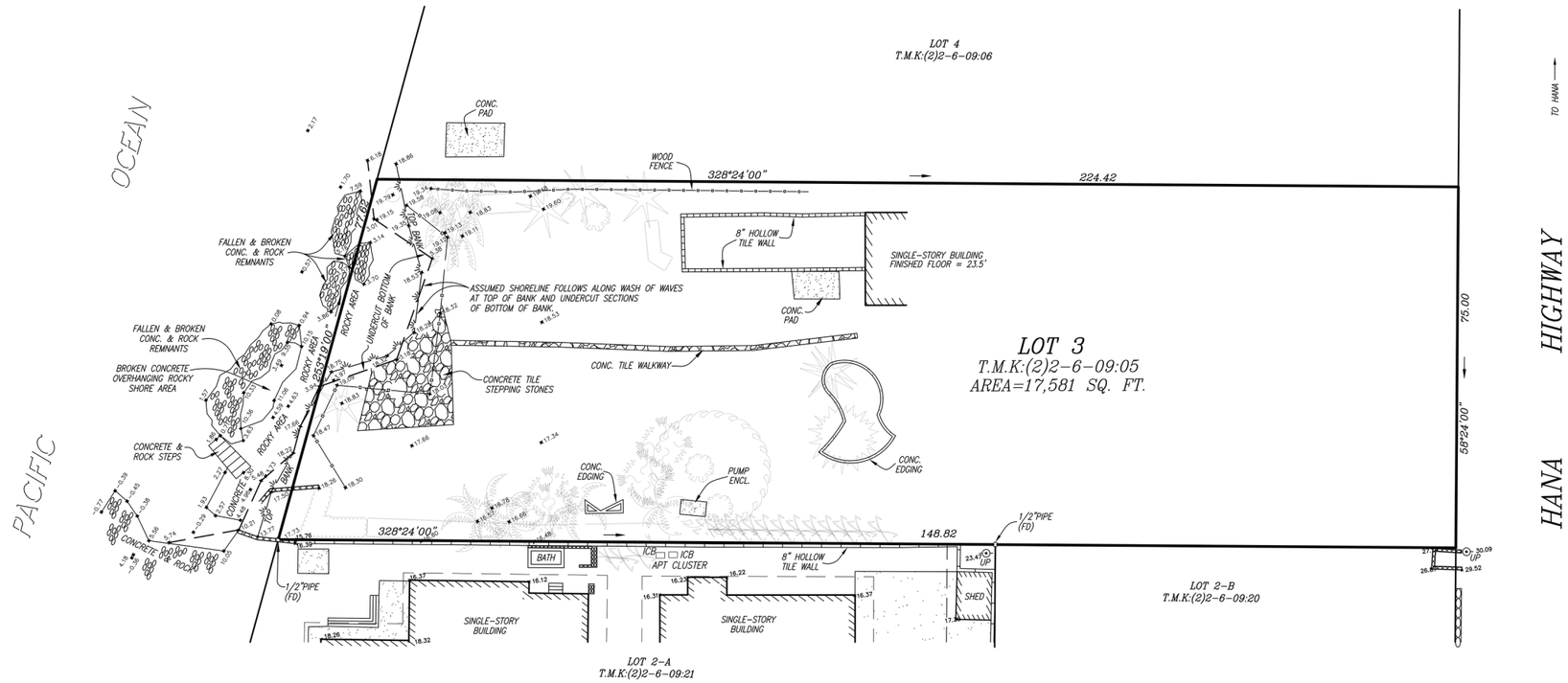
their website for review and comment. Based on public comments and recommendations from DLNR OCCL staff, the BLNR certification of the shoreline is valid for one-full year.

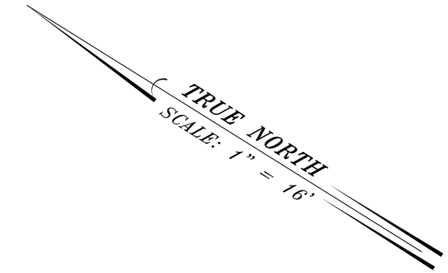
5.10.5 Potential Impacts and Mitigation Measures

Typically, a state-certified shoreline survey is conducted prior to initiation of project permitting. However, since the certification expires after 12 months, a state-certified shoreline would likely need to be repeated a second time for the project to obtain building permits from the County of Maui, Department of Public Works.

In addition, the shoreline hardening proposed would occur entirely within the landowner's property. As such, an easement and CDUP would be required from the DLNR because a portion of the structure would be seaward of the certified shoreline. Decisions on these types of requests would be made by the BLNR during public hearings. The BLNR would require a valid state-certified shoreline and real estate appraisal, prior to considering the easement request. Accordingly, a certified shoreline is not enclosed in the Draft EA, but is anticipated to be completed and part of the subsequent SMA/SSV application should a FONSI for the EA be issued. The estimated location of the shoreline on site development plans and schematics would be reviewed and commented on by the DLNR OCCL during the EA and SMA/SSV permitting process and recommendations could be made by the agency in regard to delineation of the shoreline.

A state-certified shoreline would be obtained prior to final approval and decision making of discretionary permits.





LEGEND

APT	ARECA PALM TREE	ø=1.7', H=30', S=7'
CT	COCONUT TREE	ø=1.0', H=18', S=18'
CT2	COCONUT TREE	ø=1.2', H=35', S=18'
MPT	MANILA PALM TREE	ø=0.8', H=20', S=15'
SPT	SAGO PALM TREE	ø=1.2', H=7', S=5'
SPT2	SAGO PALM TREE	ø=1.5', H=20', S=15'
TPT	TRIANGLE PALM TREE	ø=1.2', H=20', S=15'

PARTIAL TOPOGRAPHIC SURVEY OF LOT 3 OF KUAU TRACT SUBDIVISION

SITUATE AT
PAIA, HAMAKUAPOKO, MAKAWAO, MAUI, HAWAII

DATE: FEBRUARY 13, 2013 SCALE: 1" = 16'

AKAMAI LAND SURVEYING, INC.
P.O. BOX 1748
MAKAWAO, MAUI, HAWAII 96768

NOTES:

1. TOPOGRAPHIC INFORMATION SHOWN HEREON IS BASED ON AN ACTUAL FIELD SURVEY PERFORMED ON NOVEMBER 1, 2003, MAY 30, 2005 AND SEPTEMBER 8 & 11, 2007, DECEMBER 26, 2012 AND AGAIN ON FEBRUARY 11, 2013.
2. ELEVATIONS SHOWN HEREON ARE BASED ON THE TOP OF FIRE HYDRANT #55 ON HANA HIGHWAY AS REFERENCED BY THE STATE OF HAWAII DEPARTMENT OF TRANSPORTATION, HIGHWAYS DIVISION FROM U.S.G.S. BENCH MARK #17. ELEVATIONS @ TOP OF FIRE HYDRANT #55 TAKEN AS 21.56 FEET ABOVE MEAN SEA LEVEL.
3. AZIMUTHS AND DISTANCES ARE BASED ON RECORD INFORMATION AND REFER TO TRIANGULATION STATION "PUUNENE".

SHERMAN DUDLEY DEPONTE
LICENSED PROFESSIONAL LAND SURVEYOR
No. 6960
HAWAII, U.S.A.

THIS WORK WAS DONE BY ME OR UNDER MY DIRECT SUPERVISION.

SHERMAN DUDLEY DEPONTE
LICENSED PROFESSIONAL LAND SURVEYOR
STATE OF HAWAII CERTIFICATE NO. 6960
EXPIRATION DATE: APRIL 30, 2014

T.M.K: (2) 2-6-09: 05 & 21

0 16 32 48 64 80
SCALE IN FEET

Figure 5-16

SHEET 1 OF 1

JOB NO. 212371TOPO

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CHAPTER 6
SOCIAL AND CULTURAL CONSIDERATIONS

6.1 POPULATION, EMPLOYMENT AND SOCIO-ECONOMIC IMPLICATIONS

6.1.1 Existing Conditions

The Kuau area is considered part of the Pa'ia Haiku Community Plan area (PHCP). The community consists of mostly residential homes surrounding the county-town business district of Paia Town. Kahului airport, harbor, wastewater treatment plant, major commercial retailers (i.e. big box stores) and light industrial facilities lie 7 to 10 miles to the west of Paia and represent central Maui's main center of commerce. The town of Ha'iku is located to the east of Kuau and is mainly a low-density residential community, with restaurants, grocery market and shops located in a former cannery.

The PHCP region is mostly agricultural, low-density homes and has a rural unhurried character. The primary agricultural activity is sugar cane cultivation. Residential development generally follows along the shoreline and Hana Highway, becoming more concentrated around the town of Paia and continuing upland following Baldwin Avenue towards the former Paia Mill.

The resident population of Maui County has experienced rapid growth. According to census figures the resident population of Maui County has grown by approximately 56% since 1990, from 100,504 to 156,764 in 2011 (Maui County Data Book, 2012). These robust growth rates are expected to continue through 2040. According to the State of Hawaii, Department of Business, Economic Development, and Tourism, "Population and Economic Projections for the State of Hawaii to 2040, the County's population is expected to reach 232,863 by 2040, which is an increase of 46%.

The island of Maui had 2,168,487 visitors in 2011 compared with 2,211,413 visitors countywide based on Hawaii Tourism Bureau statistics (MCDB, 2012). Many of these visitors may have visited Paia Town and the nearby coastal parks. Paia Town's population of 2,689 represents 938 households (MCDB, 2012). Paia is likely to experience growth because of its visitor industry attractions, recreation and lifestyle opportunities (MIP, 2012). The PHCP has a strong visitor-based economy that continues to grow. The region is proximate to shoreline resources that are used for ocean recreation but lacks formal resort areas. Instead the area has a more country-town, natural (organic) allure that caters to a younger, non-traditional, international tourism market.

6.1.2 Potential Impacts and Mitigation Measures

The proposed action will have no impact on population growth. In the short-term, the proposed construction of shoreline hardening would have positive economic effects such as supporting workers, local purchases of materials where practical, and trucking services of cut, fill and debris removal. In the long- term, the project would help protect the existing single-family residence and maintain the viability of the property for residential uses. It would also contribute to the safe lateral access along the shoreline and near shore water use of the area fronting the property for swimming and access to the Tavares Bay surf breaks.

6.2 RECREATIONAL RESOURCES

6.2.1 Existing Conditions

The subject property is situated between two major public recreational areas along the north shore. Paia Park is located about ¾ miles to the west, whereas Hookipa Park is located just over a mile away to the east (**Figures 6-1 and 6-2**). These beach parks offer important recreational and ocean sport activities, particularly surfing. Nearshore areas in close proximity of Hookipa Park are world renown for kite and windsurfing opportunities, and the park host's big wave surfing seasonally.

Much closer to the subject property is Kaulahao Beach. The ~700 feet long, crescent-shaped beach is popular due to its undeveloped nature and ease of access to Tavares Bay. The beach abuts the Blue Tile Roof House two lots to the east of the subject property. A headland overlooks the beach on its western extent and has a cemetery. The backshore area is vacant, consisting of the unpaved beach parking lot and kiawe tree thickets. The beach extends east to the Blue Tile Roof house. A clay escarpment and headland rises from the eastern extent of the Blue Tile Roof house continuing east and in front of the subject property. The area fronting the subject property contains a narrow channel between the rocky, clay escarpment and a reef outcropping that is just offshore. This channel provides a quiescent pool that is frequently used by recreational users (**Figures 6-3 and 6-4**). Surfers use the channel to access the surf break at Tavares Bay, traversing from the beach park to Tavares Bay. Swimmers and keiki use the quiescent area as a protected swimming pool and bathing area. Several large rocks along the nearshore headlands on the adjacent property to the east [TMK (2) 2-6-009:001] offer a place for children to jump into the protected pool.

6.2.2 Potential Impacts and Mitigation Measures

The proposed shoreline hardening has been designed to reduce the potential for wave reflection into the narrow channel fronting the property. The improvements would also diminish the likelihood of the clay escarpment further eroding and collapsing as debris into the nearshore area. This debris of soil, vegetation and tree branches and trunks could block or partially fill the channel thereby blocking access. The debris could also create a safety hazard for recreational users of the channel or for those walking along the shoreline. The construction of shoreline hardening is intended to mitigate potential adverse effects of coastal erosion on recreational use of the nearshore area. As a result of these public recreational uses, protecting the nearshore channel is very import.

Allowing erosion of the clay embankment to continue unabated at the site represents a public safety hazard if not adequately addressed and *is a key basis for the proposal*.

The proposed shoreline hardening would not displace recreational users to nearby public parks or facilities, such as Hookipa Park or Paia Beach Park, and would not cause additional strain on the capacity of these facilities to accommodate recreation.

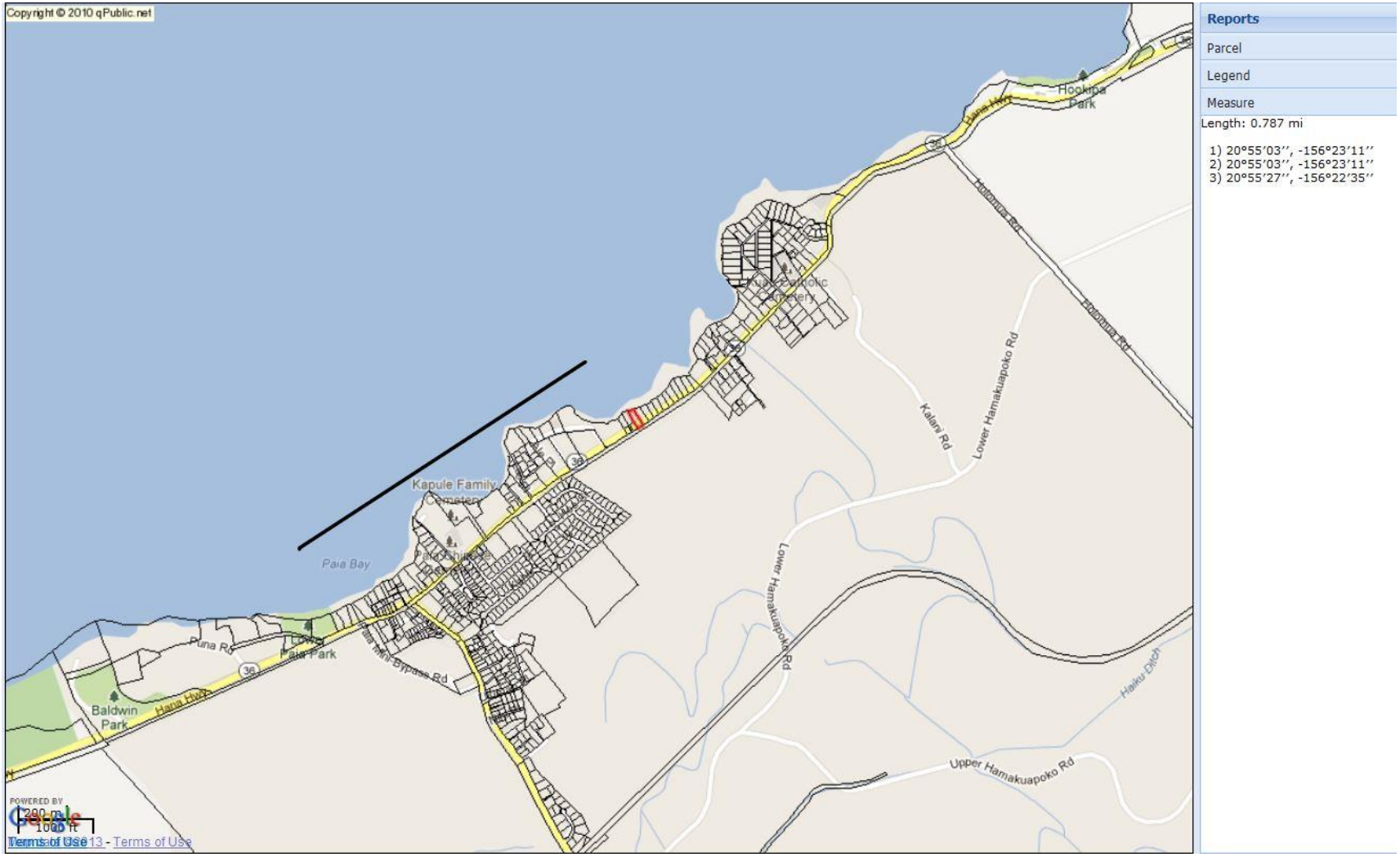

Figure 6-1: The property's location in relation to Paia Park.

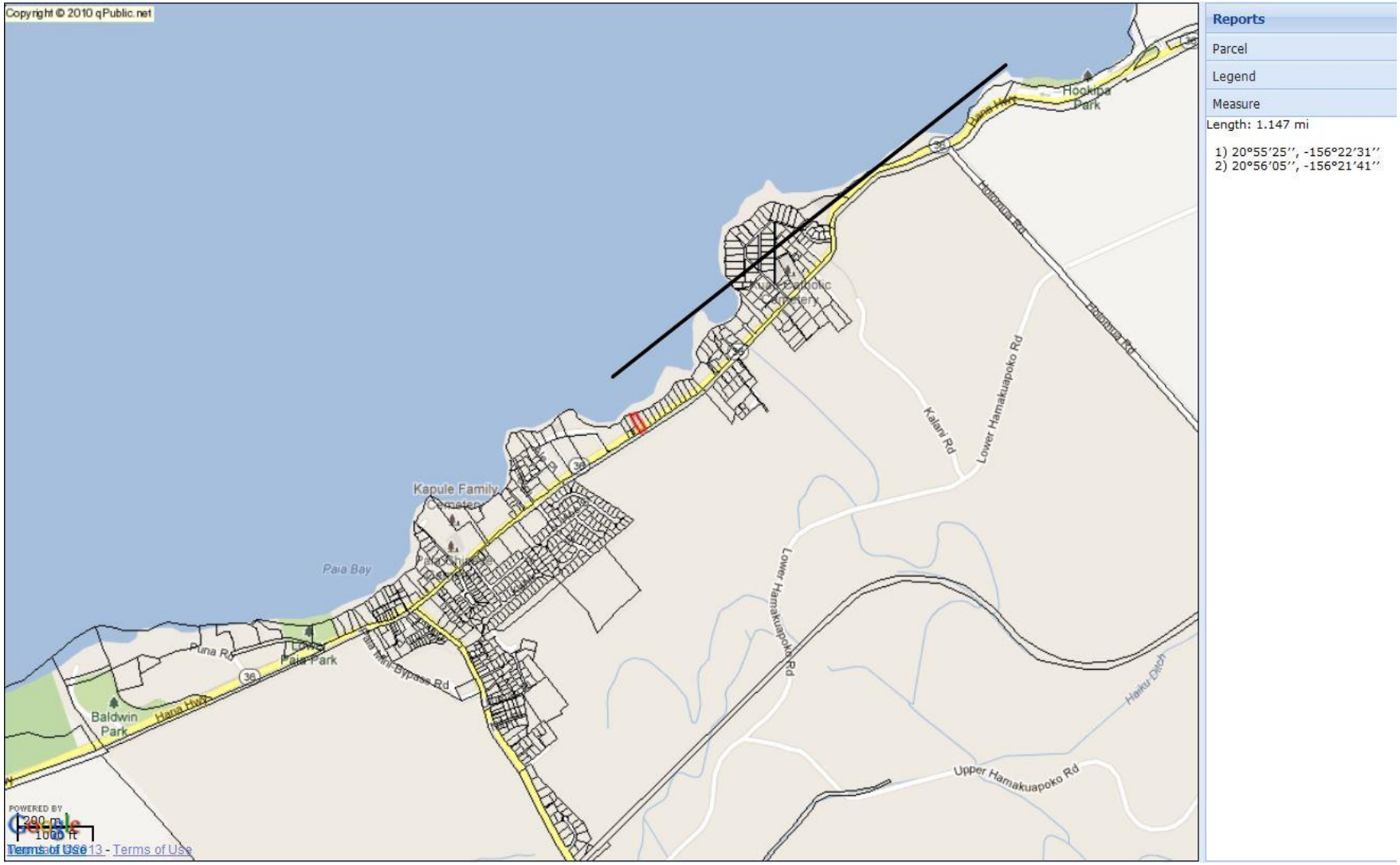

Figure 6-2: The property's location in relation to Hookipa Park.

Figure 6-3: Shoreline view of the subject property facing south, Kuau, Maui, HI

Figure 6-4: View of the nearshore reef and quiescent area facing west, Kuau, Maui, HI

6.3 VISUAL RESOURCES

6.3.1 Views to the Shoreline

Between Paia and Hookipa Park there are several good views of the ocean from Hana Highway, including at Kaulahao Beach Park and Hookipa Park. However, between these locations views to the shoreline are hindered by intervening residential development and not infrequently, high privacy walls. There were no scenic views identified at the subject property or along its roadway frontage recommended for protection in the Maui Scenic Study (CHP, 2006).

The subject property offers limited views from the highway to the shoreline due to vegetation, topography and the single-family home. The site doesn't have privacy walls that interrupt the view. The proposed shoreline hardening would be constructed into the embankment and thus not diminish any existing views to the ocean or shoreline from the public roadway. The hardening would likely be higher than the embankment to prevent splash-over or inundation of the rear yard from large waves. The hardening would result in a low wall, fence, or barrier along the edge of the escarpment for safety reasons. However, this minor imposition on the view-shed would be insignificant and would not hinder overall views of the ocean, albeit none are present from the highway.

6.3.2 Views along the Shoreline

Figure 6-5 illustrates the limited views along this shoreline in this portion of the littoral cell. Views along the shoreline are predominantly that of high embankments and rocky, boulder-strewn fringe areas when looking east from the property's seaward edge. There may be some intermittent views of the headlands and sandy shoreline of Kaulahao Beach looking to the west. However, these are somewhat interrupted by the neighboring properties unconsolidated, unengineered rock and boulder shoreline hardening.

Public enjoyment of these sporadic views is constrained by the difficulty in traversing the landward rocky shoreline adjacent to the clay escarpment. Views for those transiting by water through the channel would be similar given they would be from sea level.

The construction of shoreline hardening would not interrupt views along the shoreline, although it would likely create an impression of an anthropogenically-altered landscape. For this reason, naturally shaped stones, earth-tone colors, and roughness (as opposed to a smoothed, flat, bright surface) would be considered in the design features of the shoreline hardening chosen.

6.3.3 Architecture

There are no architecturally significant resources at the subject property. The home is generally of plantation style and the shoreline hardening would be designed relative to shore protection needs. However, as opposed to the large massing created by a flat, concrete seawall, alternatives that include the placement of large stones, earth-tones and surface roughness would be considered in the hardening's design. This would contrast to the large, flat seawall located at the apex of Tavares Bay just inland from the popular surf break.

6.3.4 Potential Impacts and Mitigation Measures

While no specific mitigation measures are proposed, large stones surface roughness can help deflect and diminish wave reflection and would therefore be considered in the final design of the proposed shoreline hardening.

Figure 6-5: View of the shoreline facing east, Kuau, Maui, HI.

6.4 SHORELINE ACCESS

The purpose of the Shoreline Access Inventory report was to update the 1986 Maui County Shoreline Access Plan in recognition of dramatic changes in Maui's demographics (Oceanit, 2005). Access along the shoreline at this specific location was not identified as a priority in the 2005 report. But retaining access to and along the shoreline from the east and west is clearly of community significance. A substantive consideration in evaluating the shoreline-hardening proposal is its potential effect on water-based, naturally protected, lateral access to and from the Tavares Bay surf break for ocean recreational users.

Rather than build into the naturally created quiescent channel fronting the subject property, the proposed shoreline hardening respects the importance of this natural feature and is designed in concert with its protection. Failing to install shoreline hardening along the eroding clay embankment would likely have negative impacts on the nearshore access route. Continued wave action along the escarpment could result in debris entering the channel that could create a public safety concern. Floating or semi-submerged tree trunks or branches, boulders and rocks dislodged by storms, and sediment inputs could negatively affect or even injure users of this naturally calm water recreation feature. Additionally, continued erosion of the clay embankment could result in slumping or episodic collapse of the escarpment. It is noteworthy that clay embankments typically do not erode in linear or consistent fashion, but tend to fail all at once dramatically altering the shoreline environment (Johnsson, 2005). This is because clay embankments swell and contract relative to hydrologic inputs and remain in place until the clay exceeds its cohesive properties, thereby slumping or causing bank failure.

Such a situation could result in substantial sediment inputs to nearshore waters that would adversely affect reefs and the reef shelf that creates the channel. A massive slump of the clay embankment could also fill or block the nearshore channel. This in turn, could limit or hinder access along the shoreline and the public's recreational use of the quiescent swimming area for recreation and safe, protected access to Tavares Bay surf spots. Once failure occurs, remedies are severely limited.

6.4.1 Potential Impacts and Mitigation Measures

Allowing continued, unabated erosion of the clay embankment to continue at the site represents a public safety hazard and the potential for lateral shoreline access to be hindered, if not adequately addressed**.**

The potential for adverse impacts to public recreational use along the shoreline and nearshore area is a key basis for this proposal. Accordingly, the proposed shoreline hardening is likely to have a favorable effect on public amenities, by protecting and retaining oceanfront uses of the coastline for the property owner and the public.

Figure 6-6: Water-based lateral access channel to Tavares Bay surf breaks.

6.5 ARCHAEOLOGICAL MONITORING PLAN

The subject property has been previously altered to construct the existing residence. Furthermore, the clay escarpment fronting the property generally does not exhibit a high probability of finding cultural artifacts or human remains given the difficulty in excavating such soils by hand when compared to areas that exhibit primarily sandy or sandy loam soils.

The nearest sandy shoreline is Kaulahao Beach, two properties to the east of the subject property, and down drift in the littoral cell. A number of archaeological studies were conducted on Parcel 23 (Kaulahao Beach). 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 900 feet west of the subject property. 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.

An inventory conducted on the mauka former sugarcane 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 clay subsoil present in the project area.

6.5.1 Potential Impacts and Mitigation Measures

A precautionary program of archaeological monitoring is recommended during any ground or subsurface disturbing activities associated with the proposed action. According to State of Hawaii historic preservation legislation "Archaeological monitoring may be an identification, mitigation, or post-mitigation contingency measure. Monitoring shall entail the archaeological observation of, and possible intervention with, on-going activities which may adversely affect historic properties" (HAR § 13-279-3). This historic preservation legislation governing archeological monitoring programs also requires that each monitoring plan discuss eight specific items (HAR § 13-279-4), as addressed below:

1. Anticipated Historic Properties: The project area contains no previously recorded pre-contact and historic cultural sites or natural sinkholes with human burials.
2. Locations of Historic Properties: The project area does not contain any historic properties. The possibility exists that human remains may exist in untested portions of the deep sand deposits.
3. Fieldwork: On-site monitoring is recommended for all ground and subsurface disturbance activities associated with construction activities. A qualified archaeologist would monitor all ground disturbance associated with these activities. In the event that multiple machines are running or manual excavation is occurring concurrently with ground disturbing activities, it is further recommended that one archaeological monitor be present for each piece of machinery or activity that involves ground excavation. Any departure from this would only follow consultation with and written concurrence from SHPD.

   Archaeological monitoring fieldwork may encompass the documentation of subsurface archaeological deposits (e.g., trash pits and structural remnants) in the event that these types of deposits are found during construction or landscaping, employing current standard archaeological recording techniques. These techniques may include drawing and recording the stratigraphy of excavation profiles where cultural features or artifacts are exposed. These exposures would be

photographed, located on project area maps, and sampled. Photographs and representative profiles of excavations would be taken and special sampling of these exposures may include the collection of representative artifacts, bulk sediment samples, or the on-site screening of measured volumes of feature fill to determine feature contents.

If human remains were identified during archaeological monitoring within the area, or during unmonitored construction anywhere on the property, no further work would take place in that vicinity unless the landowner and the SHPD are notified. All human skeletal remains that are encountered during construction would be handled in compliance with HRS Chapter 6E-7, HRS Chapter 6E-8, Hawai‘i Administrative Rules (HAR) Chapter 13-300 and in consultation with SHPD and the Maui Island Burial Council.

4. Archaeologist's Role: The archaeological monitor would have the authority to slow, suspend, or stop construction activities immediately in the vicinity of any significant findings, so that documentation can proceed and appropriate treatment of these remains can be determined.

5. Coordination Meeting: Before work commences, the archaeological monitor would hold a coordination meeting to orient the construction crew to the requirements of the archaeological monitoring program. At this meeting the monitor would emphasize his or her authority to temporarily halt construction and that all finds, including historic and traditional artifacts, are the property of the landowner and cannot be removed from the construction site.

6. Laboratory work: Laboratory analysis of non-burial related finds would include standard archaeological artifact and midden recording methods, including documentation of provenience, weight, length, width, type of material, and presumed function. Non-human bone and shell midden materials would be sorted down to species, when possible, then tabulated by provenience, and presented in table form in the archaeological monitoring report.

7. Report Preparation: At the end of construction, an archaeological monitoring report would present an overview of project finds and for the subject property. The report would contain a section on excavation stratigraphy if necessary, with a description of archaeological features and artifacts, monitoring methods, and results of laboratory analyses. The report would address the legal requirements of HAR § 13-279-5 and be reviewed by SHPD, including photo-documentation of excavations and historically significant features exposed during monitoring. Should burial treatment be completed as part of the monitoring effort, a summary of this treatment would be included in the monitoring report. Should burials and/or human remains be identified, other letters, memos, and/or reports would be forthcoming as requested by SHPD or the Maui Island Burial Council.

8. Archiving Materials: Should human burial materials be encountered during the course of monitoring and removed with the approval of SHPD and the Maui Island Burial Council, all materials would be temporarily curated on site in a clean and secured construction storage box that would be located within a secure storage warehouse. Non-burial related materials would be temporarily stored at the archaeologist monitor’s facilities until an appropriate curation facility is selected and in consultation with the landowner and SHPD.

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CHAPTER 7
RELATIONSHIP TO LAND USE PLANS AND POLICIES

7.1 OVERVIEW

The following section reviews the property's present land use entitlements and directives for land use provided by the state, county, and community.

7.2 HAWAII STATE PLAN

The Hawaii State Plan is codified as Chapter 226, HRS and sets out broad goals and objectives for land use, development and conservation strategies in Hawaii. For example, Section 226-11(b) states that to achieve land-based, shoreline and marine resources objectives, it is the policy of this State to:

> (3) Take into account the physical attributes of areas when planning and designing activities and facilities.

Additionally, Section 226-19 provides direction in the context of the socio-cultural advancements in housing as follows:

> (a) Planning for the State's socio-cultural advancement with regard to housing shall be directed toward the achievement of the following objectives:
>
> > (2) The orderly development of residential areas sensitive to community needs and other land uses.
>
> (b) To achieve the housing objectives, it shall be the policy of this State to:
>
> > (3) Increase homeownership and rental opportunities and choices in terms of quality, location, cost, densities, style, and size of housing.
> >
> > (5) Promote design and location of housing developments taking into account the physical setting, accessibility to public facilities and services, and other concerns of existing communities and surrounding areas.
> >
> > (6) Facilitate the use of available vacant, developable, and underutilized urban lands for housing.

7.2.1 Consistency

Analysis of the design of the proposed shoreline hardening allows for residential use to be maintained at the location but with sensitivity to community needs for access along the shoreline and within the nearshore environment. The proposed project retains residential housing within a residential neighborhood. The shoreline hardening's design takes into account the physical attributes of the site such as public safety, community uses and exposure to coastal hazards. Accordingly, the proposed action is in conformance with the broad goals, objectives and policies of HRS Chapter 226, the Hawaii State Plan.

7.2.2 Potential Impacts and Mitigation Measures

No specific mitigation measures are proposed.

7.3 STATE LAND USE

State Land Use designations are set forth in HRS Chapter 205. Hawaii's lands are categorized into four land use designations: urban, agriculture, rural, and conservation. The site is designated as Urban and residential use of the property is in concert with its State Land Use designation.

All oceanfront properties are located adjacent to the State's Conservation District. Makai or seaward of the state-certified shoreline are within the Resource subzone of the Conservation District regulated by the

DLNR OCCL. Shoreline hardening is a permissible use within the Resource subzone pursuant to HAR-183C.

7.3.1 Consistency

Analysis of the proposed land use notes that residential uses are consistent with the urban designation of the property and therefore the proposed action is consistent with the State Land Use law (**Figure 7-1**). Furthermore, shoreline hardening is a permissible use within the Resource subzone pursuant to HAR-183C. Comments from the DLNR OCCL would be obtained during the Draft EA process relative to the proposed action and use of the shoreline area.

7.3.2 Potential Impacts and Mitigation Measures

A state-certified shoreline survey would be obtained prior to application for a Special Management Area Use Permit and Shoreline Setback Variance. The SMA/SSV are discretionary permits approved by the Maui Planning Commission. Furthermore, a Conservation District Use Permit would be obtained if required by the DLNR OCCL for the proposed shoreline hardening. No additional specific mitigation measures are proposed for the proposed action beyond the conditions inherent in the Shoreline Rules, 12-203 of the Maui Planning Commission.

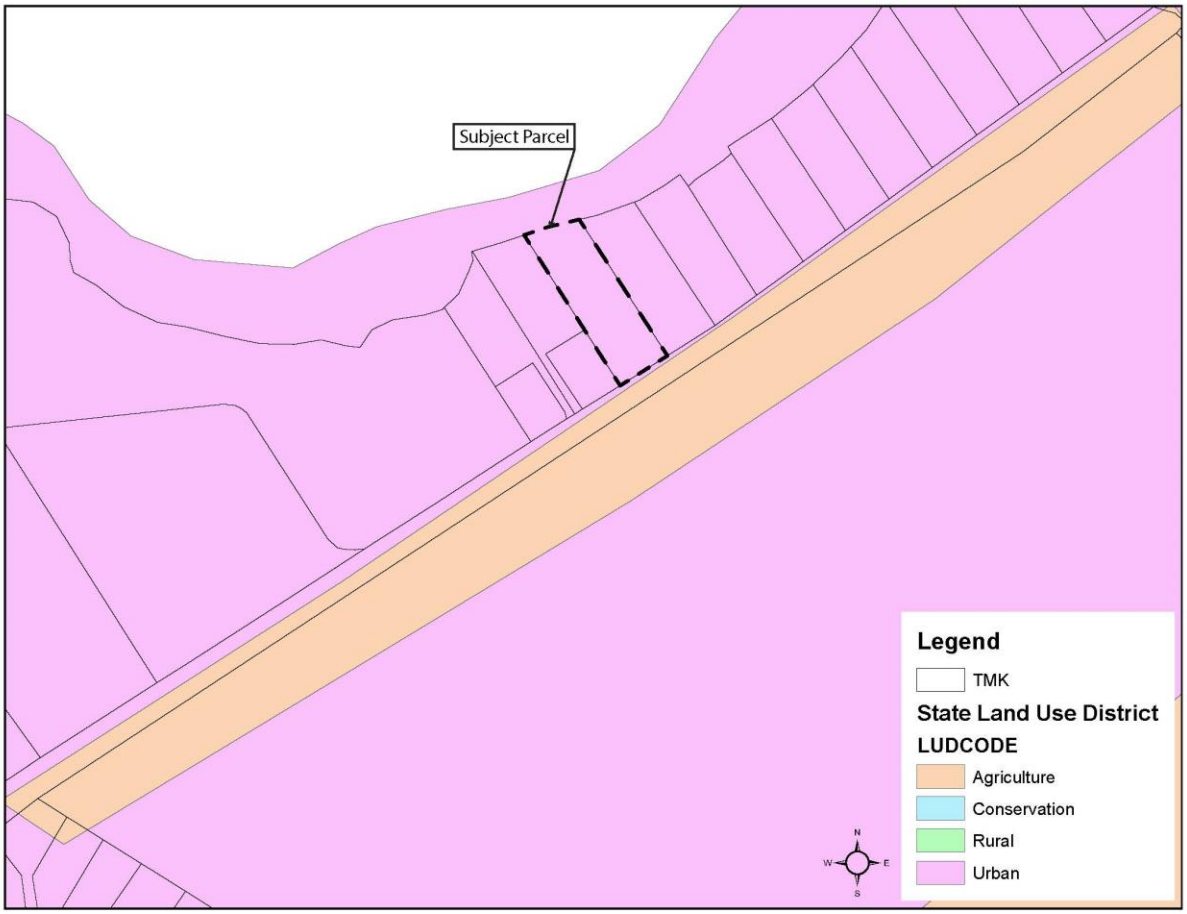

Figure 7-1: State Land Use Map.

7.4 COUNTYWIDE POLICY PLAN / GENERAL PLAN

The Countywide Policy Plan (CPP) acts as an over-arching values statement and provides a policy framework for the Maui Island Plan and Community Plans. The CPP was first adopted in 1980 and updated in 1990 as the General Plan. The CPP was adopted by ordinance 3732 on March 24, 2010 and sets forth over-reaching guidance for the County's growth to year 2030 (MC CPP, 2010). The CPP provides broad goals, objectives, policies, and implementing actions that portray the desired direction of the County's future over a twenty-year period.

The CPP includes:

1. A vision statement and core values for the County to the year 2030,
2. An explanation of the plan-making process,
3. A description and background information regarding Maui County today,
4. Identification of guiding principles, and
5. A list of countywide goals, objectives, policies, and implementing actions related to the following core themes.

Enacted in 2010 by county ordinance, Section IV of the CPP, pages 46-47, provide several county-wide goals, objectives, policies, and actions including:

A. Protect the Natural Environment

Goal: Maui County's natural environment and distinctive open spaces will be preserved, managed, and cared for in perpetuity.

Objective:

2. Improve the quality of environmentally sensitive, locally valued natural resources and native ecology of each island.

Policies:

a. Protect and restore nearshore reef environments and water quality.

f. Strengthen coastal-zone management, re-naturalization of shorelines, where possible, and filtration or treatment of urban and agricultural runoff.

g. Regulate the use and maintenance of stormwater-treatment systems that incorporate the use of native vegetation and mimic natural systems.

7.4.1 Consistency

The proposed shoreline hardening would prevent clay from the escarpment from entering nearshore waters and degrading water quality. This in turn would reduce turbidity and sediment deposition on coral reefs within the vicinity. Conducting an environmental assessment of the potential impacts of the shoreline hardening and developing methods to mitigate adverse effects strengthens management of the coastline. Although the hardening does not naturalize the clay embankment, it protects the nearshore channel and reef shelf that provides a unique natural quiescent area for swimming and lateral access to surf sites and ocean recreation. The property's rear yard and landscaping create bio-retention and enhances natural stormwater treatment, infiltration and ground water recharge. The use of climate-adapted species in the yard reduces the need, and therefore the potential treatment of, chemicals that could potentially have a deleterious effect on nearshore water quality and benthic organisms.

7.4.2 Potential Impacts and Mitigation Measures

No mitigation is proposed since the action is in keeping with the CPP objective and policies.

7.5 MAUI ISLAND PLAN

The Maui Island Plan (MIP) is intended to establish a pro-active planning process by establishing urban and rural growth areas that indicate where development is intended and will be supported. As depicted in **Figure 7-2**, the subject property is within the urban growth boundary and is in proximity to other residential developments. Growth areas will provide for less costly services, reduced commuting, protection of community character and the preservation of agriculture, open space and cultural and natural resources. The MIP includes goals, policies, programs and actions, which are based on an assessment of current and future needs and available resources. The MIP is intended to be the principal tool for decision makers to evaluate public and private projects and their impacts on land use, the economy, environment, infrastructure, and cultural resources.

7.5.1 Land Use

Less than 5% of Maui's lands are within the State Urban District designation. The Kuau area, in which the property is located, is within the Paia Small Town growth boundary for the region (**Figure 7-2**). Small towns are intended to support residential, mixed-use communities, which retain parks as protected areas (**Figure 7-3**) and promote a "sense of place." (MIPDR, 2009)

> **Analysis:** The property's location is within the small town growth boundary and is not within the protected areas of the Paia-Haiku planning region. Three properties to the west is Kaulahao Beach, an area to be protected as Park for community use, openness, and recreation. The proposed shoreline hardening respects the MIPs "sense of place" by protecting natural access for the public along the shoreline and retaining safe residential use of the property. To this end, the proposed action is consistent with the MIP.

7.5.2 Shoreline, Reef, and Nearshore Waters

Chapter 2, Heritage Resources of the MIP, addresses shoreline protection policy in broad form. It notes that Maui's comprehensive coastal zone management and regulatory framework is designed to protect the shoreline and abutting waters. However, human activities contributing to NPS pollution, shoreline hardening, increased development, and lack of beach access are among the major threats to the integrity and the public's use of the island's beaches and coastal waters. With the dynamic nature of Maui's coastal areas, the County will continue to face challenges in its resource management programs. A few shoreline protection issues include:

- Lack of an ICZM program
- Deteriorating reef health and fish stocks and compromised marine ecosystems
- Poor water quality arising from upland activities
- Limited public beach access and facilities

As humans have constructed their houses on the shoreline, they have had to adapt to natural environmental processes that may alter or damage their structures. Alterations to the shoreline, such as hardening and excessive extraction of sand from nearby dunes, can pose a threat to those very beaches and dunes. When natural sand transport processes are interrupted through human actions, such as the construction of seawalls and revetments, it can deprive adjacent beaches of the sand necessary to compensate for erosion arising from storm surge, sea-level rise, and wave action.

Coastal erosion is a natural process, whereby sand resources held in dunes maintain the width of the beach, but coastal land is lost. In contrast, beach erosion is the loss of beach width arising from erosion and the impoundment of sand behind seawalls. While shoreline hardening is appropriate in some circumstances, the loss of Maui's beaches is often accelerated when private landowners attempt to protect their oceanfront property by armoring the shoreline. The MIP contains two relevant objectives and corresponding policies and implementing actions, as listed below.

Objective
2.2.2 Improved reef health, coastal water quality, and marine life.

Policies
2.2.2.d require, where appropriate, a buffer between landscaped areas and the shoreline, gulches, and streams to reduce the runoff of fertilizers, pesticides, herbicides, and other pollutants into coastal waters.
2.2.2.e Strictly regulate shoreline armoring in accordance with adopted Shoreline Rules, with intent to protect the coastal and marine ecosystem.

Implementing Actions
2.2.2-Action 1 Adopt coastal landscaping provisions that include standards such as setbacks, buffers, and other measures that promote the use of native plants and xeriscaping.

> **Analysis:** The proposed action would prevent the erosion of clay and sediment into nearshore waters that clouds the water column depriving corals of sunlight which negatively affects reefs. BMPs during the construction of the shoreline hardening would be implemented to reduce the potential for adverse impacts to coral reefs, nearshore water quality, and marine life. In addition, the property's landscaping consists of climate-adapted vegetation.

Objective
2.2.4 Acquire additional shoreline lands and shoreline access rights.

Policies:
2.2.4.a Promote the use of conservation easements, land trusts, transfer and purchase of development rights, and mitigation banking.
2.2.4.b Require the dedication of public beach and rocky shoreline access ways to and along the shoreline where it serves a practical public interest as a condition of development or subdivision approval; future subdivisions and developments shall be consistent with and effectuate, to the extent practicable, the Shoreline Access Inventory Update – Final Report (Oceanit, 2005), and its updates.
2.2.4.c Incorporate the Shoreline Access Inventory Update - Final Report (ibid.), and its regular updates, into this plan.
2.2.4.d Identify access points while further acquiring key shoreline parcels and easement rights to enhance and protect beach access and shoreline recreation.

Implementing Actions
2.2.4-Action 1 Revise subdivision and development regulations to:
(1) Increase linear frequency for public access to and along the shoreline; and
(2) Require access to and along the shoreline as a condition of subdivision, land use entitlement, and/or discretionary development approval.
2.2.4-Action 2 Prioritize the acquisition of shoreline parcels in accordance with the recommendations of the Shoreline Access Inventory Update – Final Report (ibid.), and other plans funded by the Coastal Zone Management Program.
2.2.4-Action 4 Acquire development rights for the lands adjoining Ho`okipa Beach Park, to enhance coastal zone management.
2.2.4-Action 6 Develop and adopt funding mechanisms to finance the acquisition of additional shoreline lands in South and West Maui, and other areas as they urbanize.

> **Analysis:** The proposed action would protect existing natural lateral access adjacent to the shoreline. By constructing shoreline hardening, the public's health and safety is protected from further collapse of the clay escarpment. In addition, the removal of the existing rubble, together with mitigating the likelihood of future rubble obstructing the nearshore channel and shoreline, facilitates the public's access to and along the shoreline and access to off-shore recreational resources.

7.5.3 Natural Hazards

Goal: Maui will be disaster resilient.

Policy 3.1.2.c requires the use of construction techniques that reduce the potential for damage from natural hazards.

> **Analysis:** The proposed shoreline hardening has been located and designed to respect the potential environmental hazards in the vicinity, such as tsunami, wave surge, coastal flooding, bluff collapse and chronic erosion. The design would also allow dynamic processes within the foreshore to continue uninterrupted and allow the existing channel created by the nearshore reef shelf to remain in its natural state, which buffers storm surge and helps dissipate wave energy.

7.5.4 Consistency

Coastal erosion and long-term retreat of the shoreline should be taken into consideration for any new coastal development. The existing building site was selected prior to the implementation of site-specific historic erosion trends described in the 2003 Maui Shoreline Atlas. The home is situated further inland from the shoreline than the erosion-rate setback or average lot depth setback and therefore consistent with the MIPs recommendations.

Landscaping for the subject property incorporates drought-tolerant, climate-adapted plants that are native to Hawaii, thus reducing the need for pesticides, herbicides, and fertilizer that could otherwise impact nearshore waters. Aside from a grassy lawn in the rear yard, the landscape plan predominantly consists of natural plants commonly found growing without anthropogenic assistance in the area. These types of plants require minimal irrigation and chemical treatments once established.

The shoreline hardening would prevent erosion of the embankment and prevent clay and sediment from entering the nearshore littoral system, which would reduce water clarity, degrade reefs, and negatively impact the natural environment. The shoreline hardening would help protect and retain this natural waterway lateral access, reduce sediment inputs by encasing the clay embankment and reducing erosion, and protect the offshore reef shelf that creates this unique nearshore quiescent area.

The MIP encourages landowners to build within the context of the environment and with keen awareness of coastal hazards. The proposed action is consistent with the MIPs intent to reduce exposure to natural hazards, such as the potential for the embankments collapse, and protection of public and natural coastal amenities.

7.5.5 Potential Impacts and Mitigation Measures

Relative to nearshore water quality protection, the proposed action would fully implement BMP's during construction to minimize any potential adverse impacts to nearshore water quality, benthos, and marine life. For example, during construction the potential for sediment impacts from runoff or dust would be minimized by using silt fences and absorbent geo-tubes where appropriate, and by watering barren areas or stockpiled soils during ground altering activities.

Once constructed, the shoreline hardening would mitigate the potential public safety and health hazards that would result from the embankments collapse.

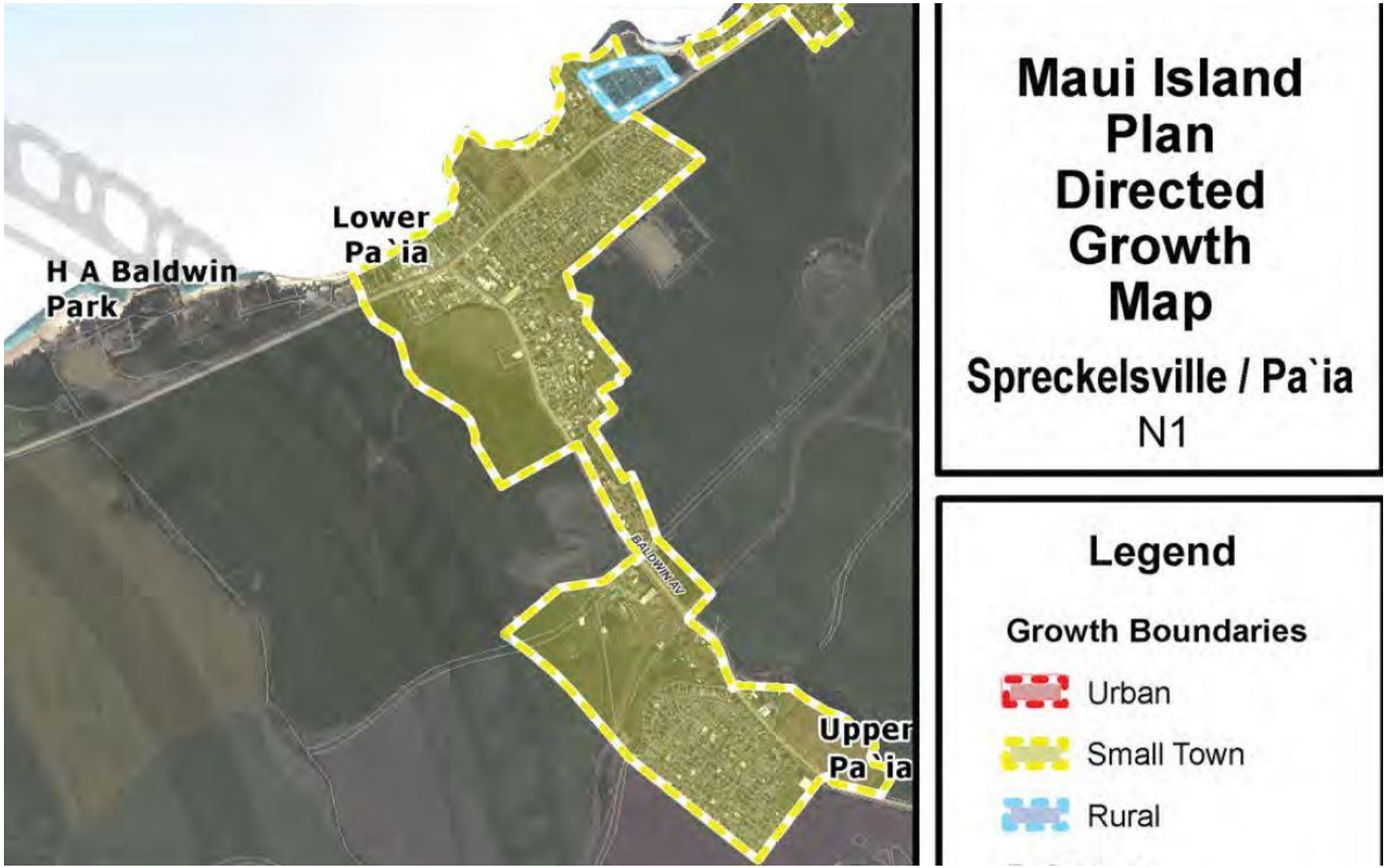

Figure 7-2: Small Town growth boundaries within the Maui Island Plan.

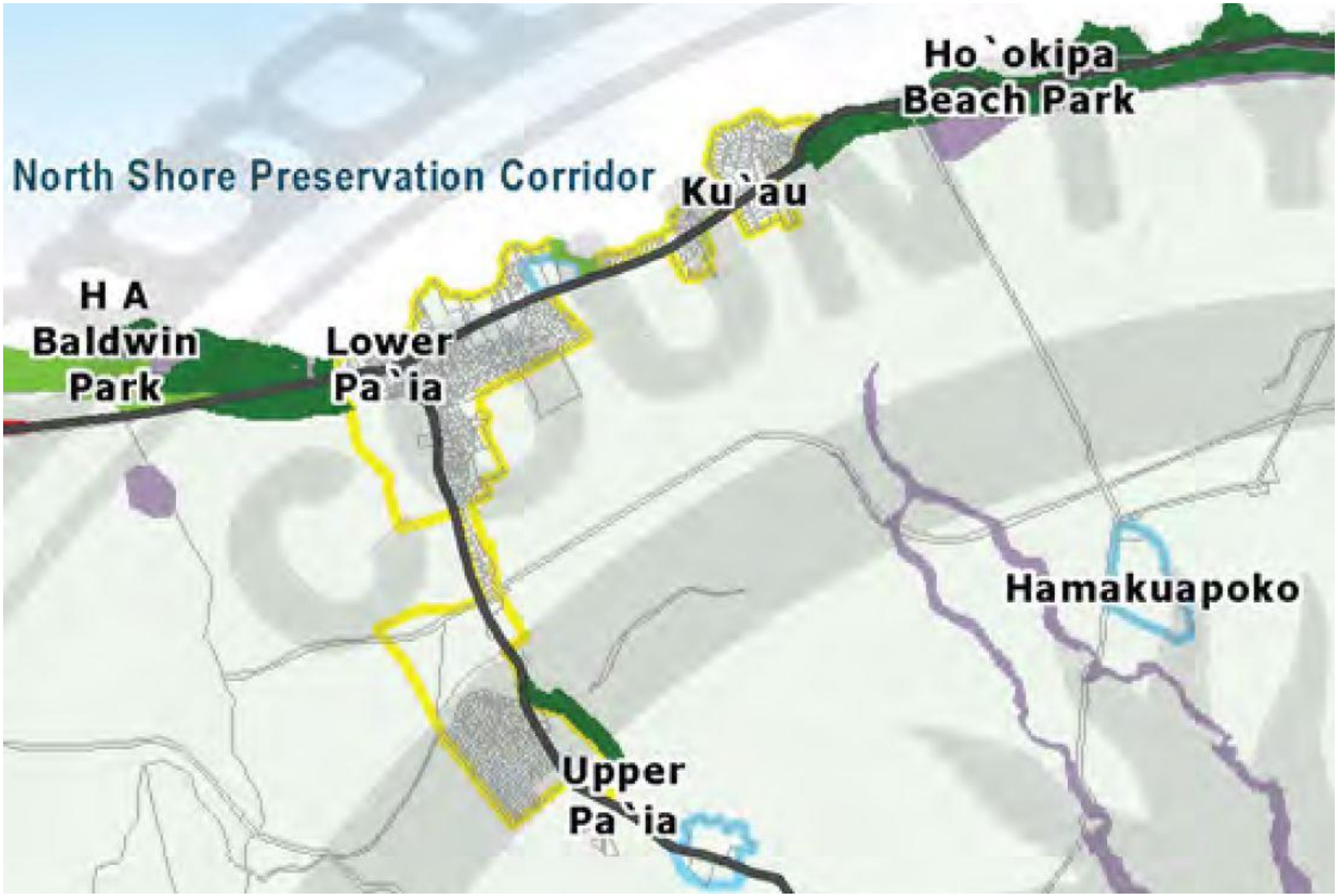

Figure 7-3: Protected areas (blue) within the Maui Island Plan.

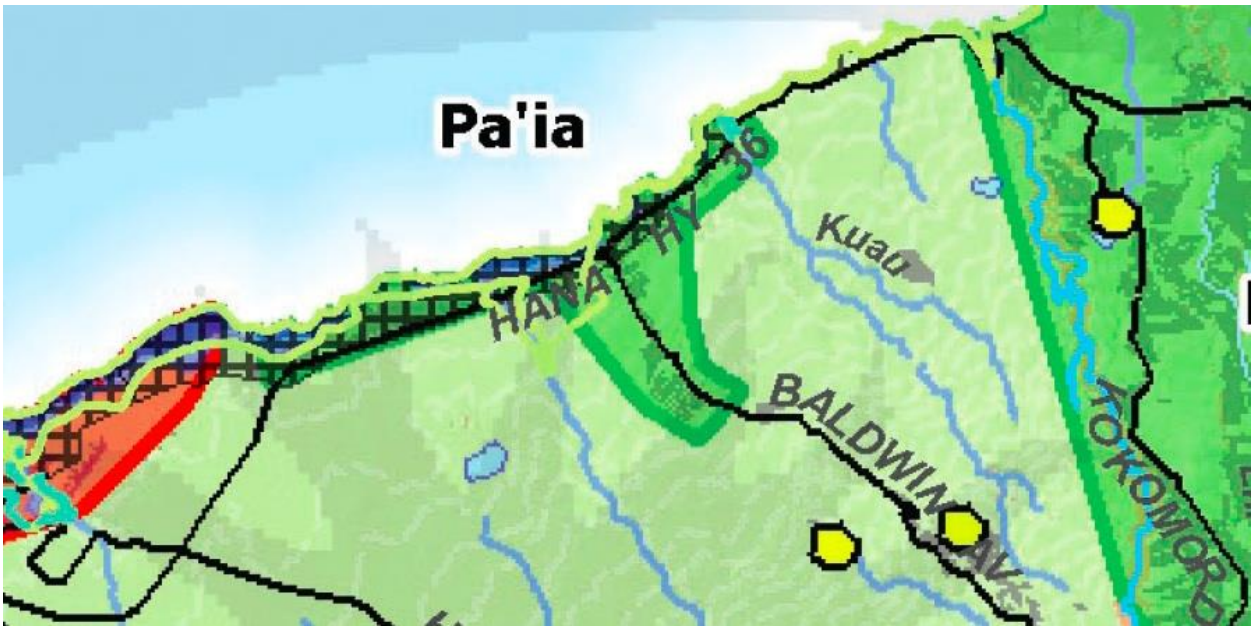

Figure 7-4: Natural Hazards delineation in the project vicinity, the Maui Island Plan.

Legend: Lime green line = 1.0% chance of 100 year flood inundation.

Green = low fire risk. Yellow = dams.

7.6 COMMUNITY PLAN

The Paia-Haiku Community Plan (PHCP) is one of nine community plans for Maui County which provides guidance and recommendations concerning land use, density and design, transportation, community facilities, infrastructure, visitor accommodations, commercial and residential areas and other matters related to development that are specific to the region. The PHCP provides specific recommendations to address the goals, objectives, and policies contained in the County-wide Policy Plan. The region has two major population centers: Haiku and Paia, and a scattering of rural residential enclaves intersperse with some agriculture. Paia retains a country-town business feel and has many retail shops and restaurants that have developed around the primary core where Hana Highway intersects with Baldwin Avenue. Baldwin Avenue leads upcountry to Haliimaile and Makawao Town, whereas Hana Highway follows the coastline from Kahului to Hana. The Hamakuapoko coast is a world-renowned surfing and windsurfing area. The shoreline consists primarily of high rocky cliffs and bluffs, small cobble beaches at the mouths of the gulches and streams, and several white coral sandy beaches. Much of the shoreline is fringed with nearshore reef shelves.

The policy recommendations of the PHCP are anticipated to have a direct effect on the sequence and pattern of growth in the region. The plan seeks to pattern future growth and development in a manner reflective of the rural and small town or village character of the region. Future residential expansion is directed to Pa`ia Town and in Ha`iku in areas close to existing villages and settlements. The PHCP emphasizes the preservation of scenic vistas and shoreline resources, and the expansion of public recreational opportunities. The plan also intends to protect and recognize the region's historic, archaeological and cultural resources (PHCP, 1995).

7.6.1 Policy Recommendations

Goals for Land Use are:

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 are:

1. Protect the marine environment and quality of the offshore waters.
2. Preserve important scenic vistas and shoreline resources of the region.
9. Maintain and expand areas desirable for public recreational uses.
12. Designate the following areas for park use:
    c. Kaulahao Beach ("Blue Tile Beach");
13. Limit visitor accommodations to owner-occupied "bed and breakfast" establishments that are residential in both scale and character. Any proposed "bed and breakfasts" should not be situated near the shoreline so as to avoid the proliferation of this use and subsequent changes in the character of the region's coast.

Implementing Actions to accomplish the above include:

5. Improve standards and procedures to protect scenic vistas and shoreline resources of the PHCP.

Analysis: The proposed shoreline hardening would protect existing natural lateral access by locating inland of the edge of the quiescent channel. The hardening would prevent the channel from being blocked by a slump or collapse of the clay escarpment. Existing debris and rubble from the previous shoreline hardening would also be removed, which would help conserve recreational use of the channel for swimming and access to surfing sites. Since the hardening is built into the embankment there would be no loss of views to or along the shoreline.

Goals for the Environment are:

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.

Applicable Objectives and Policies are:

4. 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.

9. Protect and maintain the quality of the nearshore and offshore waters and marine environment. Ensure that storm water run-off 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.

Analysis: The proposed shoreline hardening would protect the marine environment and quality by preventing clay and sediment from being eroded from the 16-18 feet high embankment and preventing these inputs from entering into nearshore waters. As discussed, when clay enters the water, it clouds the water column and reduces the amount of light reaching corals, weakening them and diminishing their productivity. This makes the coral more susceptible to disease and stress. Sediment also increases nutrient loads, favored by algae, and causes an imbalance in the symbiotic relationship between corals and zooanthelae (algae within the coral). Combined, more algae and turbid waters, eventually can lead to collapse of the reef system and corresponding loss of fish and marine life abundance and diversity.

Planning Standards

The following planning standards are specific guidelines or measures for development and design. These standards are essential in clarifying the intent of the land use and town design objectives and policies and the Land Use Map.

9. Environmental Aspects

a. Development of flood prone areas (unless appropriate flood safety measures are implemented), stream channels and open culverts into nearshore waters should be avoided for purposes of safety, open space relief and visual separation. Drainage channels should be maintained regularly by appropriate agencies.

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

c. Ensure that storm water run-off and soil erosion from proposed developments will not adversely affect the marine environment and nearshore water quality.

Analysis: The proposed shoreline hardening would be designed to accommodate coastal flooding and would not diminish the natural features of the area. The hardening would prevent soil erosion and storm water impacts to the marine environment and water quality.

Social Infrastructure

Goals for Recreation and Open Space are:

Quality recreational facilities to meet the present and future needs of residents of all ages and physical ability with emphasis on securing shorefront lands.

Objectives and Policies are:

1. Develop a system of bicycle and pedestrian accesses along the shoreline, where practicable.

Responsibilities to achieve the above policy recommendations include:
Table 1 Implementing Actions
Planning Department Responsibilities for Programs, Policy, and Projects under the Land Use category
4. Improve standards and procedures to protect scenic vistas and shoreline resources of the region.

> **Analysis:** The existing natural lateral access that provides a unique recreational benefit in this area would be protected through the installation of shoreline hardening. The proposed shoreline hardening would mitigate health and safety risks that currently exist because of the severe erosion at the property. As discussed, the project would mitigate the potential for falling debris, which could injure recreational users. The project would also prevent debris from entering nearshore waters, which could block access for surfers accessing Tavares Bay and could cause siltation of the coastal waters.

Definitions
The PHCP (1995) also provides definitions of different land use categories, as shown in **Figure 7-5**, such as:

Park (PK)
This designation applies to lands developed or to be developed for recreational use. This includes all public and private active and passive parks.

Open Space (OS)
This use is intended to limit development on certain urban and non-urban designated lands which may be inappropriate for intensive development due to environmental, physical, or scenic constraints; this category would include, but not be limited to, shoreline buffer areas, landscape buffers, drainageways, view planes, flood plains, anti-tsunami areas. Other appropriate urban and non-urban uses may be allowed on a permit basis.

Single-Family (SF)
This includes single-family and duplex dwellings.

> **Analysis:** Both Park and Open Space (OS) definitions are listed above to differentiate between the two. The existing use of the property is consistent with its PHCP land use designation of Single-Family (SF). The area seaward of the cliff line (pali) is designated as OS in the PHCP as illustrated in **Figure 7-5**. This portion of the coastline is designated as OS assumedly due to its physical constraints (i.e., steep embankment). The designation applies to the area seaward of the escarpment, which has retreated inland (into the SF area) due to the embankment's collapse. The OS designation follows the pali along the coastline from the sandy beach to the headland at the northern end of the bay.
>
> The construction of shoreline hardening would be appropriate relative to protecting water quality from sediment, silt and clay inputs that are occurring from the subject erosion. The response is appropriate when considering the physical environment at the site. The proposed action recognizes the inappropriateness of intensive development of the OS area due to is physical limitations (i.e. soil and topography). The shoreline hardening would not interrupt existing scenic views to or along the shoreline. The hardening would create a buffer to flooding, coastal storms, stormwater runoff and tsunami impacts. In sum, hardening of the shoreline would be an appropriate use, even if located within open space designated lands, because it would reduce the potential for adverse impacts to water quality, protect public lateral access, and enhance public safety. Moreover, the proposed removal of the remnant seawall debris will facilitate lateral access along the shoreline by removing the current obstructions.

7.6.2 Consistency

The property is designated as Single-Family and Open Space seaward of the escarpment as illustrated in **Figure 7-5**. The parcel is intended for single-family occupancy and the use would continue under the proposed action. Moreover, by addressing the current health and safety hazards that exist because of the severely eroding embankment, the proposed action would protect the public benefits typically accrued in open space, while providing long-term protection of this space for the public's safe and clean recreational use. Accordingly, the proposed action is consistent with the sites PHCP designations.

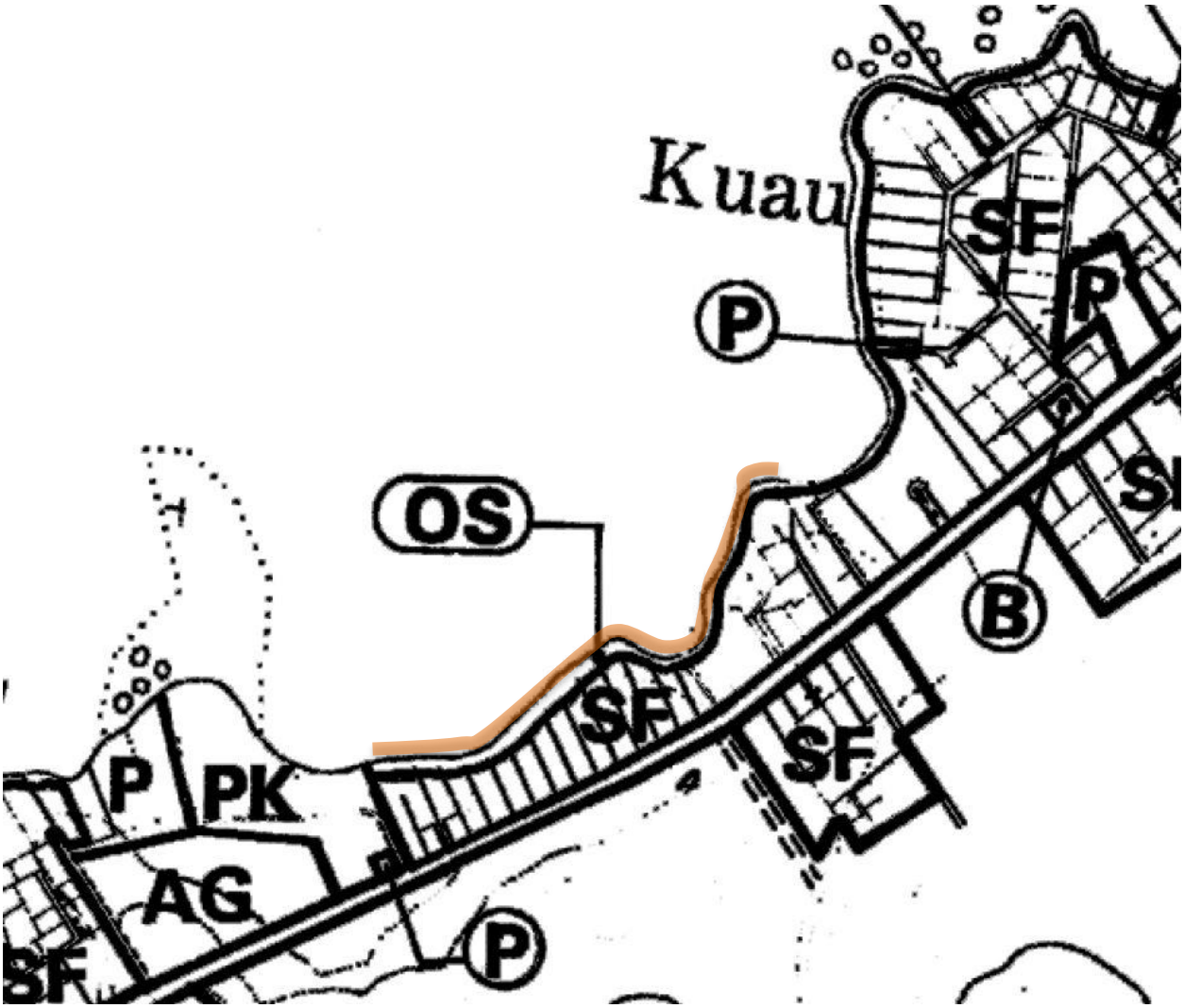

Figure 7-5: Community Plan Designations

7.6.3 Potential Impacts and Mitigation Measures

No mitigation is required given the proposed action is consistent with the PHCP and its land use designations for the property.

7.7 ZONING

MCC Chapter 19.12 establishes zoning designations for the property. The overall purpose of zoning is to ensure that land uses are compatible and that the public's health, safety and welfare are protected.

The parcel is designated as R-1, Residential (**Figure 7-6**). Within the R-1 District, MCC 19.12.020 states that there are ten (10) uses that are permitted. Among them are single-family dwellings, accessory dwellings (with certain size limitations per 19.35), and accessory buildings, which are customary, incidental, usual, and necessary to that of the main building or use of the land.

7.7.1 Consistency

The property is intended for single-family use and occupancy (MCRPT, 2013). The proposed shoreline hardening is a necessary, incidental use of the property that would provide safety for both the public and residents of the home. As such, the proposed action is consistent with the property's zoning.

7.7.2 Potential Impacts and Mitigation Measures

The proposed action is consistent with its zoning designation and therefore would have no adverse impacts. Accordingly, no mitigation measures are necessary.

Figure 7-6: Zoning for the subject property.

7.8 BEACH MANAGEMENT PLAN

The Beach Management Plan (BMPlan) for the Island of Maui was incorporated by reference into the MIP (MIP, 2012). By doing so, an analysis of a proposed action's consistency with the BMPlan is provided herein.

1997 Beach Management Plan

The first edition of the BMPlan was in 1997 and had a number of prudent recommendations for conservation and preservation of Maui's beaches many of which have since been enacted. For instance, Subsection 6 of the plan recommends the implementation of shoreline setbacks based on the expected lifetime of a structure and site-specific analysis of historic erosion trends (Mullane and Suzuki, 1997). The resulting AEHR are included in the 2003 Maui Shoreline Atlas, and have been analyzed in this document.

2008 Beach Management Plan

The second edition of the BMPlan was completed in 2008 and identifies thirteen (13) areas to improve effective managing of Maui's beaches and shoreline resources. Unlike the first edition, which mainly provided recommendations, the second edition offers specific strategies to avoid degradation of Maui's beach, sand and shoreline resources (Norcross-Nu'u, Fletcher and Abbott, 2008).

Despite the numerous negative impacts of shoreline armoring, there are instances where it may be the best alternative. For example, on shorelines that are backed by eroding clay, dirt or rock, with no sandy beach, hardening the shoreline with a seawall or revetment can be beneficial as it stops sediment from entering the water thereby improving water quality. It can even be designed to enhance public access. However, on sandy shorelines experiencing chronic recession, armoring should be a last resort and used only when a significant and valued structure is threatened and can't be moved or removed. In this case the potential for beach loss should be clearly and unequivocally stated in permitting documents so that the trade-off of beach for development is widely understood. Whenever shoreline armoring is pursued for shore protection, it is important to ensure that a means of safe lateral shoreline access is incorporated into the design of the structure or the surrounding area.

Section 2 of the BMPlan describes ***Guidelines for Shoreline Protection Measures***. It states, that decisions regarding allowable means of shore protection must be based on consistent criteria to ensure fairness and enforceability. Appropriate shore protection varies from one region to the next because of numerous location-specific factors to be considered. Ideally, interference with natural shoreline processes should be minimized.

Objectives 2.1) To establish guidelines for determining the most appropriate type of coastal protection for a particular location.

The BMPlan recommends:

2.1a) Encourage hazard avoidance in the form of retreat or relocation where possible

2.1d) Provide suggestions on alternative coastal protection designs where beach nourishment is not feasible

2.1g) Require compensatory mitigation where lateral access and/or beach resources are lost or impounded by development

2.2a) Establish a critical parcel purchase program to purchase eroding coastal properties that are sand sources for valuable public beach areas

Section 3 of the BMPlan discusses ***Sea-Level Rise***. The Fourth Assessment Report of the Intergovernmental Panel on Climate Change reports "high confidence" that global sea-level rise increased

from the 19th to 20th centuries, and that the rate of rise 1961-2003 averaged 1.8 +/-0.5 mm/yr. Satellite data show that from 1993-2003 the rate of sea-level rise averaged 3.3 +/-0.4 mm/yr (Rahmstorf et al., 2007 in Norcross, Fletcher and Abbott, 2008).

Objective 3.1) To recognize and plan for potential impacts of sea-level rise on low-lying coastal lands.

The BMPlan recommends:

3.1b) Take sea-level rise into consideration when reviewing development or redevelopment of low-lying and coastal areas.

3.1d) Identify communities and developments at risk of sea-level rise inundation and develop long-term plans to address the associated issues of a rising water table including drainage and leach field failure, flooding, wetland formation and salt-water intrusion into aquifers, as well as coastal erosion and increased susceptibility to damage from storms, hurricanes, high surf and tsunami.

Section 7 explores ***Shoreline Setbacks and Coastal Erosion Hazard Data*** with the following objective.

Objective 7.1) To improve the safety of coastal residents from coastal hazards, improve protection of coastal resources, and provide relevant information for governmental agencies and the coastal community when purchasing shoreline property and/or planning and designing any development along the shoreline

The BMPlan recommends

7.1d) Develop a study of coastal bluff erosion for bluff properties that have been developed and will potentially be developed in the future

7.1e) Develop interim policies for setback requirements on coastal bluff properties

7.1g) Amend both the county's Special Management Area (SMA) Rules and Shoreline Rules to extend county jurisdiction to the ocean.

Section 9 has recommendations about ***Inter-Agency Coordination***.

The BMPlan recommends

9.1a) Maintain ongoing discussions and improve coordination on shoreline matters with other agencies in order to avoid duplication, streamline permit processing, and encourage more environmentally sensitive shoreline protection measures

7.8.1 Consistency

The BMPlan's leading recommendation is to avoid areas likely to erode during a building's lifespan. In this instance, the residence is located well inland of the embankment and is not threatened by coastal erosion. The BMPPlan also recommends that new shoreline hardening be appropriate for the specific environment. The BMPlan recommends avoiding constructing seawalls along sandy shorelines because they hinder sand transport leading to narrower beaches. The proposed shoreline hardening would not hinder sand transport or impound sand resources within the littoral cell and doesn't interfere with natural shoreline processes that maintain sandy shorelines.

Shoreline hardening is appropriate when it prevents clay and sediment from entering nearshore waters. Sediment in the water column increases turbidity and water temperatures, which in turn degrade coral reef health and resiliency. As described earlier in this report, the analysis has considered alternative shoreline hardening designs, ways to minimize their footprint, and measures to protect, improve and minimize adverse impacts to lateral public access along the shoreline and nearshore environment.

The proposed action has taken into account the recommendations of the BMPlan and is consistent with its guidelines for shoreline protection measures.

7.8.2 Potential Impacts and Mitigation Measures

As described in both editions of the BMPlan, the most prudent mitigation method is avoidance and the present homes location is consistent with this recommendation. The proposed shoreline hardening at the site considered the biophysical environment and coastal hazards in its design, while protecting the public's safe, lateral use of the nearshore area for recreation and ocean access. The BMPlan recognizes the unique challenges of cliffs, escarpments and bluffs and the need to prevent clay and sediment inputs to sensitive reef ecosystems. To this end, the proposed action considers the overall littoral cell dynamics and not only the needs or landowner's interests at the immediate site.

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CHAPTER 8
COASTAL ZONE MANAGEMENT

8.1 OVERVIEW

The Hawaii Coastal Zone Management Act (CZMA), HRS 205A, was enacted to protect public trust resources and to encourage the construction of buildings out of harm's way. The CZMA regulates ten categories of coastal resources and provides objectives and policies to be considered when evaluating a proposed action. To enhance local decision-making and public participation, as well as respect "home rule", the authority to implement the CZMA is delegated to each Island's Planning Commission for proposed actions within the SMA. The SMA extends from the shoreline at least 300 feet inland or to the nearest state roadway (**Figure 8-1**).

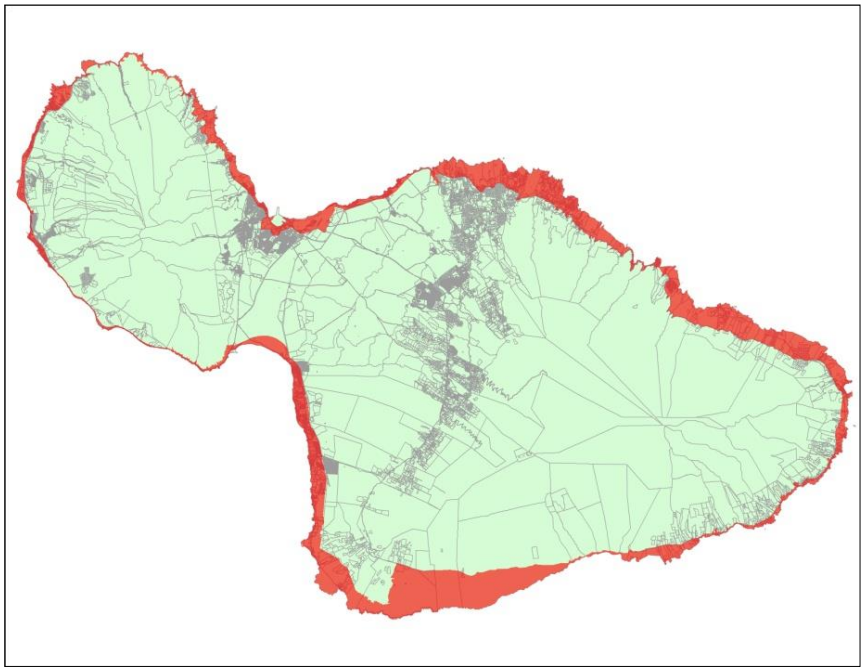

Figure 8-1: The Special Management Area of the Island of Maui

The Commission delegates decision making for minor developments and those actions that are unlikely to have adverse impacts on coastal resources to the Director of the Planning Department (**Figure 8-2**). The Director may conduct an assessment of a proposed action within the SMA to determine if the action is "Development" and thus requires a permit, or is "Not Development" and is therefore exempt. In contrast, an applicant may waive the Director's assessment and apply for an SMA Use Permit. For proposed actions greater than $500,000 within the SMA or $125,000 within the shoreline setback area, such as this one, the authority to grant approval is vested with the Commission through a public hearing and notification process. Presently, the Shoreline Rules (12-203) and SMA Rules (12-202) reflect the $125,000 referenced above, however the amount was increased to $500,000 by amendments to the CZMA that became effective July 1, 2012. For actions less than $500,000, authority for approval is delegated to the Director. SMA permits may have reasonable conditions placed on the approval to ensure that adverse impacts to coastal resources are avoided, minimized or mitigated.

In contrast, an SMA exemption does not have conditions placed on the approval because the action is, in essence, not subject to the law and exempt (**Figure 8-2**). The CZMA provides definitions of what is, and is not, "development" (HRS § 205A-22)

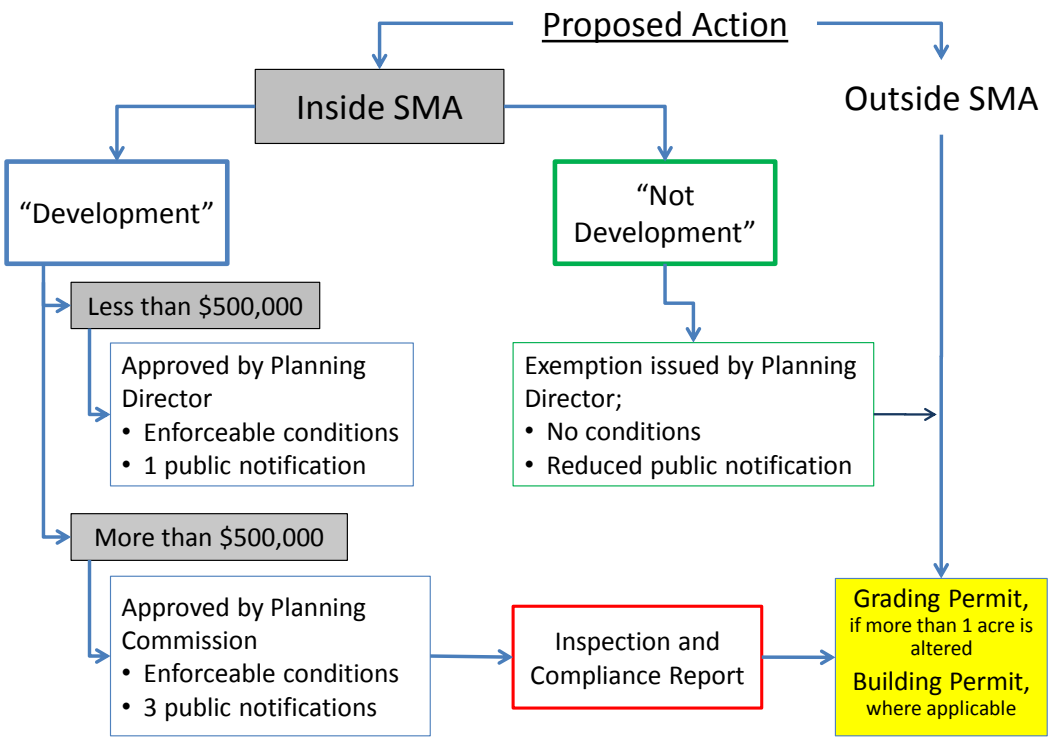

Figure 8-2: Special Management Area Approval Process.

The subject property is located within the SMA of Maui County. The site is also a shoreline property. Because the proposed action involves construction of shoreline hardening within the shoreline setback area, an SMA Permit and Shoreline Setback Variance, approved by the Maui Planning Commission during a public hearing, is required. As a result, an assessment of the proposed actions conformance and consistency with the CZMA objectives and policies is provided herein.

8.2 Recreational Resources

8.2.1 Policy

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

(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, county planning commissions; and crediting such dedication against the requirements of Section 46-6, HRS.

8.2.2 Analysis

The proposed action is not anticipated to adversely affect existing coastal recreational resources and would enhance the continued use of nearshore lateral access along the shoreline for ocean recreation. As discussed, construction of shoreline hardening at this unique site, and under the present conditions, will promote the public health, safety and welfare. Effort has been taken to enhance recreational opportunities by accommodating continuous lateral access along the shoreline as presently exists in nearshore waters. As a result, adverse impacts on recreation resources are not anticipated, rather the proposed action is anticipated to improve and protect the public's safety when using the nearshore area.

8.3 HISTORIC RESOURCES

8.3.1 Policy

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.

8.3.2 Analysis

An archaeological monitoring program, approved by the SHPD, would be fully implemented during all ground altering activities onsite, should one be required. Given past use and preparation of the site for residential use, the likelihood of encountering artifacts of historic significance is low. Nonetheless, should

artifacts or human remains be encountered, all work would cease immediately and the SHPD contacted. With the implementation of the above, no adverse impacts are anticipated.

8.4 SCENIC AND OPEN SPACE RESOURCES

8.4.1 Policy

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 which are not coastal dependent to locate in inland areas.

8.4.2 Analysis

Views to and along the shoreline are generally protected through the CZMA. However, there are no views from the residential property that were identified as scenic resources in the Maui Scenic Resource Guide (CHP 2006). Views to the ocean / shoreline from Hana Highway are hindered by an existing home and mature trees and vegetation. Two adjacent parcels to the west also obstruct views from Hana Highway to the ocean. However an open park area abutting the western-most parcel provides views to the ocean across Kaulahao Beach Park. To the east of the subject property, views to the ocean from Hana Highway are limited and sporadically interrupted by residential development and privacy walls. The proposed action would enable the safe, continued use of single-family residence at the site and safe public access in nearshore waters without impacting views to the shoreline.

Neighboring escarpments, boulders, and rocky features interrupts views along the shoreline. However, the shoreline hardening would be designed to be visually in concert with the oceanfront escarpment at the site. The construction of shoreline hardening would be at below and/or at the same elevation as the existing residence and would be setback from the ocean rather than impeding on the natural nearshore channel. Accordingly, no adverse impacts are anticipated on scenic and open resources, or views to or along the shoreline.

8.5 COASTAL ECOSYSTEMS

8.5.1 Policy

Objective:

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

Policies:

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

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

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

(D) Promote water quantity and quality planning and management practices which reflect the tolerance of fresh water and marine ecosystems and prohibit land and water uses which violate state water quality standards.

8.5.2 Analysis

The proposed action would prevent the presently exposed sediment and clay from entering nearshore waters, which would create more turbidity. Landscape planting would incorporate drought-tolerant, climate-adapted plants to minimize irrigation and reduce the need for chemical treatments. This would fertilizers, pesticides and insecticides, which can wash off during rainstorms and enter nearshore waters, from entering coastal waters and negatively impacting water quality and marine life (DAR, 2004). By avoiding the use of chemical treatments, adverse impacts to coastal ecosystems are substantially reduced. During the removal of the existing remnant debris and during construction of the proposed shoreline hardening, BMPs would be fully implemented to prevent discharges into ocean waters and to protect marine life. Long-term, the shoreline hardening would help reduce storm impacts, potential cliff failure, and episodic inputs of dirt and sediment. This in turn would help protect nearshore water quality, reef health and marine life.

8.6 ECONOMIC USES

8.6.1 Policy

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.

8.6.2 Analysis

The result of the proposed land use would allow the landowner to safely use their property for residential use while also protecting the health and safety of the public's current use of the shoreline. Residential use is in concert with agglomerating similar uses in the neighborhood. The site and area have access to public services and infrastructure such as: centralized potable water, wastewater, fire response and hydrants and electricity. The proposed action also provides the landowner with reasonable, safe use of their property and realization of the inherent economic value for which they purchased the property. In addition, the public would benefit from continued safe, debris free, recreational use of the waters abutting the subject

property. Additionally, the proposed action would stabilize a potentially unsafe shoreline area that is used by the public.

8.7 COASTAL HAZARDS

8.7.1 Policy

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;

(D) Prevent coastal flooding from inland projects; and

(E) Develop a coastal point and nonpoint source pollution control program.

8.7.2 Analysis

Development along the shoreline is subject to coastal hazards and consequently should be constructed and located out of harm's way to the extent feasible or constructed to withstand these forces of nature (Hwang, 2005). The existing residence is located outside of the tsunami inundation zone and above and inland of the flood zone, given the high elevation (~18 feet asl.) of the parcel. In contrast, the proposed shoreline hardening is in the flood zone and a flood development permit would be obtained during the building permit stage, where applicable.

The existing residence is located well inland of erosion prone areas and not within an active beach zone. Long-term chronic erosion is not expected to approach the residence during the building's lifespan. In contrast, the clay escarpment is subject to coastal hazards, such as tsunami run-up, flood inundation, high waves and storm surf. To prevent the embankments collapse, as has happened in the past, the proposed shoreline hardening is designed to withstand these forces and ameliorate their erosive, destructive impact. The structure would reduce pollution from sediments and clay that can have a negative impact on water quality leading to degradation of coral reefs and marine life habitat. The proposed hardening would also reduce the hazard to residents of the property and public recreational users of nearshore waters from the property's current unsafe condition. The design of the shoreline hardening would protect the subject property from continued erosion and adjacent properties from wave scour.

8.8 MANAGING DEVELOPMENT

8.8.1 Policy

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.

8.8.2 Analysis

Both the Environmental Assessment and the SMA assessment process encourage applicants to fully consider the effects of the proposed action in relation to the unique characteristics of the site and its environment. The process provides an opportunity to gather input, data and information from government entities and the public to facilitate modifications that would enhance coastal resource protection and reduce potential adverse impacts from the proposed action on a variety of resources and public services. By fully incorporating available information into site planning and aspects of the proposed action, coastal hazards and/or their negative effects can be avoided, minimized or mitigated. Further, risks associated with development along the shoreline can be better managed when they are evaluated in a holistic, littoral cell wide, public and private amenities and benefits context.

In this case, information on chronic long-term erosion, flood and wave inundation, storm surge and wave run-up, and tsunami inundation has been fully incorporated into the proposal's design and in consideration of alternatives to prevent or mitigate escarpment failure. Integration of comments, information and concerns expressed by the public and neighbors, government agency input, and public use considerations have been solicited relative to the proposed action. The comments, ideas and perspectives would be incorporated into the design considerations and the alternatives analysis of the proposal.

The process of obtaining public and agency insight will contribute to proposed measures to minimize, mitigate and avoid adverse impacts to coastal, environmental, recreational, historic and cultural resources and inform both the applicant and decision-makers regarding the prudence of the preferred and alternative actions.

8.9 PUBLIC PARTICIPATION

8.9.1 Policy

Objective:

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

Policies:

(A) Maintain a public advisory body to identify coastal management problems and to provide policy advice and assistance to the coastal zone management program;

(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-related issues, developments, and government activities; and

(C) Organize workshops, policy dialogues, and site-specific medications to respond to coastal issues and conflicts.

8.9.2 Analysis

Both the Environmental Assessment and the SMA assessment process help ensure that applicants are aware of coastal hazards and take appropriate steps to implement prudent coastal planning. In this case, this document has included reviews of important guidance such as the Hawaii Coastal Mitigation Guidebook (Hwang, 2005), The Maui Shoreline Atlas (Fletcher et. al., 2003a), The Beach Management Plan, and the Maui County Hazard Mitigation Plan (Pogue and Collum, 2006). A wide variety of information was disseminated to the applicant and structural engineer in developing the environmental assessment.

In addition, input is being solicited from members of the public, nearby neighbors, government agency personnel, and leaders in the coastal conservation field in preparing this document. Furthermore, the public is invited to participate in the EA process either through review and comment on the enclosed information, or by commenting on the requisite state-certified shoreline during the DLNR OCCL process. The public and government agencies would also have opportunities to participate either by submitting testimony, attending public hearings, or submitting comments on the proposed action during the SMA/SSV review by the Maui Planning Commission. As such, the public has an opportunity to comment and participate in this decision. Moreover, the EA helps provide an awareness of coastal, environmental, and social / recreational issues through development of the EA and its evaluation of the prudence of various alternatives and supporting documents.

8.10 BEACH PROTECTION

8.10.1 Policy

Objective:

Protect beaches for public use and recreation.

Policies:

(A) Locate new structures inland from the shoreline setback to conserve open space and to 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.

8.10.2 Analysis

There are no beaches at the subject property; however, Kaulahao Beach is nearby to the west. Beach protection is best achieved by avoiding erosion prone areas, allowing sand transport mechanisms to function without interruption, ensuring sand reservoirs are not impounded, and building habitable structures inland of areas that are projected to erode during a structures lifespan. The proposed structure is designed to interrupt and prevent sediment input from a clay embankment, but this would not hinder or adversely affect sand transport processes within the littoral cell. Sand and beach building materials are absent at the site and along the embankment at neighboring properties to the east.

The proposed action is intended to help avoid the deleterious effects of wave, storm and erosion action on the clay escarpment fronting the property. The proposed action also accounts for dynamics within the nearby beach and overall littoral zone. Based on the best available data, as well as past research and studies of the littoral cell's dynamics, adverse impacts to beach processes are not anticipated.

8.11 MARINE RESOURCES

8.11.1 Policy

Objective:

Implement the State's ocean resources management plan.

Policies:

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

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

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

(D) 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;

(E) 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

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

8.11.2 Analysis

The proposed action conforms to the 2007 and 2013 Ocean Resource Management Plans (ORMP). The ORMP is presently being updated but does not call for any specific actions in the Kuau area. However, it strongly encourages development that respects the mauka to makai connections within an ahupua'a. The existing residence and proposed shoreline hardening have been located to respect the public nearshore amenities. The proposed action would reduce degradation of nearshore waters and reef, help protect marine life, and would prevent the clay embankment from becoming a public safety hazard. The hardening has been designed to mitigate the coastal hazards at the site, such as tsunami, high waves, storm surge, and large surf. Adverse impacts to marine resources are not anticipated as a result of the proposed action.

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CHAPTER 9
SHORELINE SETBACK VARIANCE CRITERIA

§12-203-15 Criteria for approval of a variance.

(a) 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:
(1) Cultivation of crops;
(2) Aquaculture;
(3) Landscaping; provided that, the commission finds that the proposed structure or activity will not adversely affect beach processes and will not artificially fix the shoreline;
(4) Drainage;
(5) Boating, maritime, or water sports recreational facilities;
(6) Facilities or improvements by public agencies or public utilities regulated under HRS chapter 269;
(7) Private facilities or improvements that are clearly in the public interest;
(8) Private facilities or improvements which will neither adversely affect beach processes nor artificially fix the shoreline; provided that, the commission also finds that hardship will result to the applicant if the facilities or improvements are not allowed within the shoreline area;
(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 imposes conditions to prohibit any structure seaward of the existing shoreline unless it is clearly in the public interest; or
(10) Moving of sand from one location seaward of the shoreline to another location seaward of the shoreline; provided that, the commission also finds that the moving of sand will not adversely affect beach processes, will not diminish the size of the public beach, and will be necessary to stabilize an eroding shoreline.

Analysis: The proposed action conforms to criteria #7 and #9 relating to shoreline hardening. First, the structure is proposed for construction on private property by a private entity and does not extend into publicly owned property. Second, there is a clear public interest in protecting access through the water channel created by the nearshore reef shelf. Collapse of the embankment could cause sediment, dirt, clay and/or debris to fill the channel and subsequently block or hinder access. Collapse of the embankment could create a public safety hazard to users in the channel or along the shoreline. Both surfers and swimmers use the nearshore waters for ocean recreation. This public amenity could be degraded by increased turbidity and water pollution created by the escarpment's erosion or collapse, whether it is gradual, chronic or episodic. The proposed action would artificially fix the shoreline and would prevent further erosion of the clay embankment. By preventing this erosion, the public interest is served. Additionally, the landowner and property users would incur risk of injury if the shoreline hardening does not exist. These risks relate to potential injury from a fall or the unexpected episodic collapse of the clay escarpment that could injure the public or property users.

(b) A structure or activity may be granted a variance upon grounds of hardship if:
(1) The applicant would be deprived of reasonable use of the land if required to fully comply with the shoreline setback rules;
(2) The applicant's proposal is due to unique circumstances and does not draw into question the reasonableness of the shoreline setback rules; and
(3) The proposal is the practicable alternative which best conforms to the purpose of the shoreline setback rules.

Analysis: The proposed action does not question the need and appropriateness of shoreline setbacks to avoid coastal hazards. The situation is unique in that a water-based public access point fronts the property. Given that the release of clay sediment to the nearshore environment is adverse to coral growth, water clarity, and retention of natural features, the proposal is a practical alternative designed in concert with the shoreline environment and coastal hazards that affect the property.

(c) Before granting a hardship variance, the commission must determine that the applicant's proposal is a reasonable use of the land. Because of the dynamic nature of the shoreline environment, inappropriate development may easily pose a risk to individuals or to the public health and safety. For this reason, the determination of the reasonableness of the use of land should properly consider factors such as shoreline conditions, erosion, surf and flood conditions and the geography of the lot.

Analysis: The proposed action is a reasonable use of oceanfront property that is subject to coastal hazards that directly affect individual and public health and safety. Collapse of the escarpment could risk personal injury to both inhabitants at the property and public users of the lateral water and shoreline access fronting the property. In light of potential risk, the proposed action is a reasonable use of land that protects a public amenity and reduces the public's exposure to harm.

(d) For purposes of this section, hardship shall not include: economic hardship to the applicant; county zoning changes, planned development permits, cluster permits, or subdivision approvals after June 16, 1989; any other permit or approval which may have been issued by the commission. If the hardship is a result of actions by the applicant, such result shall not be considered a hardship for purposes of this section.

Analysis: The proposed action is not the result of a discretionary government approval. Additionally, the hardship in this situation would be from exposure to negligence to reduce risk, liability, or potential injury. A hardship exists from the continued degradation of the nearshore marine environment from clay sedimentation if unabated, rather than an economic hardship to the property owner.

(e) No variance shall be granted unless appropriate conditions are imposed:
(1) To maintain and require safe lateral access to and along the shoreline for public use or adequately compensate for its loss;
(2) To minimize risk of adverse impacts on beach processes;
(3) To minimize risk of structures failing and becoming loose rocks or rubble on public property; and
(4) To minimize adverse impacts on public views to, from, and along the shoreline. For purposes of this section only, "adversely impacts public views" means the adverse impact on public views and open space resources caused by new building structures exceeding a one-story or thirty-foot height limitation; and
(5) To comply with chapters 19.62 and 20.08, Maui County Code, relating to flood hazard districts and erosion and sedimentation control respectively.

Analysis: The applicant recognizes the prudence and purpose of the mandatory conditions associated with a shoreline variance and would comply with all required government approvals.

(f) Notwithstanding any provision of this section to the contrary, the commission may consider granting a variance for the protection of a legal habitable structure or public infrastructure; provided that, the structure is at risk of damage from coastal erosion, poses a danger to the health, safety and welfare of the public, and is the best shoreline management option in accordance with relevant state policy on shoreline hardening.

Analysis: In this unique circumstance, a structure is not endangered; however a public amenity is jeopardized by the risk of the clay escarpments collapse. As such, the situation poses a danger to the health, safety and welfare of the public. In considering viable alternatives for the site, the proposed action is reasonable and the best management option in accordance with state and county shoreline management policies.

Summary Analysis: The proposed action conforms to criteria #7 and #9 relating to permissible shoreline hardening. Given the exposure of the shoreline to coastal hazards and its potential to adversely affect public and private amenities, including nearshore access to recreational sites, the proposed action is a reasonable use of the shoreline and an appropriate management strategy to address site-specific shoreline issues. The proposed action is an acceptable remedy that adheres to the goals and objectives of the Shoreline Rules for the Maui Planning Commission and the Hawaii Coastal Zone Management Act.

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CHAPTER 10
EFFECTS AND COMMITMENTS

10.1 ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

Environmental impacts associated with the proposed action are thoroughly discussed within this document. The document analyzes potential effects on the environment, infrastructure, land use, socio-economics, cultural resources, coastal hazards and resources. If approved, the proposed action would commit the ocean frontage of the parcel to man-made armoring rather than a sheer clay embankment that is 16 to 18 feet high. While shoreline armoring is generally discouraged because of its adverse effects on sand transport processes, there are no sand supplies at this location. Allowing continued erosion of embankment increases sedimentation of nearshore waters and increases turbidity, thereby reducing light within the water column and depriving corals of necessary sunlight for growth and fecundity.

Armoring the shoreline would also result in changes to the visual aesthetic character of this segment of the shoreline. Yet views to and along the shoreline are hindered both by the irregular curvature of the shoreline and by large rocks and boulders along the shore. From offshore, surfers would likely be able to recognize the spot because it would differ in texture from neighboring unengineered armorments. But this affect would not be significant in view of the entire coastline and may be helpful in locating the access channel back to the beach park.

Continued residential use of the property is in concert with its State Land Use, Community Plan and zoning land use designations. There may be temporary air, noise and water quality impacts associated with grading and site work that could create dust, debris, sediment, and nuisance from heavy equipment operations. However, these activities would be temporary and intermittent and BMPs would be fully implemented to reduce adverse effects.

An erosion control and dust management plan would be implemented during construction as required by MCC and all activities would be conducted in compliance with DOH regulations and guidelines. Noise Control standards would be used and a Community Noise Control Permit would be obtained where applicable.

In summary, the proposed action would result in armoring of the shoreline, which would change the visual character of the ocean frontage of the parcel. This minimal loss is offset by enhanced public safety and improved water quality that benefits marine life and reef health. The armoring would allow for the continued residential use of the property, while respecting and protecting the public's interest and right in having safe access along the shoreline. The resulting outcome of the proposed action is not anticipated to create any negative effects on coastal or public resources.

10.2 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Should the proposed shoreline hardening be granted approval, certain resources, such as materials and labor would be committed to construction of the armoring. These materials and human resources would be irretrievable. Armoring the oceanfront portion of the property would encase the clay embankment, thereby making the sediment irretrievable. The proposed action would also irreversibly harden the shoreline against wave attack and bank collapse. The resources used for construction and alteration of the embankment represent an irreversible and irretrievable commitment that would have favorable outcomes on public safety, the nearshore environment, lateral access, and use of the residential property.

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CHAPTER 11
DLNR OCCL SHORELINE HARDENING CRITERIA

The Department of Land and Natural Resources (DLNR), Office of Conservation and Coastal Lands (OCCL) has guidelines relative to shoreline hardening in the State Conservation District. The Coastal Lands Program is involved with initiating and developing innovative shoreline management techniques that will help with the long-term goal of beach and coastal preservation. The Coastal Lands Division has also been developing public education programs and distributing information and guidelines on the best management, erosion control and construction practices for Hawaii's coastal areas. Through these programs, the OCCL hopes to provide cutting edge coastal engineering and management and solutions that will prove to be useful for the next generation of coastal managers.

OCCL regulates lands seaward of the certified shoreline. The 'shoreline' is located at the highest wash of the waves during the highest tide of the year, absent named coastal storms. The previous shoreline followed the base of the man-made revetment that protruded seaward of the present clay escarpment. However, storm action has caused the revetment to fail and become debris along the shoreline. The new shoreline, if properly delineated, would assumedly be the base of the existing clay escarpment. The delineation would place a portion of the project clearly within the jurisdiction of the OCCL, and by default would place it in the general resource subzone. As illustrated in the site plans, the shoreline hardening would be entirely within the confines of the landowner's property boundaries. As such, the DLNR OCCL may have jurisdiction over the area but the landowner has property rights for the portion of land that has eroded behind the former shoreline hardening.

In 1999, the BLNR adopted COEMAP as an internal policy for managing shoreline issues including erosion and coastal development. The Hawaii Coastal Erosion Plan (COEMAP) lists five alternatives for erosion management: abandonment, beach restoration, erosion control, adaptation, and hardening. In this circumstance, abandonment would not address the present hazard to the public of existing debris and potential debris created by the escarpments collapse. Beach restoration is not a viable option because no beach or sandy shoreline fronts the property and the addition of sand to the littoral cell would help slow, but not prevent erosion of the clay embankment. Erosion control using coir bags, woven matts, vegetative replanting, sand replenishment or other 'soft' measures would have negligible impact during high surf and large storm events that have been recorded at the site. Consequently, soft measures for erosion control could reduce the rate of erosion over time, but would have limited effect in preventing episodic collapse of the clay escarpment due to coastal storms, particularly in the winter season when wave heights exceed 15 feet. Adaption to storm surge and coastal erosion would entail locating structures out of harm's way. In this case, the residential home is located well inland of the embankment and the building is not subject to coastal erosion. Elevating a residence on post and pier is another adaption strategy, useful where flood and storm surge inundate the building. However, the home is located well above the flood plain and coastal storm surge and wave inundation area. Adaption therefore, has limited potential to positively affect the situation.

Although shoreline hardening is an option of last resort, particularly on sandy shorelines, it can be a viable and prudent response to erosion, particularly when the soils exposed would adversely affect the nearshore environment. In this case, inputs of clay sediment would be deleterious to coral reef vitality, would degrade water quality and increase turbidity, could fill the existing water-based nearshore access channel or could fail episodically causing risk of injury to the public and/or recreational use of the nearshore area. Consequently, the following evaluative criteria, based on the OCCL Conservation District Rules, are provided to analyze the prudence of the proposed action.

Evaluation Criteria

The Department or Board will evaluate the merits of a proposed land use based upon the following eight criteria (HAR §13-5-30 (c)):

1. The purpose of the Conservation District is to conserve, protect, and preserve the important natural and cultural resources of the State through appropriate management and use to promote their long-term sustainability and the public health, safety, and welfare. *(HAR §13-5-1)* How is the proposed land use consistent with the purpose of the conservation district?

   Response: The proposed action would substantially reduce sediment and clay inputs into nearshore waters and off shore coral reefs within the conservation area. Clay and sediment stresses coral and reduces its vitality. As such, the proposed shoreline hardening promotes long-term health of the reef system. Additionally, the proposed action would tend to enhance public health, safety and welfare when using nearshore waters and accessing the shoreline by addressing the unstable clay embankment that creates a risk to public health and safety. The action also involves the removal of an existing debris field created by the remnant seawall, which currently hinders lateral access along the shoreline.

2. How is the proposed use consistent with the objectives of the subzone of the land on which the land use will occur? *(HAR §13-5-11 through §13-5-15)*

   Response: By default, lands seaward of the shoreline fall into the resource subzone category. This subzone allows for shoreline hardening contingent upon obtaining a Conservation District Use Permit. The CDUP must be approved by the BLNR during public hearings during which the public has an opportunity to comment.

3. Describe how the proposed land use complies with the provisions and guidelines contained in chapter 205A, HRS, entitled "Coastal Zone Management".

   Response: A full assessment of the project's compliance with CZM, SMA, and Shoreline Rules criteria is provided in Chapter 8, Coastal Zone Management (pages 8-2 – 8-9) and Chapter 9, Shoreline Setback Variance Criteria (pages 9-1 – 9-3) of this report. Additionally, a Coastal Zone Management Consistency Determination would be obtained for the proposed action from the State Office of Planning if required.

4. Describe how the proposed land use will not cause substantial adverse impact to existing natural resources within the surrounding area, community or region.

   Response: Shoreline hardening at the subject property would not interrupt sand transport or transport mechanisms within the littoral system. The project would not degrade, but rather protect, nearshore natural resources. The hardening is limited to a specific property and would not adversely impact nearby beaches or public parks.

5. Describe how the proposed land use, including buildings, structures and facilities, is compatible with the locality and surrounding areas, appropriate to the physical conditions and capabilities of the specific parcel or parcels.

   Response: The proposed hardening is compatible with the shoreline environment at the subject property. Given the erodible clay escarpment fronting the subject property, installation of hardening

would reduce the embankment's erosion, and sediment / clay inputs to neashore waters that degrade water quality, increase water temperature, and produce turbid waters nearshore. Shoreline hardening occurs fronting the two parcels immediately to the west and large boulders have been placed along the entire shoreline to the east, which provides fortification against storm surge. The hardening is designed in consideration of the physical conditions of the parcel and its coastal environment.

6. Describe how the existing physical and environmental aspects of the land, such as natural beauty and open space characteristics, will be preserved or improved upon.

   Response: The existing shoreline environment consists of boulder-strewn hardening. Views to the shoreline from the nearest public thoroughfare would not be diminished by the presence of the proposed shoreline hardening, since it would not block or hinder the existing view-shed. Views along the shoreline are not homogenous in this section of the bay and would not be substantially impaired by the existence of a man-made structure. The structure may contrast in form, color and texture to neighboring boulder strewn shoreline environments, however since a continuous view of the shoreline is not available, the limited interruption created by an engineered structure at this location would not significantly affect views along the shoreline.

   The portion of land between the embankment and water's edge is designated as Open Space in the Paia-Haiku Community Plan. Since the hardening is intended to coincide with the seaward edge of the owner's property and since the existing debris field, which is both within and outside of the owner's property, will be removed, the amount of open space would not be substantially reduced relative to the public's present ability to use or appreciate this open area. The shoreline hardening would not hinder or interrupt the present amenities that accrue to the public from the open space designation. Rather, the hardening and debris removal would tend to retain and improve the benefits of lateral access along the shoreline and in nearshore waters for recreational purposes. The proposed hardening is compatible with, and in keeping with the preservation of open access along the shoreline and is in concert with the physical aspects of the steep embankment.

7. If applicable, describe how subdivision of land will not be utilized to increase the intensity of land uses in the Conservation District.

   Response: The existing shoreline environment consists of a clay embankment and boulder-strewn area between the sheer embankment and water's edge. Hardening of the shoreline with an engineered structure would not lead to intensification of use or increased density of use of the lands adjacent to the structure. However, the structure would enhance the safety of those using nearshore waters for recreational purposes, which is in keeping with the purpose of the conservation district.

8. Describe how the proposed land use will not be materially detrimental to the public health, safety and welfare.

   Response: Continued erosion of the clay escarpment could lead to detriment effects on the public's recreational use of nearshore waters. By reducing the potential for catastrophic failure of the embankment, public health, safety and welfare would be enhanced. Moreover, preventing the release of clay and sediment into nearshore waters would reduce turbidity, algal growth, and potentially higher pathogen counts associated with colloids in sediment. Failure to harden the shoreline and encapsulate the clay escarpment with an engineered structure could be detrimental to the public's health, safety and welfare. Thus, the proposed action is prudent in terms of conserving public amenities and protecting public health, welfare and safety, particularly for surfers and swimmers at this location.

Cultural Impacts

Articles IX and XII of the State Constitution, other state laws, and the courts of the State require government agencies to promote and preserve cultural beliefs, practices, and resources of Native Hawaiians and other ethnic groups.

A. Please provide the identity and scope of cultural, historical and natural resources in which traditional and customary native Hawaiian rights are exercised in the area.

Response: The existing shoreline environment consists of a clay embankment and boulder-strewn area between the sheer embankment and water's edge. Use of the area for traditional and customary practices is not known to occur, and there are no known or identified cultural properties at the project site based on a review of SHPD records. The clay soils and rocky terrain are not likely to yield cultural artifacts and are generally not suitable for *'iwi* or burials. Nearshore gathering of limu or marine resources and fishing is not prevalent at the site, and instead occurs along the sandy public beach two properties away. Human remains are prevalent within a sandy soil layer along the headland on the opposite side of the beach. This area and its adjacent cemetery have been protected by a conservation easement and has been identified and thoroughly studied by the SHPD.

B. Identify the extent to which those resources, including traditional and customary Native Hawaiian rights, will be affected or impaired by the proposed action.

Response: Native Indigenous rights would not be adversely affected by the proposed shoreline hardening. Such hardening, if approved, would facilitate continued recreation and continued safe lateral access within the nearshore area. The project would not impair customary and traditional rights.

C. What feasible action, if any, could be taken by the BLNR in regards to your application to reasonably protect native Hawaiian rights?

Response: Approval of the shoreline hardening would not adversely impact Native Indigenous rights. In the absence of shoreline hardening, the marine environment would continue to be subject to degradation from sediment and clay inputs, which can add stress to corals and marine life reducing their vitality. Approval of the proposed action would further protection of marine resources and indirectly enhance marine resource quality to the benefit of Indigenous users and their rights.

Furthermore, archeological monitoring would be implemented during ground altering activities. In the event that historic remnants or cultural remains are encountered, all work would cease and the SHPD contacted immediately.

Other Impacts

- Does the proposed land use have an effect (positive/negative) on public access to and along the shoreline or along any public trail?

  Response: The proposed action would enhance safe public access along the makai shoreline particularly the nearshore channel that provides access to recreational spots within Tavares Bay.

- Does the proposed use have an effect (positive/negative) on beach processes?

  Response: The proposed action would have no impact on beach processes, particularly since there are no sand resources fronting the property. The proposed action would not interrupt littoral transport processes.

- Will the proposed use cause increased runoff or sedimentation?

  Response: The proposed action would reduce unconstrained erosion of a clay embankment and would prevent sediment from entering nearshore waters.

- Will the proposed use cause any visual impact on any individual or community?

  Response: The proposed action would not hinder views to the shoreline from the nearest public road. The action would not adversely impact views along the shoreline, given its uneven face and boulder-strewn nature.

- Please describe any sustainable design elements that will be incorporated into the proposed land use (such as the use of efficient ventilation and cooling systems; renewable energy generation; sustainable building materials; permeable paving materials; efficient energy and water systems; efficient waste management systems; et al.).

  Response: The proposed action would be designed with consideration of the sites exposure to storm surge, wave run-up, sea level rise, and the base flood elevation. The design would be sustainable in the context that it is designed for long-term erosion control.

- If the project involves landscaping, please describe how the landscaping is appropriate to Conservation District *(e.g. use of indigenous and endemic species; xeriscaping in dry areas; minimizing ground disturbance; maintenance or restoration of the canopy; removal of invasive species; habitat preservation and restoration; et al.).*

  Response: The project will not require landscape planting within the shoreline setback area.

- Please describe the Best Management Practices that will be used during construction and implementation of the proposed land use.

  Response: Project construction would be sequenced to avoid high tides, storm and rain events. Ground altering would avoid periods of inclement wet weather. Silt curtains and/or fences would be installed and maintained to prevent pollution of neashore waters. Visual monitoring of water quality would be ongoing and appropriate action taken should an increase in turbidity be observed. A site-specific erosion control plan and standard construction protocols would be fully implemented.

- Please describe the measures that will be taken to mitigate the proposed land use's environmental and cultural impacts.

  Response: The proposed action would not adversely impact the environment and would serve to protect marine and water quality resources. Should artifacts or cultural remnants be encountered, all work would cease and the SHPD contacted immediately.

Management Plan Requirements

Certain land uses require that the Board of Land and Natural Resources approve a Management Plan. The Management Plan can be processed concurrently with the Conservation District Use Application, and must be consistent with the Hawaii Administrative Rules Chapter 13-5, Exhibit 3.

Response: A management plan would be developed to the satisfaction of the DLNR OCCL, as necessary. Additionally, an erosion control plan would be submitted to the Maui County Department of Public Works as required and best management practices fully implemented throughout the duration of the project's construction.

CHAPTER 12
OEQC SHORELINE HARDENING CRITERIA

The Office of Environment Quality Control issued *Shoreline Hardening Policy and Environment Assessment Guidelines* in December 1998 and reiterated in the 2004 *Guidebook for the Hawaii State Environmental Review Process*. Although the OEQC deemed the guidelines were obsolete on April 11, 2013, the policies and guidance are provided here for informational and historic purposes.

II. General Policy

Hardening of the shoreline should be considered the erosion management option of last resort, and its use should be avoided if other options are available. In addition, development in coastal hazard zones, including erosion hazard zones and coastal flood zones should be avoided in order to:

(1) Prevent the inevitable financial and personal hardships that befall individuals and families, and the expenditure of public funds that accompany the occurrence of coastal hazards on developed shorelines;
(2) Prevent the inevitable need to harden the shoreline where there is chronic erosion and the resulting loss of public beaches, lateral shoreline access, open space and view corridors, and littoral sand due to sediment impoundment behind walls;
(3) Mitigate threats to inhabited structures, and public infrastructure from coastal hazards; and
(4) Avoid the need for future public expenditures in responding to damage caused by hurricanes, tsunami, high wave impacts and other coastal hazards;

III. Response to applications for seawalls, groins and revetments

All decision makers should discourage the construction of seawalls, revetments or other shoreline hardening devices that have the potential to lead to beach loss and that also have the tendency to encourage development in areas of chronic erosion. As an alternative to a hardened structure, applicants should consider the applicability of coastal dune enhancement, beach and dune restoration, sand replenishment, and other "soft" approaches to mitigating coastal erosion. Applicants should also evaluate the potential for moving dwellings and other structures away from the shoreline as a means of mitigating the effects of erosion. Finally, any application should include the information requested in the attached guidelines for assessing shoreline alteration and hardening projects.

If after a thorough analysis of an application, the decision maker finds by clear and convincing evidence that the impact on public trust resources would be negligible, alternatives to hardening would be impractical, substantial hardship to the applicant is real, and these compelling reasons dictate that a hardened structure should be approved, any approval that is granted should be conditioned on the applicant monitoring shoreline response to the structure. Monitoring should be conducted using standard coastal surveying techniques to document short-term and long term changes in the beach profile both on the subaerial beach and offshore. In order to ensure that planning authorities retain the ability to protect our beaches and because future events may require the removal of seawalls, revetments or groins, all variances and permits should either have an expiration date (subject to renewal), or be revocable upon a finding of environmental impact. In other words, the variance or permit should not confer a vested right to keep the structure in perpetuity.

In general, a variance should be viewed as an extraordinary exception, which should be granted sparingly. The reasons to justify approval must be substantial, serious and compelling.

Analysis: In this unique circumstance, there is a clear and present danger to the public using the shoreline for lateral access as well as for lateral water-borne access to surf sites in Tavares Bay and swimming in the quiescent waters formed by the just offshore reef shelf.

Allowing continued erosion of the clay embankment would not only lead to its eventual collapse, perhaps causing injury to nearshore recreational users. Continued erosion would contribute to increased nearshore water turbidity, degradation of nearshore reefs, degradation of the reef shelf that inhibits wave action near-shore, and create the potential for the nearshore channel to be filled with debris. The latter would cause a public safety issue and is not a preferred outcome for the public's use of the nearshore area.

There are no beaches or sandy shoreline fronting the site that would be adversely affected by the shoreline hardening or need monitoring. Best management practices would be implemented and appropriate visual monitoring of nearshore water quality for turbidity conducted during construction activities to ensure that water quality is maintained and that sediment is not released into nearshore waters.

Thus, the proposal conforms to the intent of the OEQC policy, which is to retain valued public trust resources and coastal amenities.

CHAPTER 13
FINDINGS AND CONCLUSIONS

13.1 OVERVIEW

The proposed action triggers compliance with HRS Chapter 343 regarding Environmental Review because it is a use of the shoreline area. The law and its associated rules for implementation, provide succinct significance criteria upon which to evaluate a proposed action. These significance criteria are described in Section 12 of the Administrative Rules, Title 11, Chapter 200, "Environmental Impact Statement Rules".

13.2 EVALUATIVE CRITERIA

The level of significance of the proposed action's potential to impact a resource is determined based on the evaluative criteria provided in the rules. The outcome of the evaluation is that the potential impact of the proposed action is anticipated to be "not significant", "less than significant", "mitigated to less than significant", or "significant". An analysis of the proposed action in relation to each of the criteria is provided below.

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

The proposed action does not, in and of itself, involve an irrevocable commitment to loss or destruction of any natural or cultural resource. Mechanical ground altering at the site would require the implementation of the SHPD-approved Archaeological Monitoring Plan, an Erosion Control Plan and the implementation of best management practices. Should artifacts be encountered, all work would stop and the SHPD contacted. As such, the granting of the proposed action does not result in the loss or destruction of cultural or natural resources with the implementation of the aforementioned mitigation measures and BMPs.

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

The proposed action does not curtail the beneficial uses of the environment. The outcome of the proposed action would address a potentially dangerous condition created by the unstable clay escarpment. The project would facilitate the safe use of the nearshore area by the public and the continued use of the property as a single-family residence. In light of the representations made herein, the shoreline hardening would not impinge on the public's right to access and/or use shoreline and ocean recreation resources along or near the subject property. The proposed action would have a favorable effect on the environment by preventing the release of clay into ocean waters and reducing water pollution from unconstrained erosion of sediment from the existing embankment.

3. The Proposed Action Does Not Conflict with the State's Long-term Environmental Policies or Goals or Guidelines as Expressed in Chapter 344, Hawai`i Revised Statutes

Opportunities for public input and discussion are being provided through the EA/SMA/SSV process, as well as the State shoreline certification process, in keeping with the State's environmental policies and guidelines. Furthermore, the proposed action does not conflict with the State's long-term goals, policies or guideline and does not conflict with long-term environmental policies, goals, and guidelines of the State of Hawaii.

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

The economic or social welfare of the community or State would not be substantially affected. In the near term, the outcome of the proposed action would provide employment in construction. In the long-term,

the proposed action would allow for safe use and passage by the public, swimmers and surfers along the shoreline and through the existing natural quiescent channel adjacent to the shoreline.

5. The Proposed Action Does Not Affect Public Health

Public health would not be adversely affected if the proposed action were approved. BMPs would minimize potential adverse effects on water quality and public health during construction activities. Thereafter, water pollution from clay and sediment would be reduced creating positive effects on public health and creating a cleaner environment for swimmers and nearshore water users.

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

The proposed action would not increase the potential for increased population or effects on public facilities. Substantial secondary impacts are not anticipated from the proposed action.

7. No Substantial Degradation of Environmental Quality is Anticipated

Implementation of a full suite of BMPs would ensure that nearshore water quality is protected during construction. Furthermore, a number of measures are included in the design of the proposed shoreline hardening to avoid, minimize or mitigate potential adverse impacts associated with coastal hazards. The proposed action would prevent erosion and minimize the potential for environmental degradation, particularly in the context of water quality. Thus, substantial or significant degradation of environmental quality is not anticipated.

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

The proposed action applies to a single parcel. Should an SMA/SSV be approved, it would result in the construction of shoreline hardening and the subsequent continued use of the property as a single-family residence. Sufficient infrastructure exists to provide for residential use of the residence. Down-drift effects of the shoreline hardening have been accounted for in the structure's design so as to avoid adverse effects on neighboring and adjacent properties. The proposed hardening would not interrupt sand transport or impinge on sand resources that are crucial for the health and retention on nearby Kaulahao Beach. Accordingly, the proposed action does not involve a commitment to larger actions or result in cumulative effects beyond those specific to the subject parcel. No additional lands are involved beyond the individual privately owned parcel.

9. No Rare, Threatened or Endangered Species or Their Habitats Would be Adversely Affected by the Proposed Action

There are no rare, threatened or endangered flora and fauna on the subject parcel. Flora observed on the parcel is common to the north shore of the island of Maui. Rare and protected species can be observed transiting off shore and in the warm tropical waters (**Table 3-1**). Turtles are commonly observed feeding along the beach to the west of the subject property, however there are no known haul-out, breeding or nesting areas along the subject property and no turtles have been known to nest at the site. Hawaiian Stilts are not commonly observed, as there is seldom standing water or wetland habitat that they prefer. Monk seals and whales may be observed as transient species but no seals have been known to use the shoreline fronting the property. Wedge-tailed shearwater or 'ua'u kani (*Puffinus pacificus*) are not known to use the site for nesting purposes, given the clay embankment is not preferred habitat (DAR, 2005). However, this species can be found along the sandy-loam headlands in the protected park area to the west of the project site. The proposed action however would have no effect on the protected area and is limited to the embankment fronting the property.

10. Air Quality, Water Quality or Ambient Noise Levels Would Not be Detrimentally Affected by the Proposed Project

Air, ambient noise levels, and water quality would not be adversely affected by the proposed action. BMPs would be fully implemented to ensure protection of water and air quality. Similarly, elevated noise levels from construction activities would be minimized through the implementation of standard operating procedures, such as restricting the timing and intensity of heavy equipment operation. Where applicable, ministerial permits would be obtained and requisite mitigation measures implemented to reduce sound levels and minimize potential adverse effects to air and water quality. In the long-term, the proposed action would have a favorable impact on water quality by preventing the erosion of the escarpment and corresponding release of dirt and clay into the water column and would prevent increased turbidity.

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 action, if authorized, would result in the construction of shoreline hardening to provide safe residential use of the site. The residence itself and its building footprint are located outside of hazardous and environmentally sensitive areas. There are no wetlands, estuaries, or fresh waters, rivers, streams, or gulches at the project site.

The proposed shoreline hardening would be designed in recognition of the seaward portion of the property's exposure to tsunami, flooding, coastal erosion, and the dynamics of the active littoral cell. Appropriate design and construction mitigation measures have been taken into account so as to respect and avoid environmentally sensitive areas, such as the quiescent channel immediately offshore and the reef shelf, which provides protection for the channel. Encasing clay through shoreline hardening is a proactive means of reducing sediment inputs into nearshore waters and protecting reef resources along the coastline. The proposed hardening would also prevent the clay embankment from collapsing and blocking or adding debris to the abutting quiescent channel used by the public for ocean recreation.

12. The Proposed Action Would Not Substantially Affect Scenic Vistas and View planes Identified in County or State Plans or Studies

Views from Hana Highway across the residential property to the ocean were not identified as scenic resources in the Maui Scenic Resource Guide (CHP 2006). Views to, and along, the shoreline are protected through the CZMA and the proposed action would result in little interference with existing coastal views. The shoreline hardening would be constructed into the existing embankment and would not block views to the ocean or hinder views along the shoreline given its heterogeneous nature. In consideration of the aforementioned, the proposed action would not substantially affect scenic vistas or view planes.

13. The Proposed Action Would Not Require Substantial Energy Consumption

The property is currently serviced by centralized electric provided by MECO. No substantial energy consumption is anticipated as a result of the proposed action. The resultant continued single-family use of the property is within the capacity provided by MECO for the neighborhood. The construction of shoreline hardening does not pose the need for upgrades in utility generation capacity. As such, the proposed action (and/or its outcome) would not require substantial energy consumption.

13.3 SUMMARY

Based on the foregoing findings, it is anticipated that the proposed action would not result in significant or substantial adverse impact on the environment or natural resources. Accordingly, the accepting authority for the proposed action may consider a Finding of No Significant Impact (FONSI).

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CHAPTER 14
OTHER PERMITS, APPROVALS, AND AUTHORIZATIONS

14.1 REQUISITE DISCRETIONARY APPROVALS

A. A Finding of No Significant Impact by the Maui Planning Commission

B. Approval of a Special Management Area Major Use Permit by the Maui Planning Commission

C. Approval of a Shoreline Setback Variance by the Maui Planning Commission

D. Approval of a Conservation District Use Permit by the Board of Land and Natural Resources

14.2 REQUISITE MINISTERIAL APPROVALS

Maui County Department of Public Works

- Grading permit
- Building permit
- Possibly Retaining Wall permit

Maui County Planning Department

- Shoreline Setback Determination
- Special Flood Hazard Area Development permit
- Flood Elevation Certificate

Department of Land & Natural Resources

- Right of Entry Permit
- Non-Exclusive Easement – in the event that any portion of the shoreline hardening is located on State lands

14.3 INDIVIDUALS AND STAKEHOLDERS CONSULTED

Tara Owens, Sea Grant Extension Agent for Maui County

James Buika, Coastal Resources and Shoreline Planner, Maui County Planning Department, Current Division, Coastal Zone Management Program

Andy Bohlander, Sea Grant Extension Agent, DLNR OCCL

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APPENDIX A.
STRUCTURAL ENGINEERING REPORT

Preliminary Structural Engineering Report for Shoreline Protection Improvement at 475 Hana Highway Pa'ia, Hawaii 96779

Prepared for:
Nicolas Argyropoulos

Structural Engineering
Inspection & Evaluation Services

106 Nokekula Loop
Wailuku, HI 96793
Phone: 808-398-6749

October 21, 2013

PRELIMINARY STRUCTURAL ENGINEERING REPORT
FOR
SHORELINE PROTECTION IMPROVEMENTS
AT
475 HANA HIGHWAY, PA'IA, HAWAII 96779

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SECTION ONE

PROJECT DESCRIPTION

1.1 Background

In November 2012, as a part of a shoreline protection improvement project, AAA Structural Engineering Inspection & Evaluation Services was commissioned to assess the existing condition of the shoreline fronting the property located at 475 Hana Highway, Pa'ia, on the Hawaiian island of Maui, identify feasible and practical options to address the precarious conditions at the referenced site, recommend a preferred option, present a probable overall construction cost opinion for the recommended option, and prepare a preliminary structural engineering report that includes its findings and recommendations for implementation of the referenced shoreline protection improvement project.

This report is submitted for the said purpose. The report presents preliminary conceptual drawings for the proposed shoreline modifications at 475 Hana Highway, Maui, Hawaii. These drawings are the result of engineering assessment of the existing conditions and development of a conceptual structural system for the proposed shoreline modifications. The report concludes with a probable construction cost opinion based on the proposed structural system shown on the conceptual drawings included herein.

1.2 Description of Existing Conditions

The subject property is a shorefront land parcel located at 475 Hana Highway along the north coast of Maui. The geographic location of the property is shown on Figure 1-1. As a shorefront property, the project site is exposed to north swells and trade wind waves. An important characteristic of the subject property is that the adjacent properties on both sides are protected by rock revetments. The adverse impacts of the environmental factors have resulted in failure and disintegration of the original hardened rock shoreline protection rendering the property exposed to direct impact of coastal waves and high tides. The chronic impact of coastal waves and high tides and the flanking effect due to the adjacent hardened shoreline properties have led to a dramatic failure of the unprotected soil at the subject property creating an intrinsically precarious 16 feet high vertical bluff that is prone to failure at any time. In addition to the danger associated with the collapse of the bluff and possible ensuing loss of life, the existing unprotected and unstable condition of the shoreline land constitutes a potential economic loss mechanism for the owner since as the bluff gradually or suddenly moves further landward, the shoreline as defined by the Laws of the State of Hawaii also moves landward and the ownership of the affected section of the land is automatically transferred from the current owner to the State of Hawaii. Note that the owner of the subject property has already lost about 438 square feet of his property due to the erosion and collapse of the shoreline soil.

1.3 Required Action and Possible Options

Unless loss of property and possible danger to human welfare are unnaturally considered acceptable, the necessity and urgency of taking appropriate measures to effectively address the existing safety hazards and to prevent further loss of property at the referenced location are undisputable. To this end, some shoreline protection improvements are required.

Generally, the most reasonable approach to the design and implementation of any shoreline improvement project is a balanced one where the proposed activities and improvements while being effective are minimized and do not cause irreversible adverse impact to the environment and the adjacent properties.

Considering the existing conditions at the subject property, while construction of a shoreline protection structure is a logical choice, the nature, layout, and relative location of the structure require an objective method where both the public and private interests are observed as practically possible.

Possible options for a shoreline protection structure at the referenced property include:

1. Building a conventional reinforced concrete cantilever seawall with nearly vertical textured face that follows the shoreline as defined by the State of Hawaii,

2. Building a tiered or terraced wall with a conventional reinforced concrete cantilever wall as the main bottom wall and two short reinforced masonry walls creating a terraced configuration,

3. Building an anchored reinforced shotcrete wall with nearly vertical textured face that follows the shoreline as defined by the State of Hawaii and textured wall,

4. Building a tiered or terraced wall with an anchored reinforced shotcrete wall as the main bottom wall and two short reinforced masonry walls creating a terraced configuration.

5. Building a hybrid revetment – retaining wall where the revetment consists of an armor stone layer placed on top of a stone underlayer that, in turn, is underlain by geotextile filter fabric. The retaining wall at the end of the revetment consists of short reinforced concrete masonry with stone veneer.

1.4 Discussion of Possible Options

While all five referenced options address existing precarious condition of the unprotected shoreline and provide the required protection against future erosion and loss of land, their impact on the environment and their feasibility as regards the adjacent properties differ as follows:

Options No. 1 and No. 2 require considerable excavation at the property lines with the neighboring properties. Considering the depth of excavation (nearly 19 feet) below the finished grade at the existing adjacent properties, the required excavation will necessitates extensive shoring along the common property lines at the sensitive and unstable shoreline conditions. In addition, due to the presence of an existing residence building on the adjacent property to the west (TMK (2) 2-6-09:21) at the close proximity of the affected property line, the deep excavation at this location is prohibitively restrictive. Note that large scale excavation activities increase the chances of environmental pollution as well. Aside from these excavation related issues, the required footings for the conventional cantilever retaining wall near the eastern property line (TMK (2) 2-6-09:06) will encroach into the adjacent property.

In contrast Option No. 3 and No. 4 do not require excavation along the property lines with the adjacent properties. In addition, the required excavation elsewhere is minimal. In other words, Options No. 3 and No. 4 have no adverse impact on the neighboring properties, require no encroachment into the neighboring property on the east, and have a remarkably lesser chance of environmental pollution.

Options No. 3 and No. 4 differ in the tiered nature of Option No. 4. Option No. 3 requires much less excavation and preserves considerable amount of land at the main yard level. Option No. 4 uses up a large area of usable yard, requires services of more trades for construction, and costs more than Option 3. On the other hand, Option No. 4 results in an especially-engineered configuration that resembles and acts as a 30-foot long stepped revetment with potentially lesser impacts on the coastal erosion due to high waves than Option No. 3.

Although a subjective matter, generally a tiered wall with landscaped terraces is considered more attractive.

Option No. 5 is different from all other options in that the toe of the revetment coincides with the property line rather than the shoreline. There are several reasons for the proposed difference. First, the adverse impact of significant excavation (i.e. more than 19 feet) at the environmentally sensitive area is reduced for this option. The reduction in the required excavation is due to the existing eroded area already included in this option as well as the lesser required landward excavation. Second, if the toe of the revetment follows the shoreline, the resulting small but open bay in front of the property will be the focal point where the considerable energy of the waves and surf will be concentrated on a limited area along the shoreline fronting one property. Considering the very steep slope of existing shoreline at both adjacent properties, the impact of concentrated energy on a limited area of the shoreline at the subject property should not be underestimated. Note with the toe of the revetment at the property line, the energy of waves and surf will be distributed along the entire width of the property resulting in less long-term damages to the shoreline. Third, considering the generous 10-foot flat exposed revetment toe, Option No. 5 provides an easy lateral access for the surfers frequenting the area. Fourth, the proposed configuration

reduces the length of excavation in the vicinity of the adjacent properties and therefore reduces the risks of damages to the neighboring properties and the amount of required shoring at these areas. Fifth, the proposed configuration is the natural configuration for the shoreline as a rather smooth transition from one neighboring property to the other. Aside from the above difference, as a hybrid revetment, Option No. 5 is the most environmentally-friendly options among the possible options since it provides the most efficient mechanism for energy dissipation with the least adverse environmental impacts. Furthermore, Option No. 5 is the most forgiving option in regard to both steady long-term as well as sudden impact loads due to coastal water. Also, the maintenance requirements for Option No. 5 generally result in less adverse environmental impacts when compared to other options.

1.5 Special Project Requirement & Associated Impact

Generally, the above-mentioned engineering factors may be considered sufficient in order to select the preferred option for the type of shoreline protection structure for the project. However, it appears that the State of Hawaii Department of Land and Natural Resources (DLNR) might require that the existing remnants of an old seawall and a lateral shoreline access way in front of the property which reportedly are considered to be within the State lands be removed as a part of the proposed shoreline improvement project.

Considering the significant volume, hardened nature (grouted/concreted rocks), and the relative location (i.e. depth and reach from top of the failing bluff) of the existing remnants, in order to remove the remnants, shoreline access must be provided for the appropriate excavators in order to reach, break down, and remove as well as for the trucks to load and haul away the existing remnants from the site. Due to the topographic characteristics of the site, the required shoreline access to allow the removal of the existing remnants is only possible through excavation at the subject property and creating a long and wide down ramp from the existing grade to the shoreline level. The required excavation, however, nullifies the possibility of Option No. 3 and Option No. 4 which depend on the existing site topography to anchor the proposed shoreline protection wall.

1.6 Proposed Option

If the possible requirement of the State DLNR to remove the existing remnants of the old seawall and the lateral shoreline access way does not exist, considering the peculiarities and implications of the referenced possible options, Option No. 4 is the recommended option for the project. This recommendation is despite the fact that Option No. 3 yields the required results for the owner and addresses the safety concerns as well as preservation of the land at a lesser cost and results in a larger usable yard area. The following are the reasons for the choice of Option No. 4 for the project. First, Option No. 4 is relatively more in line with the preferred option by the State and County for similar projects. Second, Option No. 4 is arguably more aesthetically pleasing. Third, hopefully the selection of this option encourages

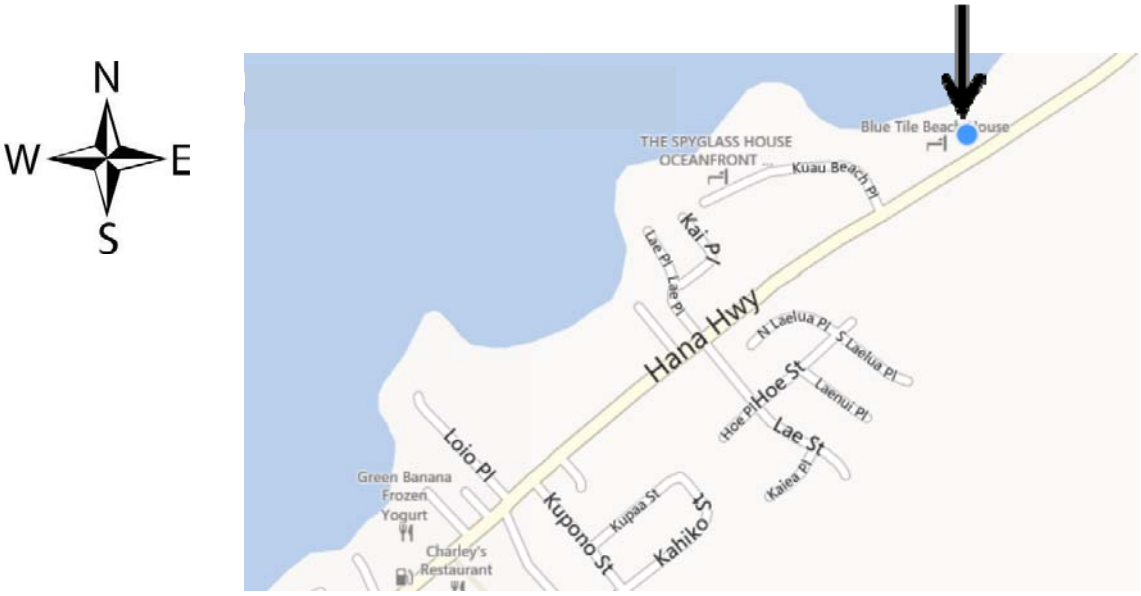
the owners of other properties with similar shoreline problems to adopt similar terraced design with its environmental advantages.

On the other hand, if the State DLNR requires that the existing remnants of the old seawall and the lateral shoreline access way be removed, the preferred option is clearly Option No. 5. The reasons for this selection are as follows. First, Option No. 3 and Option No. 4 are not possible because of the required excavation to remove the existing remnants of the old seawall and the lateral shoreline access way. Second, due to their arguably possible adverse impact on the shoreline processes, Option No. 1 and Option No. 2 are generally not favored when other options with potentially lesser impacts on the shoreline processes are possible. For the proposed project, Option No. 5 is an option with clearly lesser impact on the shoreline processes and as such is the preferred option for this scenario.

Figure 1.1 Project Site Location & Vicinity Maps

Project Location Map

Project Site: 475 Hana Highway, Pa'ia,
Pa'ia, Hawaii 96779



Project Site Vicinity Map

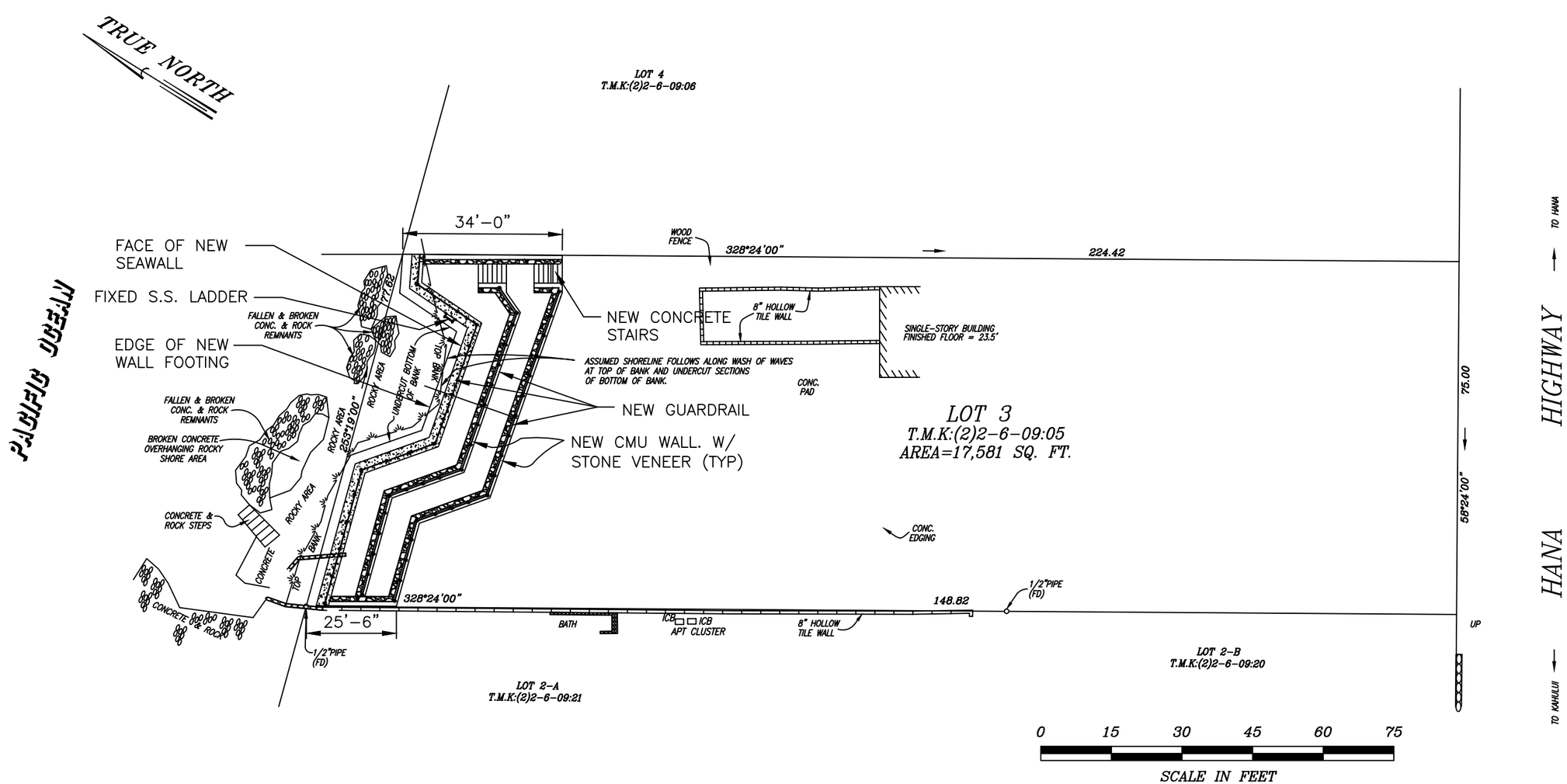
SECTION TWO

STRUCTURAL DRAWINGS

2.1 List of Structural Drawings

In this section the following structural drawings for the implementation of the proposed shoreline protection Master Plan are included:

1. Site Plan & Relative Layout
2. General layout of Seawall
3. Hybrid revetment – Retaining Wall
4. Option 1
5. Option 2
6. Option 3
7. Option 4
8. Option 5



SITE PLAN – RELATIVE LAYOUT OF PROPOSED TERRACED SEAWALL

SCALE: 1" = 25'-0"

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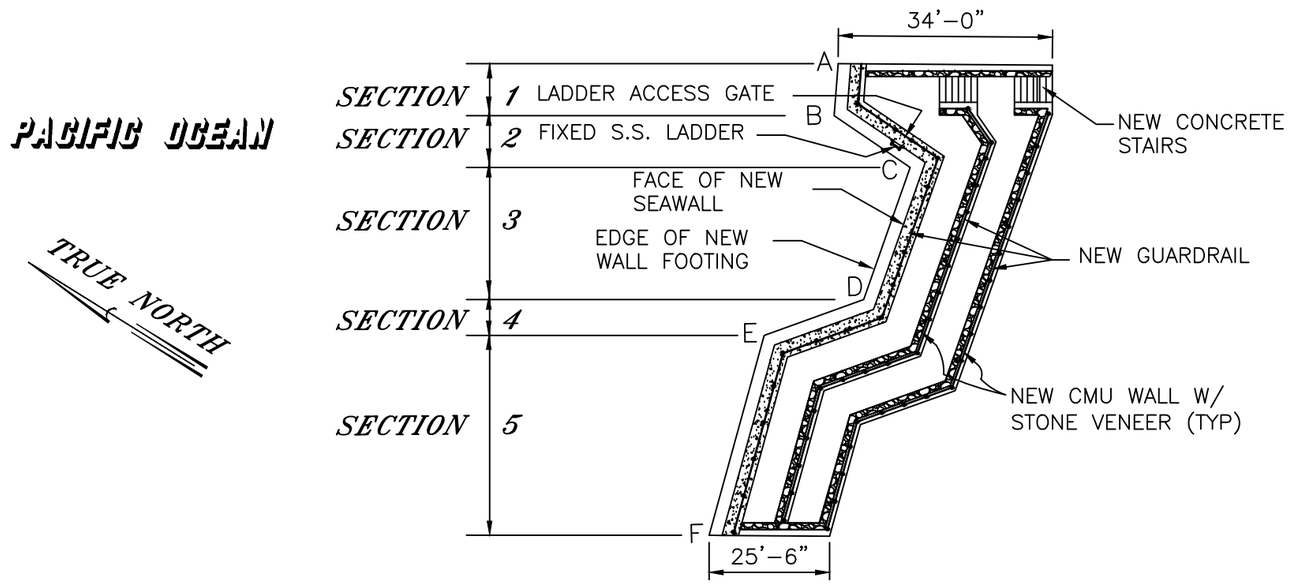
Project: SHORELINE PROTECTION CONCEPTUAL OPTIONS TMK: (2) 2-6-009:05

Title: SITE PLAN & RELATIVE LAYOUT

Revisions		
No.	Description	Date

Scale:	NTS
Date:	March 2013
Drawn by:	JAS
Designed by:	KS
Drawing No.:	S-1

Sheet 1 of 9



NOTE: SEE SHEET S-1 FOR RELATIVE LAYOUT OF THE PROPOSED SEAWALL WITH RESPECT TO THE SITE PLAN.

GENERAL LAYOUT OF PROPOSED TERRACED SEAWALL

SCALE: 1" = 24'-0"

WALL	WALL TYPE	OPTION	FEASIBILITY
SECTION 1	CANTILEVER REINFORCED CONCRETE WALL W/ TEXTURED FACING	OPTION NO. 2	UNFEASIBLE-ENCROACHMENT INTO ADJACENT LAND DURING CONSTRUCTION
SECTION 2	CANTILEVER REINFORCED CONCRETE WALL W/ TEXTURED FACING	OPTION NO. 2	UNFEASIBLE-PERMANENT FOOTING ENCROACHMNET INTO ADJACENT LAND
SECTION 3	CANTILEVER REINFORCED CONCRETE WALL W/ TEXTURED FACING	OPTION NO. 2	FEASIBLE
SECTION 4	CANTILEVER REINFORCED CONCRETE WALL W/ TEXTURED FACING	OPTION NO. 2	FEASIBLE
SECTION 5	CANTILEVER REINFORCED CONCRETE WALL W/ TEXTURED FACING	OPTION NO. 2	UNFEASIBLE-ENCROACHMENT INTO ADJACENT LAND DURING CONSTRUCTION
SECTION 1	ANCHORED WALL W/ REINFORCED SHORCTRETE TEXTURED FACING	OPTION NO. 4	FEASIBLE
SECTION 2	ANCHORED WALL W/ REINFORCED SHORCTRETE TEXTURED FACING	OPTION NO. 4	FEASIBLE
SECTION 3	ANCHORED WALL W/ REINFORCED SHORCTRETE TEXTURED FACING	OPTION NO. 4	FEASIBLE
SECTION 4	ANCHORED WALL W/ REINFORCED SHORCTRETE TEXTURED FACING	OPTION NO. 4	FEASIBLE
SECTION 5	ANCHORED WALL W/ REINFORCED SHORCTRETE TEXTURED FACING	OPTION NO. 4	FEASIBLE

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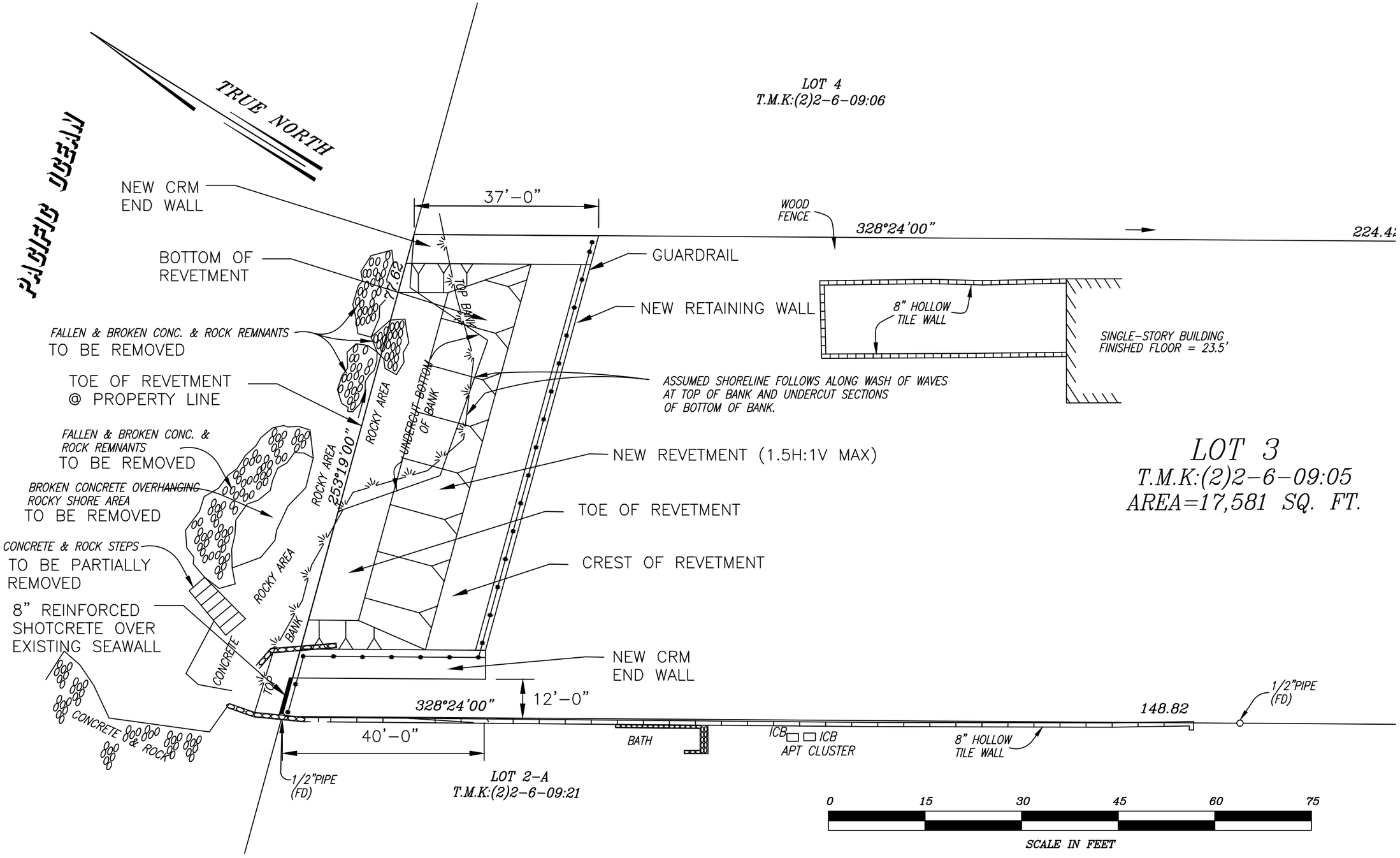
Project: SHORELINE PROTECTION CONCEPTUAL OPTIONS
TMK: (2) 2-6-009:05

Title: GENERAL LAYOUT OF SEAWALL

Revisions		
No.	Description	Date

Scale: NTS
Date: March 2013
Drawn by: JAS
Designed by: KS
Drawing No.: S-2



RELATIVE LAYOUT OF PROPOSED HYBRID REVETMENT-RETAINING WALL

SCALE: 1" = 15'-0"

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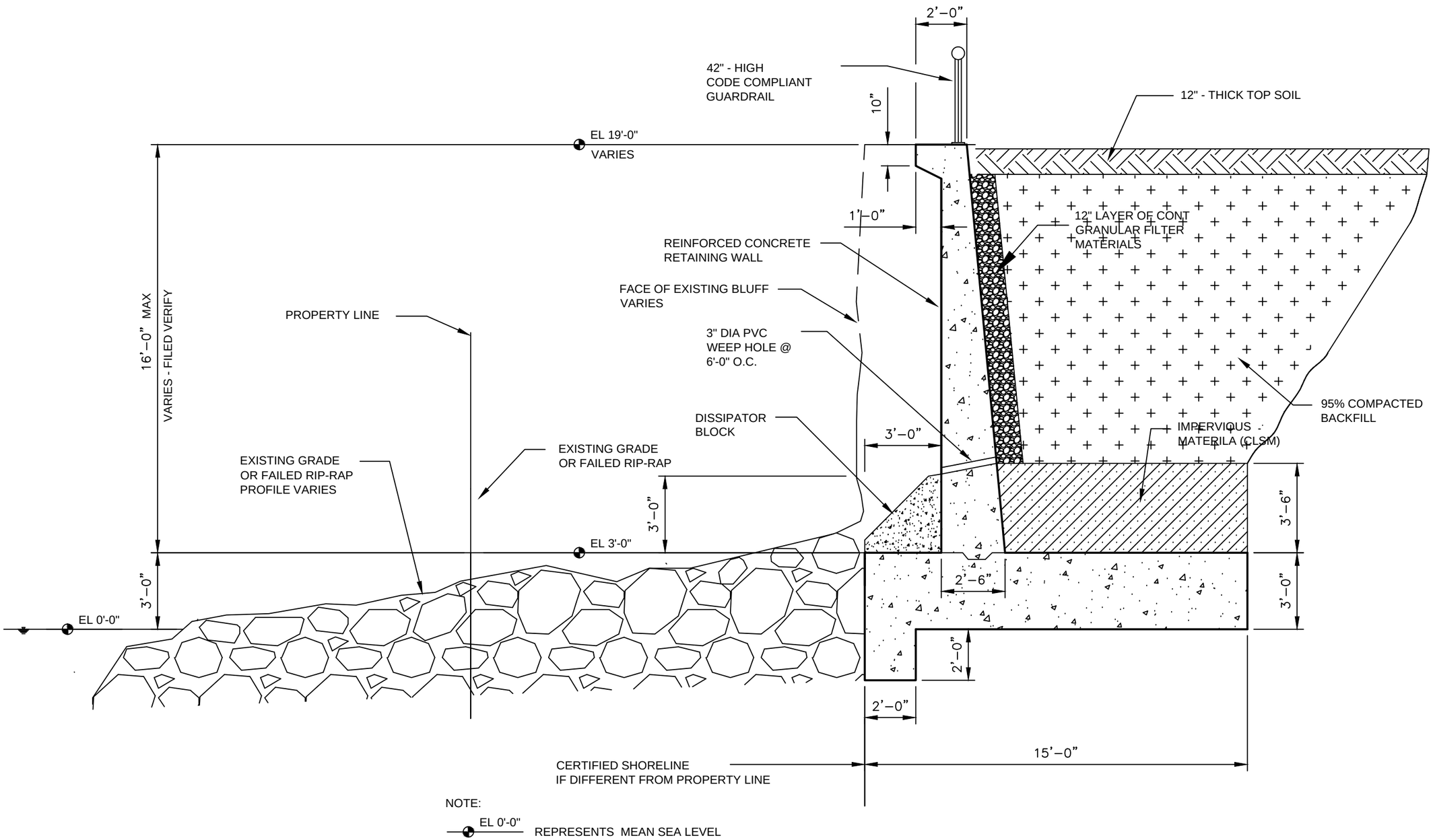
Project: MAUI MARBLE AND GRANITE SOLAR PANEL INSTALLATION TMK: (2) 3-4-044:-031

Title: HYBRID REVETMENT-RETAINING WALL

Revisions		
No.	Description	Date

Scale:	NTS
Date:	April 2013
Drawn by:	JAS
Designed by:	KS
Drawing No.:	S-3

Sheet 3 of 9



NOTE:

EL 0'-0" REPRESENTS MEAN SEA LEVEL

OPTION NO. 1: REINFORCED CONCRETE CANTILEVER RETAINING WALL

SCALE: 1/4"= 1'-0"

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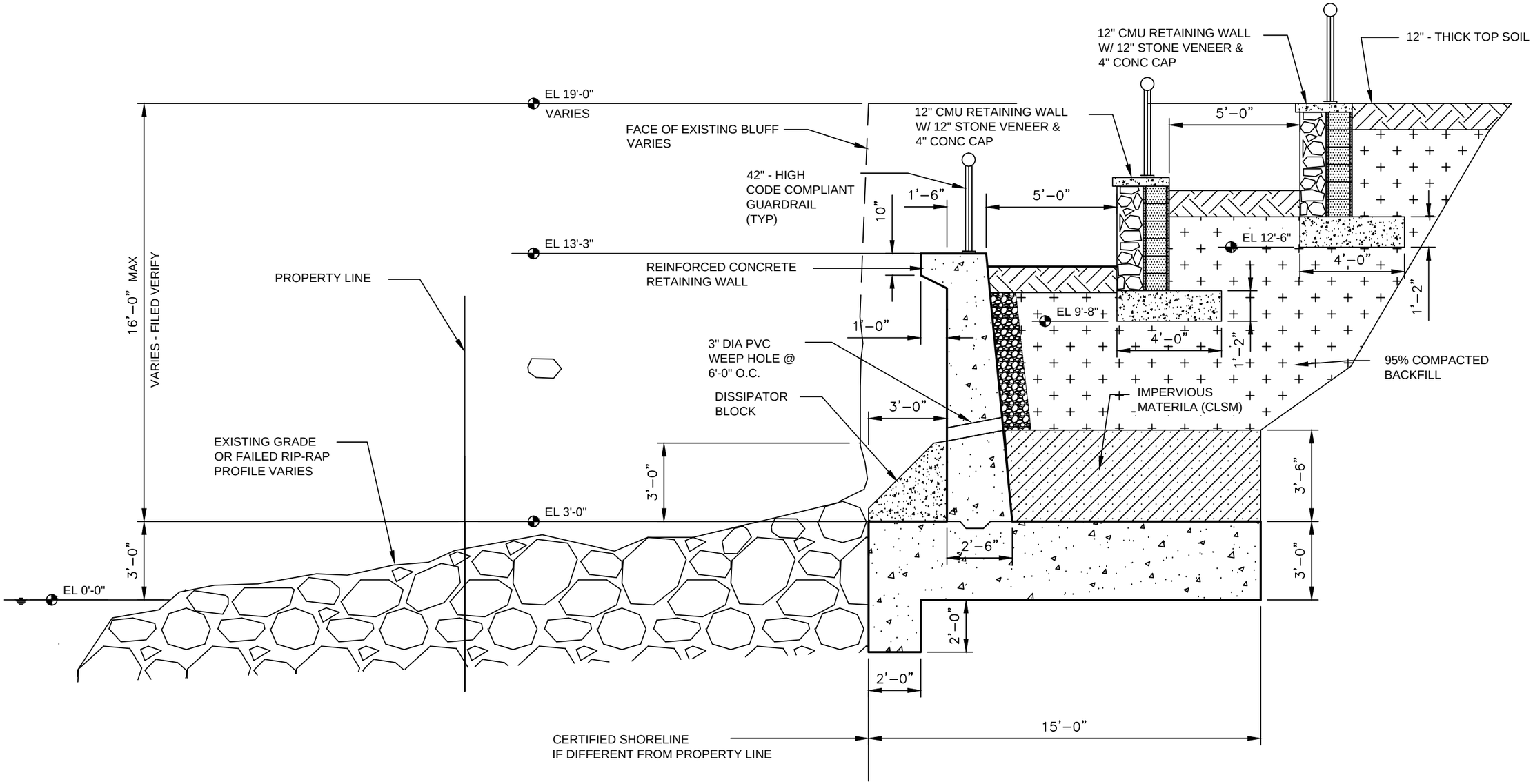
Project: SHORELINE PROTECTION CONCEPTUAL OPTIONS TMK: (2) 2-6-009:05

Title: OPTION NO. 1

Revisions		
No.	Description	Date

Scale:	NTS
Date:	March 2013
Drawn by:	JAS
Designed by:	KS
Drawing No.:	S-4

Sheet 4 of 9



NOTE:

EL 0'-0" REPRESENTS MEAN SEA LEVEL

OPTION NO. 2: REINFORCED CONCRETE CANTILEVER WALL W/ TERRACED RETAINING WALLS

SCALE: 1/4"= 1'-0"

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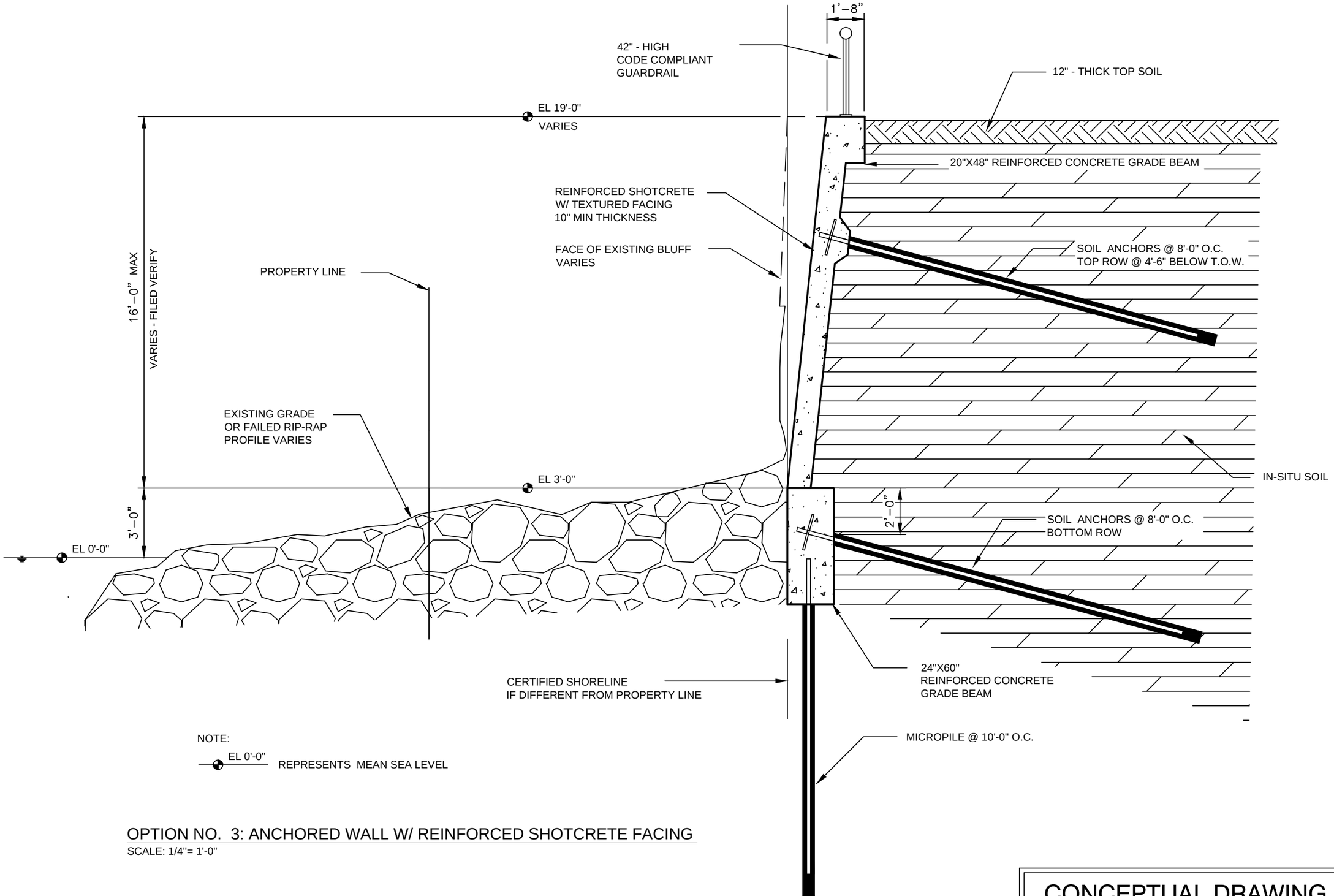
Project: SHORELINE PROTECTION CONCEPTUAL OPTIONS TMK: (2) 2-6-009:05

Title: OPTION NO. 2

Revisions		
No.	Description	Date

Scale: NTS
Date: March 2013
Drawn by: JAS
Designed by: KS
Drawing No.: S-5



NOTE:

EL 0'-0" REPRESENTS MEAN SEA LEVEL

OPTION NO. 3: ANCHORED WALL W/ REINFORCED SHOTCRETE FACING

SCALE: 1/4"= 1'-0"

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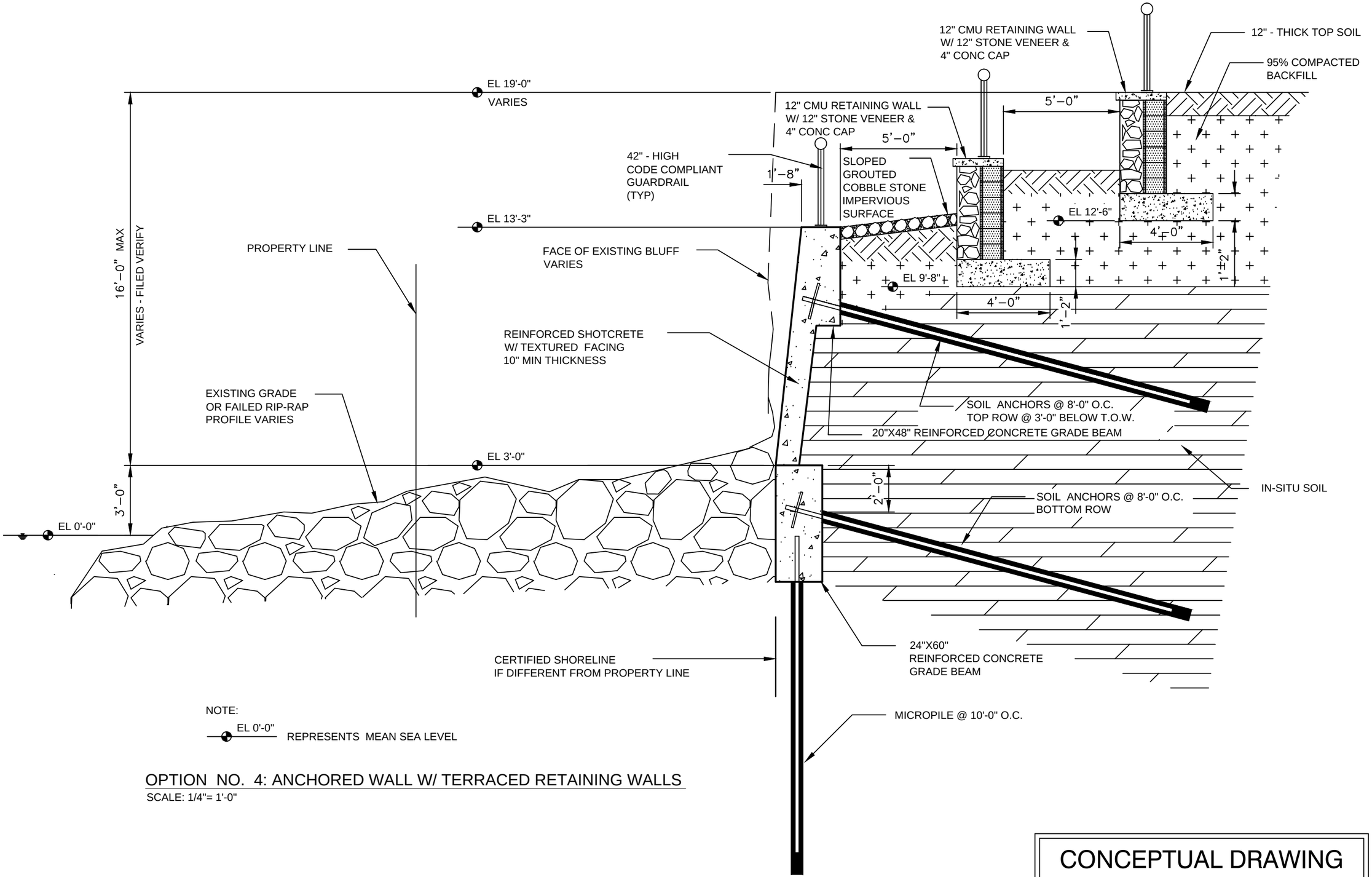
Project: SHORELINE PROTECTION CONCEPTUAL OPTIONS TMK: (2) 2-6-009:05

Title: OPTION NO. 3

Revisions		
No.	Description	Date

Scale: NTS
Date: March 2013
Drawn by: JAS
Designed by: KS
Drawing No.: S-6



NOTE:

EL 0'-0" REPRESENTS MEAN SEA LEVEL

OPTION NO. 4: ANCHORED WALL W/ TERRACED RETAINING WALLS

SCALE: 1/4"= 1'-0"

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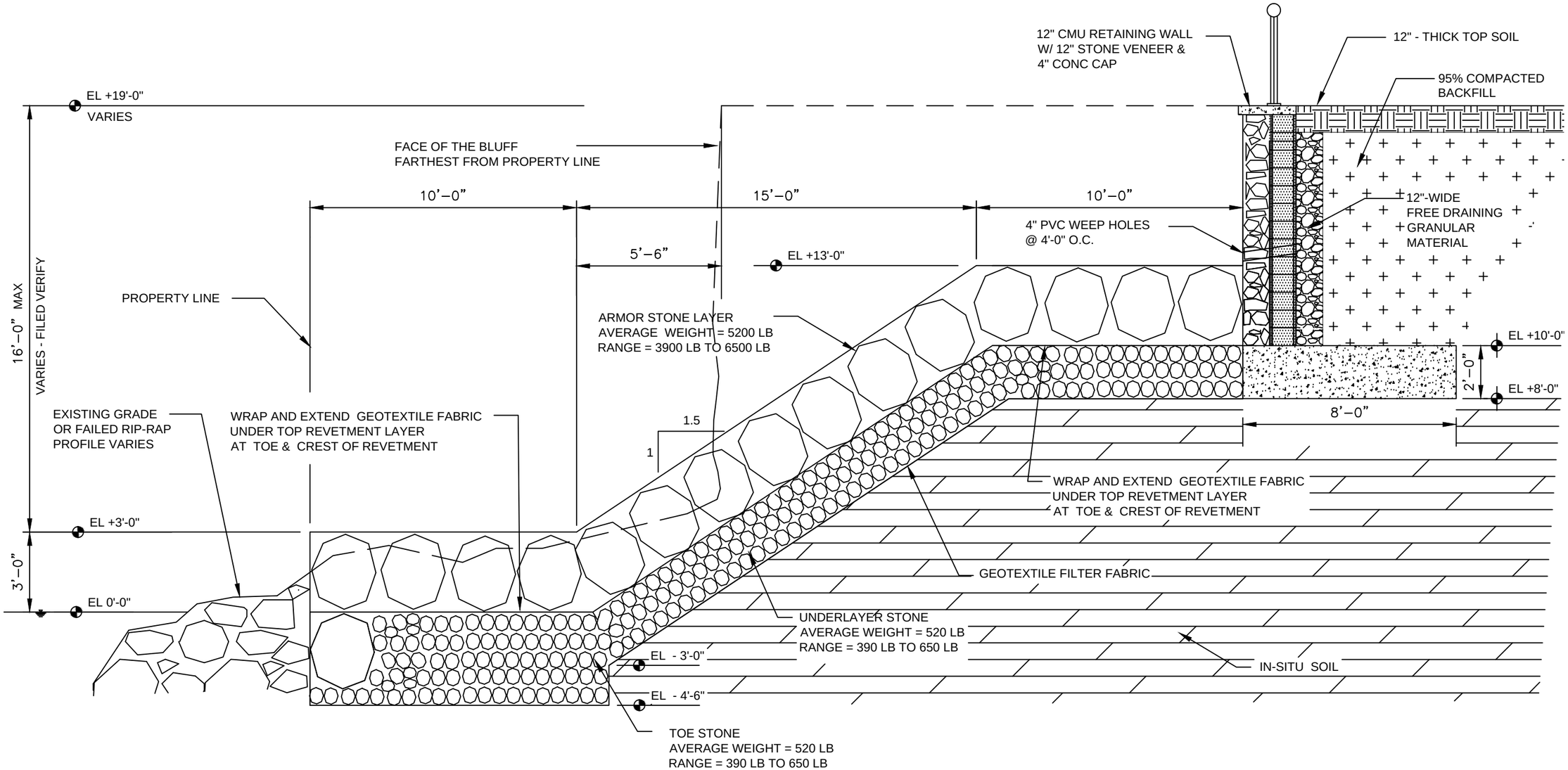
Project: SHORELINE PROTECTION
CONCEPTUAL OPTIONS
TMK: (2) 2-6-009:05

Title: OPTION NO. 4

Revisions		
No.	Description	Date

Scale: NTS
Date: March 2013
Drawn by: JAS
Designed by: KS
Drawing No.:

S-7



NOTE:

EL 0'-0" REPRESENTS MEAN SEA LEVEL

OPTION NO. 5: HYBRID REVETMENT-RETAINING WALL

SCALE: 1/4"= 1'-0"

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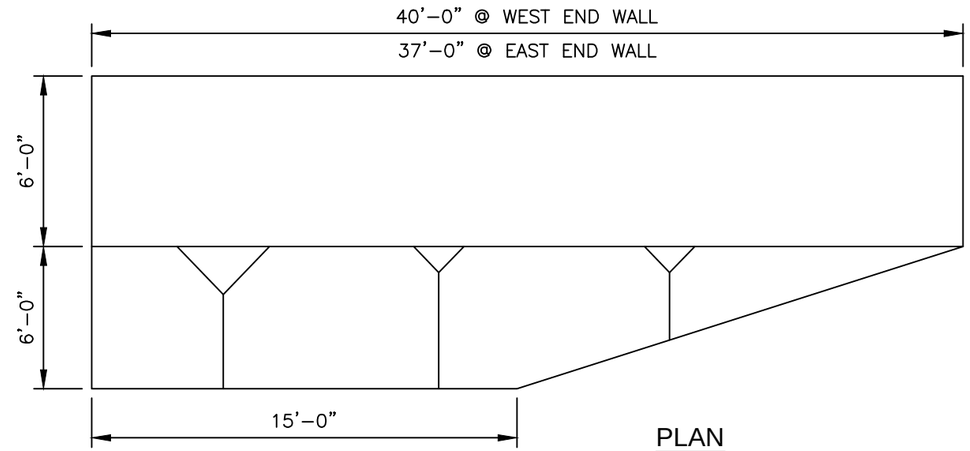
Project: SHORELINE PROTECTION CONCEPTUAL OPTIONS TMK: (2) 2-6-009:05

Title: OPTION NO. 5

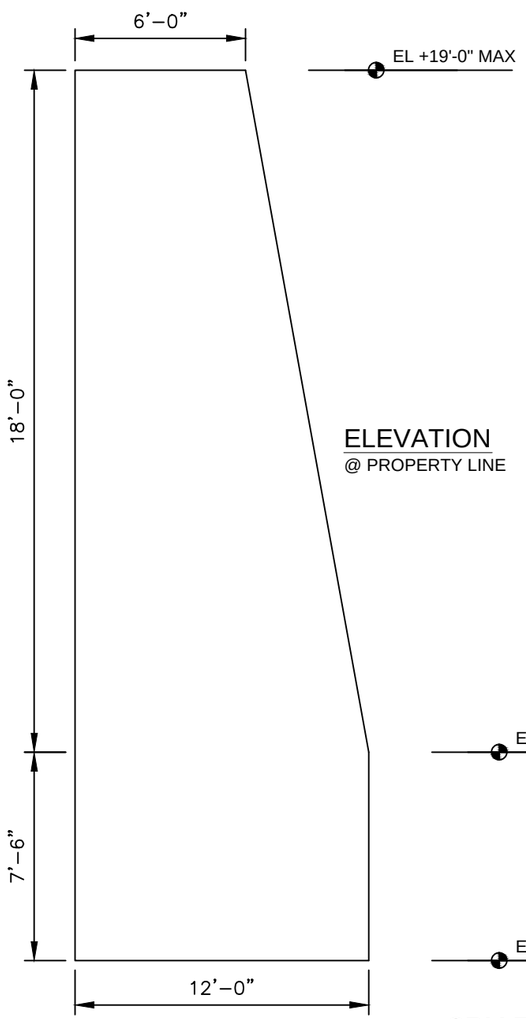
Revisions		
No.	Description	Date

Scale:	NTS
Date:	April 2013
Drawn by:	JAS
Designed by:	KS
Drawing No.:	S-8

Sheet 8 of 9

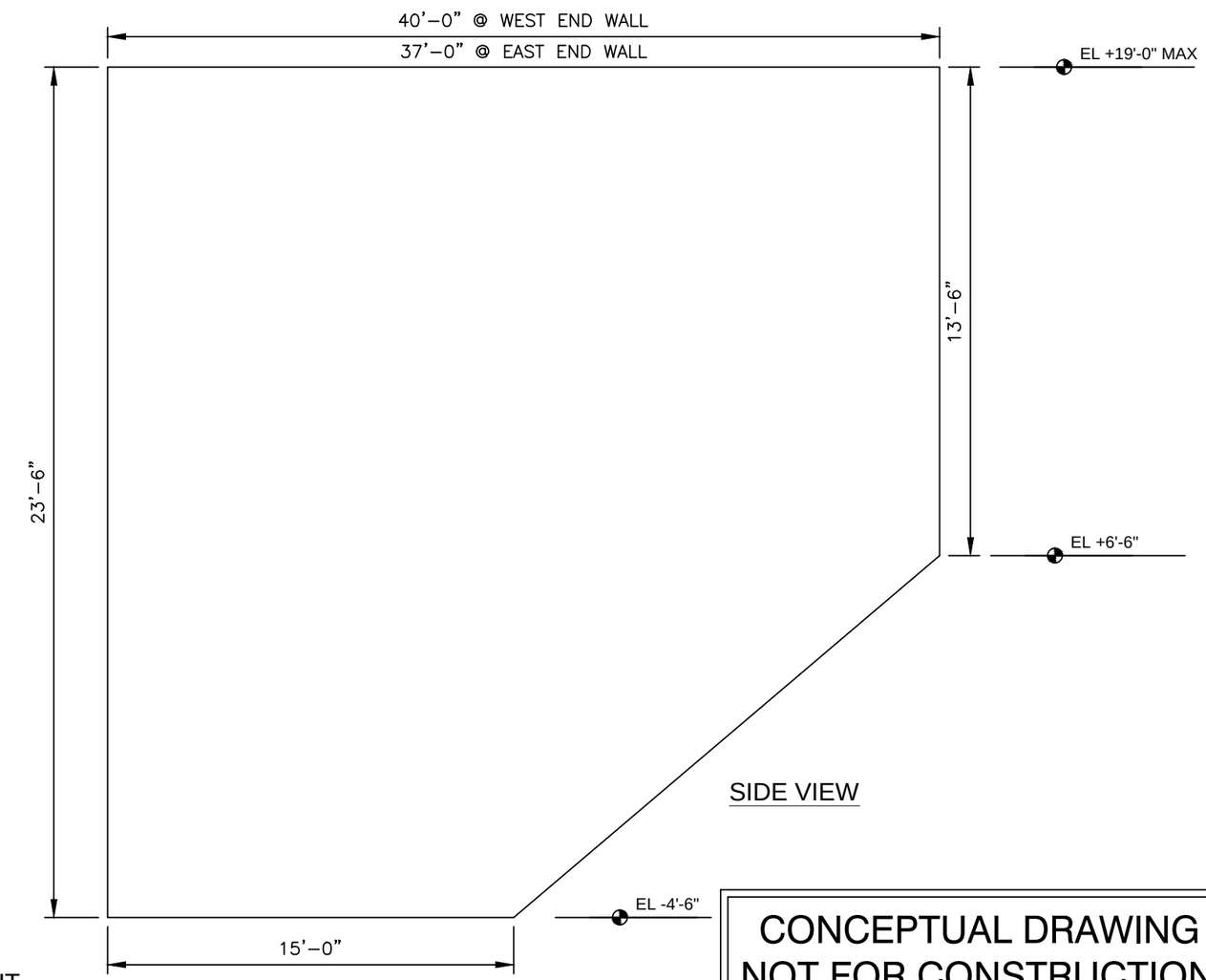


PLAN



ELEVATION
@ PROPERTY LINE

CRM END WALL LAYOUT
SCALE: NTS



SIDE VIEW

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Project: SHORELINE PROTECTION CONCEPTUAL OPTIONS TMK: (2) 2-6-009:05

Title: CRM END WALLS

Revisions		
No.	Description	Date

Scale:	NTS
Date:	April 2013
Drawn by:	JAS
Designed by:	KS

Drawing No.: S-9

SECTION THREE

CONSTRUCTION COST OPINION

3.1 Construction Cost Opinion

For the purpose of cost opinion, it is assumed that the Sate DLNR will require that the existing remnants of the old seawall and lateral shoreline access way be removed. Therefore, the cost opinion in this section is associated with Option No. 5.

Based on the conceptual drawings for the proposed shoreline modification project as presented in Section Two of this report, the probable cost of the proposed shoreline modifications (Option 5) including the removal of existing debris at the shoreline is estimated to be Four Hundred Fifty Thousand Dollars ($450,000.00).

3.2 Limitations of Construction Cost Opinion

The referenced estimated cost is limited to the cost items associated with the work indicated on the conceptual drawings included in this report. These items include all labor, material, and execution costs related to the excavation, demolition, hauling off unwanted materials, installation of geotextile fabric, stone underlayer, stone armor layer, rock masonry end walls, stone-veneered concrete masonry retaining wall, backfill, and compaction as shown on the conceptual plans for Option No. 5. Additional cost items related to the site improvement, drainage, landscaping, and other ancillary work required to complete the project shall be included in the overall project budget. Furthermore, the above estimated construction cost does not include cost of engineering design, special inspection, testing, required permitting fees, or other costs not specifically mentioned herein.

Whereas reasonable attempts were made to opine on the probable construction cost for the project, it should be noted that cost opinions, especially when based on conceptual plans, are subjective. Therefore, it is emphasized that we cannot and do not guarantee or warranty that the above estimated cost opinion will match the actual construction cost as submitted by bidding contractors.

3.3 Contingency Construction Budget

Considering the preliminary nature of the project, for budgeting purposes it is recommended that an additional contingency construction budget of approximately 15% to 20% be allocated for the project.

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ENGINEER
No. 9446-S
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Date: October 21, 2013

Structural Engineering
Inspection & Evaluation Services

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Phone: 808-398-6749

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APPENDIX B.
PRELIMINARY DRAINAGE REPORT

PRELIMINARY DRAINAGE REPORT

FOR

SHORELINE PROTECTION AT 475 HANA HIGHWAY

Paia, Maui, Hawaii

T.M.K.: (2) 2-6-009: 005

Prepared for:

James Argyropoulos
475 Hana Highway
Paia, Hawaii 96779

STACY A. OTOMO
LICENSED PROFESSIONAL ENGINEER
No. 5115-C
HAWAII, U.S.A.

Prepared by:

OTOMO ENGINEERING, INC.

CONSULTING CIVIL ENGINEERS
305 SOUTH HIGH STREET, SUITE 102
WAILUKU, MAUI, HAWAII 96793
PHONE: (808) 242-0032
FAX: (808) 242-5779

August 2013

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II. SITE LOCATION AND PROJECT DESCRIPTION

III. EXISTING TOPOGRAPHY AND SOIL CONDITIONS

IV. EXISTING DRAINAGE CONDITIONS

V. FLOOD AND TSUNAMI ZONE

VI. PROPOSED DRAINAGE PLAN

VII. HYDROLOGIC CALCULATIONS

VIII. CONCLUSION

IX. REFERENCES

EXHIBITS

1 Location Map

2 Vicinity Map

3 Soil Survey Map

4 Flood Insurance Rate Map

APPENDICES

A Hydrologic Calculations

PRELIMINARY DRAINAGE REPORT
FOR
SHORELINE PROTECTION AT 475 HANA HIGHWAY
T.M.K.: (2) 2-6-009: 005

I. INTRODUCTION

The purpose of this report is to examine both the existing drainage conditions and the proposed drainage system for the project.

II. SITE LOCATION AND PROJECT DESCRIPTION

The subject parcel is identified as T.M.K.: (2) 2-6-009: 005, which encompasses an area of approximately 17,581 square feet or 0.40 acres. The parcel is also known as Lot 3 of the Kuau Tract Subdivision.

The project site is bordered by residential properties to the east and west, Hana Highway to the south, and the Pacific Ocean to the north. The property is currently developed as a single-family residence and ohana.

Improvements are limited to the construction of a seawall for shoreline protection. The seawall is being proposed to mitigate the erosion of the seaward boundary of the property caused by wave action. To some extent, runoff from the property also causes erosion of the seaward boundary.

III. EXISTING TOPOGRAPHY AND SOIL CONDITIONS

The study area slopes from approximately 33 feet above mean sea level at the property's southeasterly corner to approximately 17 feet above mean sea level at the property's northwesterly corner, averaging approximately 6.40%. There is also an eroded area along the northern boundary of the property, which encompasses approximately 432 square feet.

According to the "Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii (August, 1972)," prepared by the United States Department of Agriculture Soil Conservation Service, the soils within the project site are classified as Paia silty clay, 3 to 7 percent slopes (PcB) and Paia silty clay, 7 to 15 percent slopes (PcC). PcB is characterized as having moderate permeability, slow runoff, and slight erosion hazard. PcC is characterized as having slow to medium runoff and slight to moderate erosion hazard.

IV. EXISTING DRAINAGE CONDITIONS

There are no drainage systems in the vicinity of the project site. Runoff currently sheet flows across the subject property and either ponds in low-lying areas or flows into the ocean.

It is estimated that the existing 50-year, 1-hour storm runoff from the project site is 0.99 cfs, corresponding to a runoff volume of 653 cubic feet.

V. FLOOD AND TSUNAMI ZONE

According to Panel Number 150003 0408E of the Flood Insurance Rate Map, revised September 25, 2009, prepared by the United States Federal Emergency Management Agency, the parcel is situated in Flood Zone X. Flood Zone X represents areas outside the 0.2% annual chance floodplain.

VI. PROPOSED DRAINAGE PLAN

The only improvement proposed for this project is the construction of a seawall and revetment to mitigate the erosion of the seaward boundary. The post project runoff will remain unchanged. Runoff will continue to sheet flow across the property, over the proposed seawall, and down an armor stone layer, which will lead towards the ocean. The proposed seawall will provide protection from further erosion of the shoreline.

The drainage design criteria will be to minimize any alterations to the natural pattern of the existing onsite surface runoff. The proposed drainage plan meets the requirements of Chapter 4, “Rules for the Design of Storm Drainage Facilities in the County of Maui.”

VII. HYDROLOGIC CALCULATIONS

The hydrologic calculations are based on the "Drainage Master Plan for the County of Maui,” and the "Rainfall Frequency Atlas of the Hawaiian Islands," Technical Paper No. 43, U.S. Department of Commerce, Weather Bureau.

Rational Formula Used: $Q = CIA$

Where Q = rate of flow (cfs)

C = rainfall coefficient

I = rainfall intensity for a duration equal to the time of concentration (inches/hour)

A = drainage area (Acres)

See Appendix A for Hydrologic Calculations

VIII. CONCLUSION

The proposed project will not create any additional runoff from the 50-year, 1-hour storm of 0.99 cfs or any additional runoff volume. Furthermore, the proposed project will provide protection form further erosion of the shoreline from wave action and runoff.

In view of the foregoing, it is our professional opinion that the proposed development will not have an adverse effect on the adjoining or downstream properties.

IX. REFERENCES

A. Soil Survey of Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawaii, prepared by U.S. Department of Agriculture, Soil Conservation Service, August, 1972.

B. Erosion and Sediment Control Guide for Hawaii, prepared by U.S. Department of Agriculture, Soil Conservation Service, March, 1981.

C. Rainfall-Frequency Atlas of the Hawaiian Islands, Technical Paper No. 43, U.S. Department of Commerce, Weather Bureau, 1962.

D. Flood Insurance Rate Maps of the County of Maui, September, 2009.

E. Chapter 4, Rules for the Design of Storm Drainage Facilities in the County of Maui, prepared by the Department of Public Works and Waste Management, County of Maui, 1995.

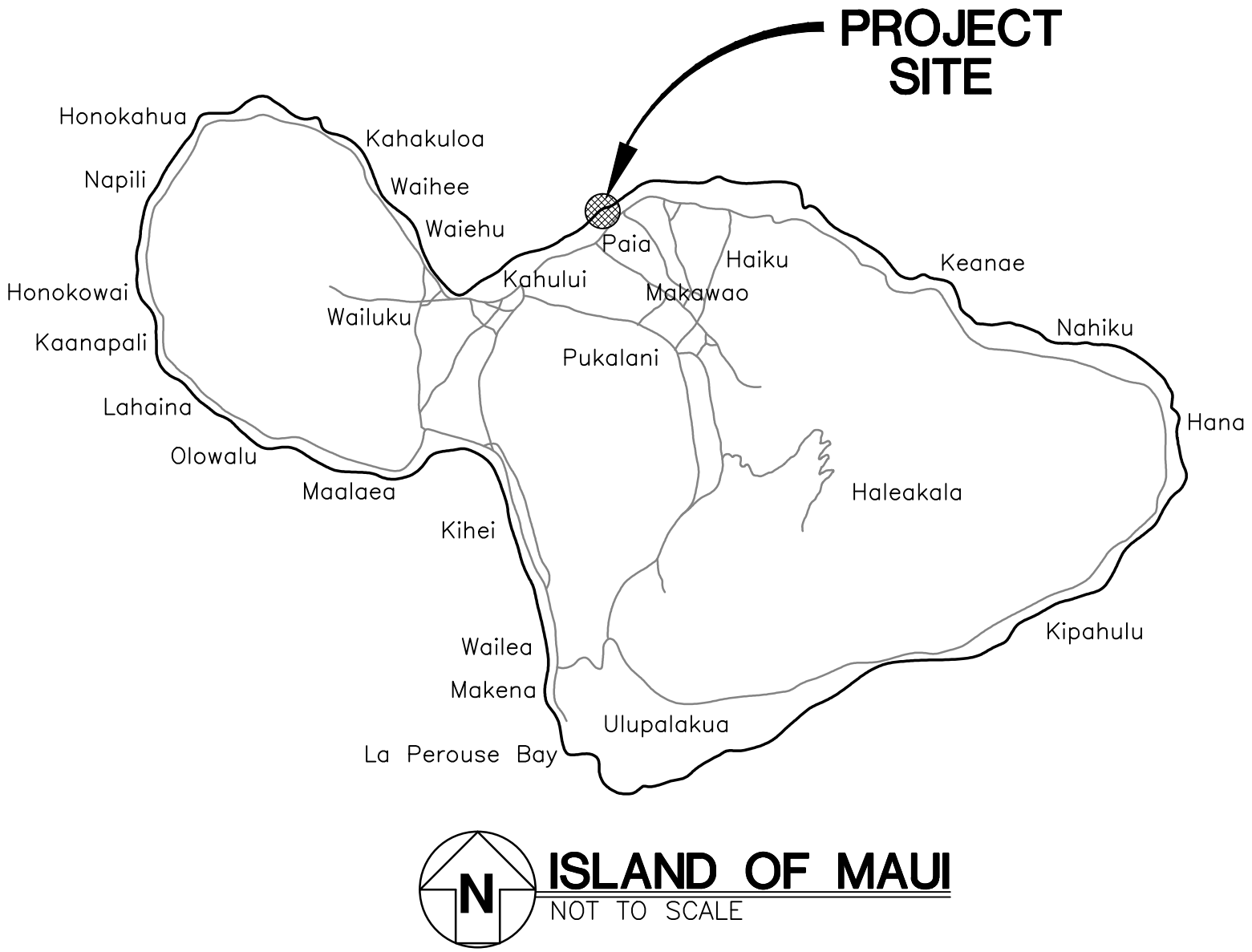
EXHIBITS

1 Location Map

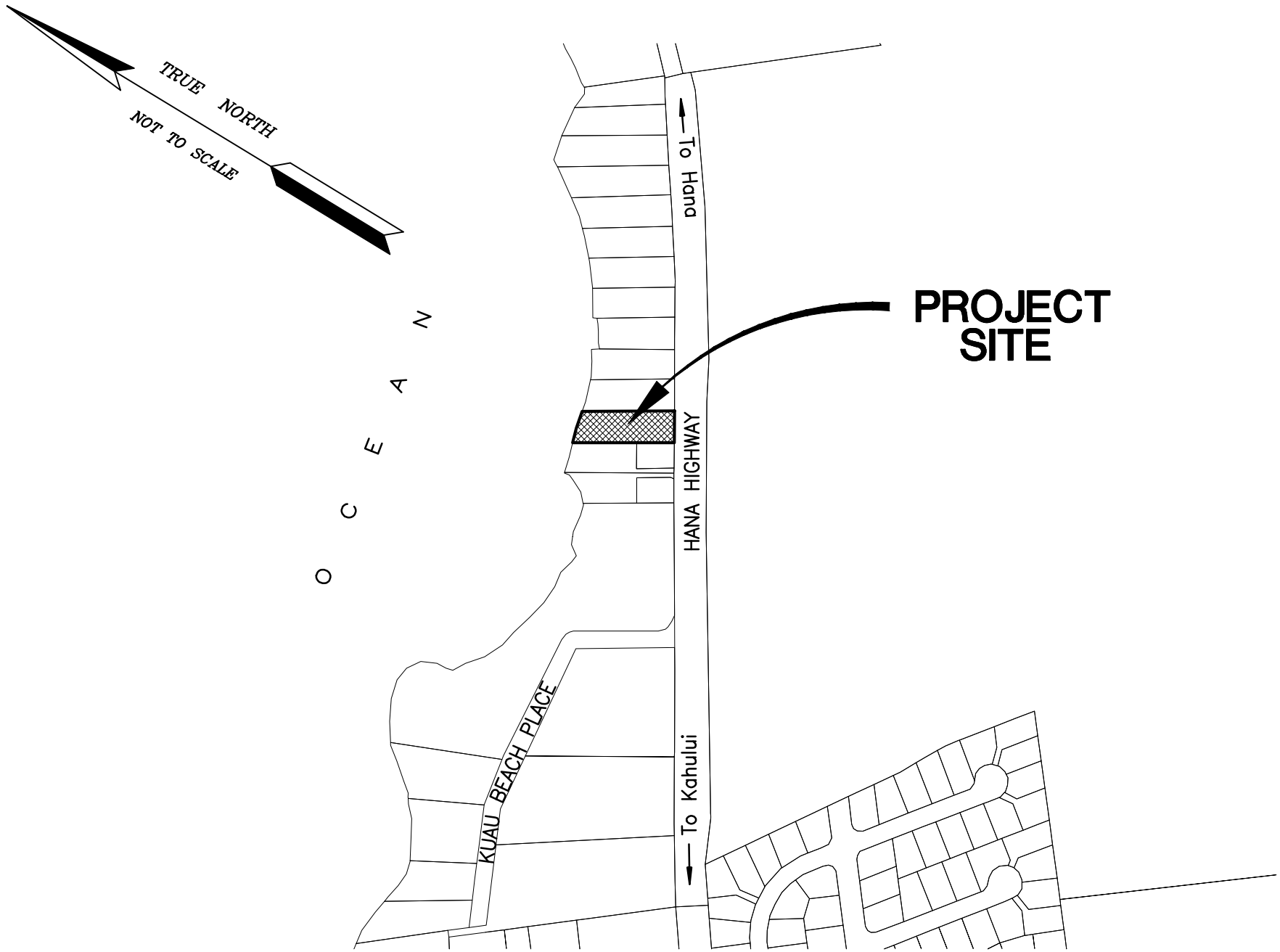
2 Vicinity Map

3 Soil Survey Map

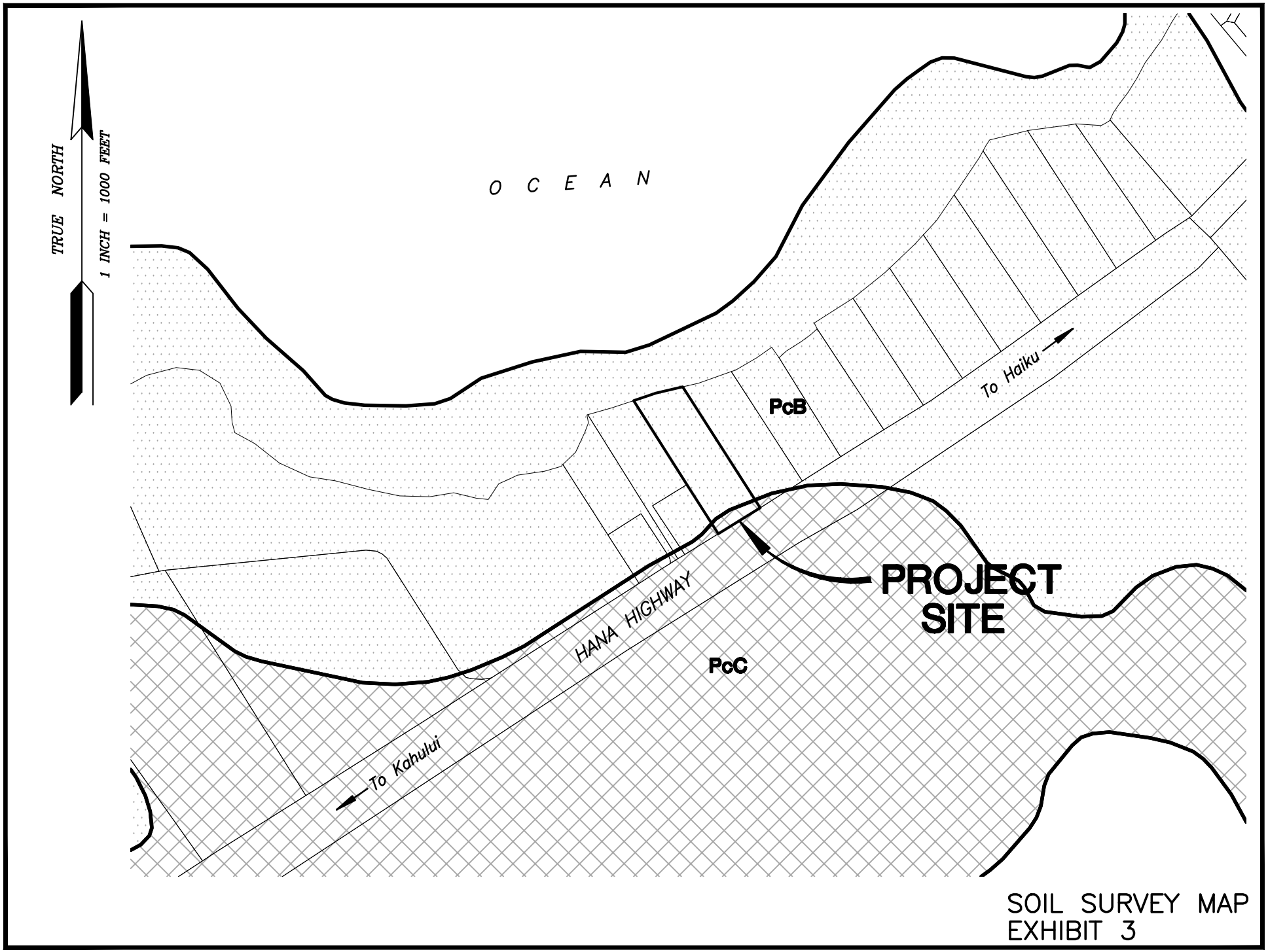
4 Flood Insurance Rate Map



LOCATION MAP
EXHIBIT 1



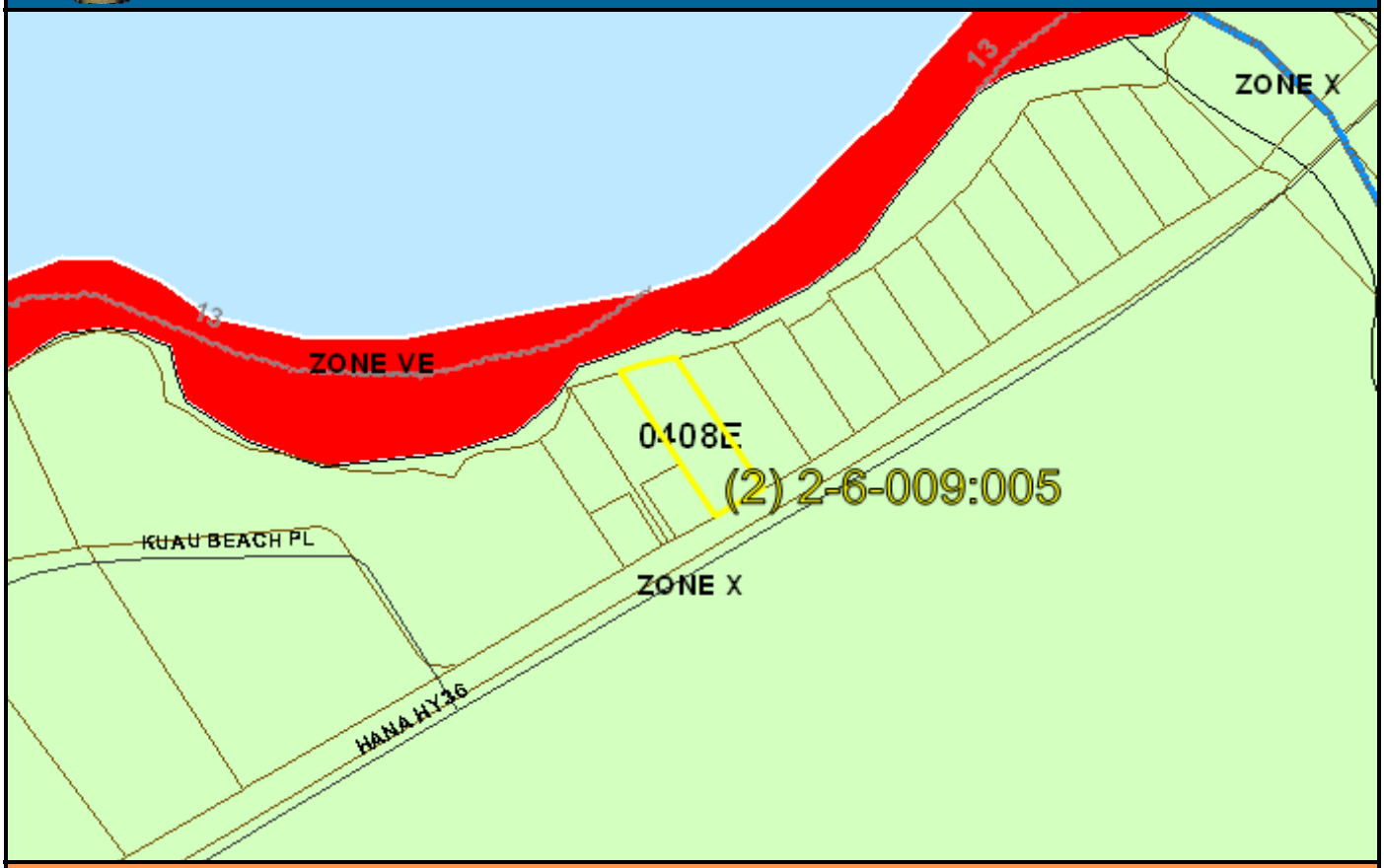
VICINITY MAP
EXHIBIT 2



SOIL SURVEY MAP
EXHIBIT 3

State of Hawaii

FLOOD HAZARD ASSESSMENT REPORT



NATIONAL FLOOD INSURANCE PROGRAM

FLOOD ZONE DEFINITIONS

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD – The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zone A, AE, AH, AO, V, and VE. The Base Flood Elevation (BFE) is the water-surface elevation of the 1% annual chance flood. Mandatory flood insurance purchase applies in these zones:

- **Zone A:** No BFE determined.
- **Zone AE:** BFE determined.
- **Zone AH:** Flood depths of 1 to 3 feet (usually areas of ponding); BFE determined.
- **Zone AO:** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined.
- **Zone V:** Coastal flood zone with velocity hazard (wave action); no BFE determined.
- **Zone VE:** Coastal flood zone with velocity hazard (wave action); BFE determined.
- **Zone AEF:** Floodway areas in Zone AE. The floodway is the channel of stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without increasing the BFE.

NON-SPECIAL FLOOD HAZARD AREA – An area in a low-to-moderate risk flood zone. No mandatory flood insurance purchase requirements apply, but coverage is available in participating communities.

- **Zone XS (X shaded):** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
- **Zone X:** Areas determined to be outside the 0.2% annual chance floodplain.

OTHER FLOOD AREAS

- **Zone D:** Unstudied areas where flood hazards are undetermined, but flooding is possible. No mandatory flood insurance purchase requirements apply, but coverage is available in participating communities.

PROPERTY INFORMATION

COUNTY:	MAUI
TMK NO:	(2) 2-6-009-005
PARCEL ADDRESS:	475 HANA HWY PAIA, HI 96779
FIRM INDEX DATE:	SEPTEMBER 19, 2012
LETTER OF MAP CHANGE(S):	NONE
FEMA FIRM PANEL(S):	1500030408E
PANEL EFFECTIVE DATE:	SEPTEMBER 25, 2009

PARCEL DATA FROM:	MAY 2012
IMAGERY DATA FROM:	MAY 2005

IMPORTANT PHONE NUMBERS

County NFIP Coordinator	
County of Maui	
Francis Cerizo, CFM	(808) 270-7771
State NFIP Coordinator	
Carol Tyau-Beam, P.E., CFM	(808) 587-0267

Disclaimer: The Department of Land and Natural Resources (DLNR) assumes no responsibility arising from the use of the information contained in this report. Viewers/Users are responsible for verifying the accuracy of the information and agree to indemnify the DLNR from any liability, which may arise from its use.

If this map has been identified as 'PRELIMINARY' or 'UNOFFICIAL', please note that it is being provided for informational purposes and is not to be used for official/legal decisions, regulatory compliance, or flood insurance rating. Contact your county NFIP coordinator for flood zone determinations to be used for compliance with local floodplain management regulations.

EXHIBIT 4

FLOOD INSURANCE RATE MAP

APPENDIX A

HYDROLOGIC CALCULATIONS

Hydrologic Calculations

Purpose: Determine the onsite surface runoff of the project site based on a 50-year, 1-hour storm.

A. Determine the Runoff Coefficient (C):

DRAINAGE AREA CHARACTERISTICS:

ROOF AREAS:

Infiltration (Negligible)	=	0.20
Relief (Hilly)	=	0.06
Vegetal Cover (None)	=	0.07
Development Type (Roof)	=	0.55
C	=	0.88

PAVEMENT AREAS:

Infiltration (Medium)	=	0.20
Relief (Rolling)	=	0.03
Vegetal Cover (None)	=	0.07
Development Type (Pavement)	=	0.55
C	=	0.85

LANDSCAPED AREAS:

Infiltration (Medium)	=	0.07
Relief (Rolling)	=	0.03
Vegetal Cover (Good)	=	0.03
Development Type (Landscape)	=	0.15
C	=	0.28

EXISTING CONDITION:

Roof Area = 0.05 Acres

Pavement Area = 0.05 Acres

Landscaped Area = 0.30 Acres

WEIGHTED C = 0.43

B. Determine the 50-year 1-hour rainfall:

i_{50} = 2.8 inches

Adjust for time of concentration to compute Rainfall Intensity (I):

Existing Condition:

T_c = 11 minutes

I = 5.76 inches/hour

C. Drainage Area (A) = 0.40 Acres

D. Compute the 50-year storm runoff volume (Q):

Q = CIA

Existing Conditions:

Q = (0.43)(5.76)(0.40)

= 0.99 cfs

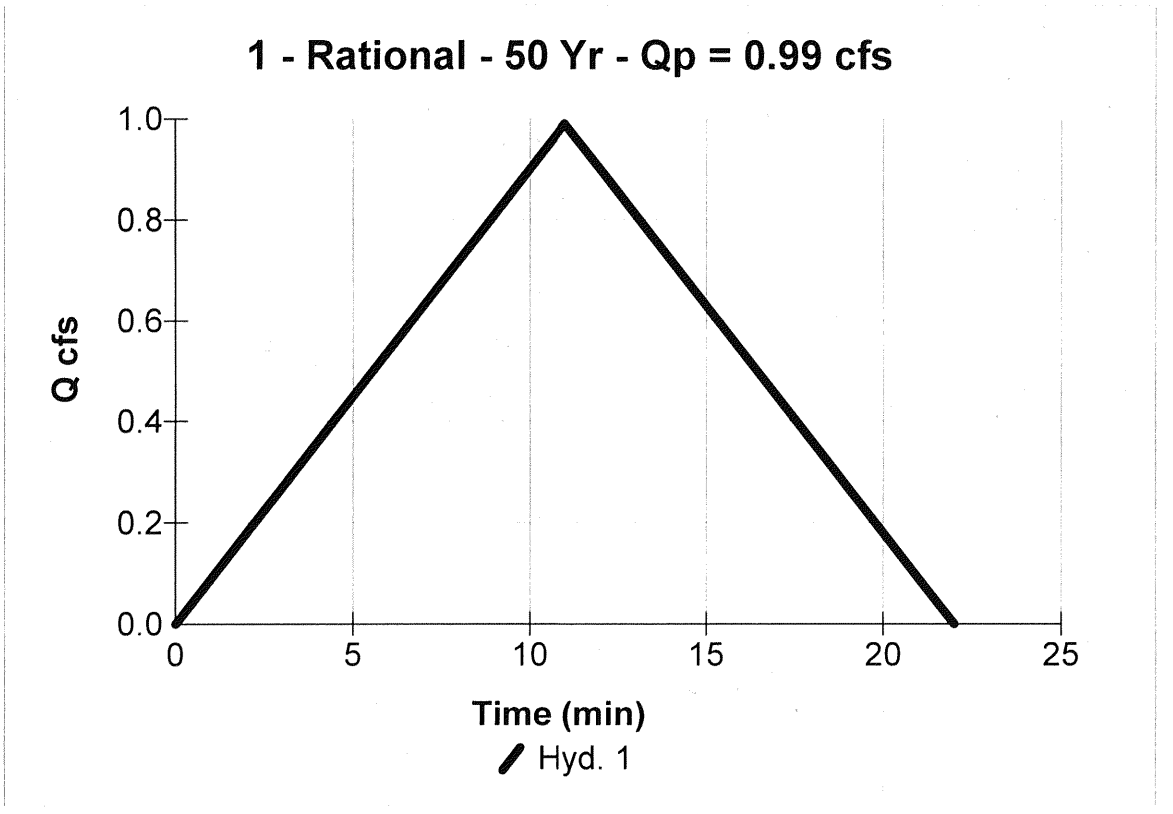
No development is proposed for this project. Therefore, there will be no increase in runoff due to this project. The existing runoff from a 50-year, 1-hour storm is 0.99 cfs, corresponding to a runoff volume of 653 cubic feet.

Hydrograph Plot

English

Hyd. No. 1

Existing Conditions

Hydrograph type	= Rational	Peak discharge	= 0.99 cfs
Storm frequency	= 50 yrs	Time interval	= 1 min
Drainage area	= 0.4 ac	Runoff coeff.	= 0.43
Intensity	= 5.76 in	Time of conc. (Tc)	= 11 min
I-D-F Curve	= 2.8.IDF	Reced. limb factor	= 1

Total Volume = 653 cuft