JOHN WAIHEE
GOVERNOR OF HAWAII

KEITH W. AHUE, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

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JOHN P. KEPPELER, II
DONA L. HANAIKE

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AQUATIC RESOURCES
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CONSERVATION AND ENVIRONMENTAL AFFAIRS
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HISTORIC PRESERVATION
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STATE PARKS
WATER AND LAND DEVELOPMENT

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

'93 SEP 24 A11 :48

OFC. OF ENVIRONMENTAL QUALITY CONTROL

REF:OCEA:SKK

FILE NO.: KA-5/20/93-2646
DOC. NO.: 3495

SEP 23 1993

MEMORANDUM

TO: Mr. Brian J. J. Choy, Director
Office of Environmental Quality Control

FROM: KEITH W. AHUE, Chairperson
Board of Land and Natural Resources

SUBJECT: Document for Publication in the OEQC Bulletin - Final Environmental Assessment for Conservation District Use Application No. KA-5/20/93-2646 for a Sloping Rock Seawall at Haena, Kauai, TMK: 5-9-02: 35

The above mentioned Chapter 343 document was reviewed and a negative declaration was declared based upon the final environmental assessment provided with the CDUA.

Please feel free to call me or Roy Schaefer of our Office of Conservation and Environmental Affairs, at 587-0377, if you have any questions.

OCT - 8 1993

1993-10-8-KA-FEA-Haena Seawall

CHAPTER 343, H.R.S.
ENVIRONMENTAL IMPACT ASSESSMENT AND DETERMINATION

for

SLOPING ROCK WALL/REVETMENT, MAUKA OF CERTIFIED SHORELINE, AT HAENA, KAUAI, HAWAII

(Kauai Tax Map Key: 5-9-002-035)

CDUA #KA-2646

CHAPTER 343, H.R.S.
ENVIRONMENTAL ASSESSMENT DETERMINATION

Applicant:	Walton D. Y. Hong 3135-A Akahi Street Lihue, HI 96766
Owner:	Murcia-Toro, Inc.
Location:	149,135 square feet, more or less, situated at Haena, Island and County of Kauai, State of Hawaii, being Lot 18, Haena Hui Partition
Tax Map Key:	(4th) 5-9-02-35
Request:	Conservation District Use Application (CDUA) permit, for the construction of a rock wall, mauka of certified shoreline
Approving Agency:	Board of Land and Natural Resources
Agencies Consulted:	Department of Land and Natural Resources, State of Hawaii Planning Department, County of Kauai Department of Public Works, County of Kauai
Determination:	EIS not required

I. Background.

The subject property is presently owned by the Murcia-Toro, Inc., a California corporation, who has authorized its attorney to submit the subject request. A map showing the subject property is attached hereto as Exhibit "A". Exhibit "B" hereto is a copy of a tax map, showing the subject property.

The property was originally 161,521 square feet in area. Because of heavy surf and wave action over the past years, as well as Hurricane Iniki, much of the shoreline has been eroded away to the extent that a preexisting concrete deck has been

undermined and in jeopardy. According to the last shoreline certification, dated December 1, 1992, the property presently contains an area of 149,135 square feet, for a loss of 12,386 square feet.

A copy of the latest certified shoreline for the subject property is submitted herewith as Exhibit "C".

Of equal, if not greater, significance is that the land area along the shoreline is higher than the center of the subject lot, and forms a natural beach berm. This higher beach berm acts as a natural barrier to prevent high waves from coming further into the lot.

The Owner obtained Conservation District Use Permit KA-2086 for a rock revetment on March 11, 1988. However, because of the Owner's inability to meet all of the conditions and obtain all necessary approvals from the County of Kauai in a timely manner, the Conservation District Use Permit expired and has been revoked.

The subject application is to renew the Owner's request for a rock wall, to be built mauka of the certified shoreline to retain the soil from the subject property and keep the same from eroding away during times of abnormally high storm waves.

II. Proposed Action.

The Owner proposes to construct a sloping rock wall along and mauka of the certified shoreline and within the shoreline setback area for the purposes of preventing further erosion into its property and minimizing the undermining and damage to the existing concrete deck due to the shoreline erosion.

The proposed wall will be constructed into the face of the eroded bank, which will be between 8 and 20 feet inland of the certified shoreline. The approximate location of the proposed revetment is shown on Exhibit "D" hereto; the actual location will be determined by the degree of erosion and location of the face of the bank at the time of commencing construction, which in any case, will not be makai of the shoreline.

It is noteworthy that the proposed sloping wall will be constructed inland of the certified shoreline to act as retaining wall and protect the face of the berm where erosion is taking place. The structure is not subject to continual wave

action, as the waves only reach the site of the proposed revetment during times of abnormally high waves during storms. As the proposed wall is normally a considerable distance above the upper reaches of the waves, the proposed structure is not subject to, and does not affect, the littoral processes in the area.

The proposed structure will consist of boulders being placed in layers fronting the eroded bank, with crushed rock filler. The boulders will be 1-2 ton boulders over a layer of 6-12 inch bedding rock over a fabric filter, and anchored at its base by 4-ton boulders. The proposed wall will be similar to the wall constructed on the neighboring property, to continue the natural look along the shoreline fronting both properties.

A drawing of a typical cross-section of the proposed rock wall or revetment is attached hereto as Exhibit "E". As a matter of interest, the normal water's edge is about 80 to 100 feet away from the proposed wall.

III. Technical Characteristics.

1. The subject property is presently open lawn with a single family residence thereon. There are a few Norfolk pines, ironwoods, and other trees on the property. The residence is located about the center of the lot. A chain link fence exists along the makai portion the property, which was originally built a considerable distance in from the original shoreline. However, because of erosion, the fence is currently at the upper edge of the berm, mauka of the shoreline.

2. The land closest to the shoreline is the highest portion of the lot, and forms a natural beach berm. Inland from the berm, the land gently slopes downward, rising again only as the mauka boundary is approached.

3. Most of the trees growing along the shoreline have been downed because of erosion and wave action. The remaining trees along the shoreline are in danger of being lost for the same reasons, and their roots have been undermined and exposed.

4. The proposed wall will not affect the drainage pattern on the lot in any manner, as the highest area closest to the shoreline causes rainfall to run towards the center of the lot. No flooding problems from surface runoff have been experienced.

5. As the proposed use is the mere construction of a sloping wall up to the existing grade along the beach, the proposed structure will not result in any adverse effect on traffic, sanitation, waste disposal, refuse and use of water. It will not interfere with the public's right to use the beach in any manner because the wall is located entirely within the property.

6. An archaeological study was done on the subject property as part of the conditions for the previously granted Conservation District Use Permit. A copy of that study is submitted herewith as Exhibit "F". The Owner believes that the past study is sufficient to identify any archaeological or historical concerns, and is willing to adhere to the recommendations contained therein and as may be required by the approving agency insofar as addressing the archaeological or historical concerns.

7. Haena is an area of great natural beauty, with its sandy beaches and relatively undeveloped community. The area also contains the Haena State Park and the County's Haena Park. Except for the Urban designated portions along Kuhio Highway between Wainiha and Haena of higher density developed lots, the area is generally included within the Land Use Conservation district. The proposed revetment is limited only to the subject property, and will be constructed no higher than the existing grade of the shoreline berm. As such, it should not adversely affect the scenic beauty of the area, and for the reasons stated herein, may be more visually attractive that what currently exists at the site.

IV. Economic Characteristics.

As the proposed use is the construction of a sloping wall mauka of the shoreline, there would not be any significant beneficial or adverse economic effects resulting from the proposed action except for the short term employment benefits during the course of construction.

The construction of the proposed revetment would take up to six months, and construction would commence when all permits have been obtained. It is also likely that construction may be undertaken during the summer season so as to avoid the work being disrupted by high wave conditions which tend to occur during the winter months.

The cost of construction is estimated at $180,000.00.

V. Social Characteristics.

The proposed use would not have any significant beneficial or adverse social effects due to its limited scope.

During normal tidal conditions, the public has lateral shoreline access fronting the property on the beach below the certified shoreline. While public activity on the beach should not be occuring during high storm waves, a sloping wall provides a better means of retreat from the shoreline than does the existing condition at the property.

VI. Environmental Characteristics.

The subject property is within the tsunami inundation zone and on the Haena shoreline. It is not located within any flood prone area, geologically hazardous lands, on an estuary, or near any fresh water source.

The proposed use will not result in any significant adverse environmental or ecological effects. The proposed use will not result in any significant levels of water usage, sewage generation, noise, and traffic so as to cause any significant adverse effects to the surrounding environment.

The flora of the area consists of morning glory, ironwood trees, and beachgrasses, none of which are endangered or threatened species. The fauna of the area consists of what is commonly found in such shoreline environment, such as mice, various insects, and birdlife; no threatened or endangered species of fauna have been observed or found at the subject site.

The area of the proposed wall is of beachgrasses and morning glory vines. As the Owner intends to backfill and re-top the sloping wall with sand, similar vegetation should reestablish itself on the wall after completion of the work.

As the proposed wall will be mauka of the certified shoreline and out of the reach of the normal wave action, it will not have any impacts to the ocean resources.

The area is believed to be of archaeological significance, in that artifacts and midden were uncovered during an archaeological investigation and trenching performed at the site of the proposed structure by Cultural Surveys Hawaii in 1989. While the investigation and trenching did not uncover any burials and skeletal remains, the same have been uncovered during the construction of a similar structure on the abutting property.

VII. Potential Impacts.

The potential impacts of the proposed revetment are (1) the effect of such a structure on the abutting properties along the shoreline and the risk of accelerated erosion, (2) potential visual impacts, and (3) the destruction of archaeologically significant features and human burials and remains.

(a) Effect on the shoreline processes. Studies have found that vertical structures affect the littoral processes by reflecting the wave energy, which in turn causes a scouring of the beach and the undermining of the wall itself.

The proposed structure, however, is not a seawall nor vertical in design. It is a sloping rock wall, placed inland of the certified shoreline, for the purpose of retaining and protecting the existing face of the eroded beach berm from further erosion during times of occasional high storm waves. The proposed structure is not subject to the littoral shoreline processes, as the wave actions would not reach the structure except during times of abnormally high storm waves.

To minimize the reflection of wave energy and its adverse impact to the littoral processes, if any, during the times of high storm waves, the proposed wall is designed to have a sloping front (1V:1.5H), rather than a vertical surface. This will permit wave runup and dissipation of the wave energy, thus minimizing the reflection of wave energy, scouring of the beach, and undermining of the structure during such times as the wave action may be sufficient to reach the wall.

It is noteworthy that prior to the construction of the a similar wall or revetment on the abutting property, the entire shoreline fronting the properties was in a state of erosion, with the roots of trees and vegetation being exposed and subjected to the actions of the waves. Since the construction

of the revetment on the abutting property, the beach fronting the revetment has widened.

A technical report on the proposed action, being an update to the coastal engineering evaluation, is submitted herewith as Exhibit "G".

(b) Visual impacts. The present face of the eroding berm is not visually attractive, with the roots of existing vegetation exposed in the obvious eroded bank and the collapsed concrete deck laying at an almost 45% angle. The proposed revetment is intended to be an extension of the revetment constructed several years ago on the neighboring property. Since the construction of the neighboring revetment, there has been a buildup of sand fronting the revetment, and coupled with the vegetation growing on the revetment, presents a more visually attractive appearance to the beachgoing public.

The Owner plans to backfill the area of construction and replant the vegetation on the top of the revetment. The sand used for the backfilling will be the sand from excavation for the revetment; no beach sand makai of the certified shoreline will be removed or utilized during construction. The end result should be what can be found at the present time fronting the abutting property, i.e., a wider beach and visually attractive grade to the owner's property.

(c) Destruction of archaeological features and remains. As above noted, the Owner had an archaeological investigation and trenching done on the site. In view of the midden and artifacts recovered during the process, it was recommended that an archaeological monitor be present for initial excavation activity associated with the construction. The Owner will follow this recommendation, as well as the recommendations of the State Historic Preservation Division in its response to this Environmental Assessment.

VIII. Proposed Mitigation Measures.

As there are no significant adverse effects expected from the proposed use on the shoreline littoral processes and as to the visual effects thereof, no mitigation measures are necessary to address the same.

The recommendations of the State Historic Preservation Division are acceptable to the Owner and would suffice to mitigate any adverse effects which the proposed action would have on the archaeological concerns.

IX. Alternatives to Proposed Action.

One alternative is to leave the property is its present unprotected state. However, in view of the eroding of the beach berm and the necessity of preventing the loss of the beach berm to protect the Owner's property and residence, this alternative does not appear to be viable nor reasonable.

Another alternative is to replenish the eroded portions of the bank. This would be a continuous process, required each time erosion occurs as a result of the high storm wave action. It would not be viable nor reasonable due to the economics of continual replenishing, the undesirability of using dirt for the replenishing efforts (as the dirt would be carried by the wave action unto the sand beach and into the ocean), and the expected difficulty in finding a needed source of beach sand for continued replenishing.

X. Compliance with Coastal Zone Management Act

The proposed action is in compliance with the Coastal Zone Management Act, Chapter 205A of the Hawaii Revised Statutes, as amended by Act 258, SLH 1993, as follows:

(a) The objectives of the Coastal Zone Management (CZM) program are complied with as follows:

(1) The proposed action will enhance coastal recreational opportunities accessible to the public by improving the visual character of the adjoining beach lot and by providing a more appropriate method of retreat during high storm wave conditins. As shown herein and the exhibits hereto, the construction of the proposed wall will not adversely affect the shoreline littoral processes nor accelerate shoreline erosion, but may result in an accretion of sand and a better beach than that existing prior to the construction of the revetment on the neighboring property.

(2) The historic resources will be protected through the adherence of recommendations by the State Historic Sites Section.

(3) The sloping wall, upon its completion, will be backfilled and revegetated. This will present a more visually attractive appearance than the eroded bank and exposed roots of vegetation.

(4) As the proposed structure will be built inland of the certified shoreline and will not intrude into the water, it does not affect the coastal ecosystem.

(5) The confidence of private landowners that they may make reasonable use of their private property, including steps to protect the same without significant adverse effects to the public, is important to the State's economy. The proposed action will foster that confidence.

(6) The proposed revetment will reduce hazard to life and property from tsunami and high storm waves.

(7) Based on the experience of the revetment on the abutting property, the proposed action can afford additional beach accretion and protection.

(b) The policies of the CZM program will also be complied with, as follows:

(1) The proposed action will not adversely affect the recreational resources of the area, but may actually improve the same.

(2) The proposed action will promote the identification and analysis of the archaeological resources of the site as a result of the required archaeological protections prior to and during the course of construction.

(3) The proposed action will replace the unsightly eroded bank and collapsed concrete slab with an attractive vegetative border, rising from the sand beach to the level grade at the top of the berm. Thus, the proposed action will improve the scenic and open space resources of the area.

(4) As the proposed wall is not within the normal reaches of the waves nor within the water (it is between 80 to

100 feet away), it will not affect the coastal ecosystem in any significant manner.

(5) The proposed structure is in an appropriate area for the protection of the Owner's property, and will be constructed with minimum adverse social, visual, and environmental impacts in the CZM.

(6) The proposed revetment will render additional protection against coastal hazards such as tsunamis and high storm waves.

(7) While Act 258, SLH 1993, requires that new structures be located inland from the shoreline setback, it also recognizes that private facilities which will not adversely affect the beach processes nor artificially fix the shoreline are permissible where hardship will result. The proposed wall, set inland from the reaches of the waves (other than tsunamis and high storm waves) and into the eroded bank, will not affect the beach processes. Nor will it artificially fix the shoreline, as the shoreline will continue to be seaward of the structure. The inability of the Owner to construct the proposed wall will result in a hardship of having the protective berm being eroded away, with the imminent collapse of the rest of the concrete slab and eventual loss of the berm currently protecting the residence in the lower portion of the property.

(8) The failure to construct the wall may result in a further of loss of beach to the public. If erosion is allowed to continue, the public beach may actually be reduced in that the resulting dirt wash from the eroded bank can create an opportunity for additional encroaching vegetative growth unto sandy beach. This can make the certified shoreline move seaward, naturally increasing private property at the expense of the public's loss of beach.

XI. Responses to Comments Received

Copies of the comments received are attached as Appendix "1" hereof.

The Applicant responds to those comments as follows:

1. Letter of Brian J. J. Choy, O.E.Q.C., of June 8, 1993: The final EIA has been revised to include a discussion of

impacts to the flora, fauna and ocean resources. Likewise, maps and drawings showing the certified shoreline, location of the proposed revetment, and typical cross-section of the proposed structure are submitted as part of the final EIA.

Finding and reasons to support the determination as contained in the final EIA.

2. Letter of Harold S. Masumoto, OSP, of June 24, 1993: The concrete slab was the floor of a residence which preexisted the implementation of the coastal zone management law and shoreline setback law. Due to the undermining of the slab, the structure was torn down, the electrical and plumbing removed, and the uncollapsed portion is currently being used as a sun deck.

The Owner is cognizant of the concern which any hardening of the shoreline may have. However, there appears to be a misunderstanding and belief that the proposed structure will be at the edge of the wave action, and possibly adversely affect the normal littoral processes along the shoreline. The structure will be located between 80 to 100 feet inland of the reaches of the waves, and will only be reached during occasional high wave storm conditions; it is only during these times that the bank needs protection.

Further, the Owner believes that the fear of accelerated erosion of the beach is adequately dispelled by the events following the construction of a similar revetment on the abutting property, i.e., the accretion of sand fronting the wall and a wider, nicer addition to the public beach.

While the City and County of Honolulu has a policy of slopes no steeper than 1V:3H, no such policy has been implemented in the County of Kauai. The design of the proposed wall is that used in the construction of the wall on the abutting property, and has been shown to be of benefit to the area in terms of a wider sandy beach and a more visually attractive shoreline.

3. Letter of John C. Lewin, Dept. of Health, of July 29, 1993: It should be noted that the edge of the water, and not the certified shoreline, is approximately 80-100 feet seaward from the toe of the seawall. The certified shoreline will be approximately 8 to 20 feet seaward of the proposed wall.

4. Letter of Kiyoji Masaki, Dept. of Public Works, County of Kauai, of June 14, 1993: As no work will be done seaward of the certified shoreline nor in the water, no approval by the Army Corps of Engineers will be required. The Owner will apply for and obtain required building and/or grading permits prior to commencement of construction of the proposed revetment.

5. Letter of Don Hibbard, State Historic Preservation Division, of August 5, 1993: Mr. Hibbard is correct in stating that the mitigation work has yet to occur. The Applicant meant to state that the prior archaeological investigation was sufficient to identify the archaeological concerns, and the final EIA has been amended to reflect this. The Owner is agreeable to the conditions recommended in Mr. Hibbard's letter.

6. Letters of Sam Lee, Division of Land Management, of June 18, 1993, and July 23, 1993: The Applicant will reapply for recertification of the shoreline as soon as the necessary CDUA, SMA and shoreline variance permits have been obtained. It would not be prudent to bear the expense of having the shoreline resurveyed and recertified if the Applicant is unable to construct the proposed wall due to the inability to obtain all necessary approvals. The wall will be constructed into the face of the eroded bank, and in any case, will not be seaward of the certified shoreline.

As noted in the final EIA, beach sand located makai of the certified shoreline will not be removed or utilized for the construction of the proposed sloping wall.

The Owner is agreeable to the proposed condition that the certified shoreline be staked and maintained by the owner or contractor during all phases of construction, with stakes to be a minimum of 5' tall, painted orange and flagged. The Division of Land Management will be notified after staking and prior to commencement of construction, to provide it with an opportunity to inspect.

7. Letter of 1000 Friends of Kaua'i, of July 15, 1993: For the reasons set forth in the final EIA and Exhibit "F" thereto, the concerns of adverse shoreline littoral processes resulting from the proposed revetment are likely without merit.

The concerns regarding ancient burials at the site are noted and can be addressed in implementing the conditions recommended by the State Historic Preservation Division of the

Department of Land and Natural Resources. As stated above, the Owner is agreeable to those conditions.

The Owner has no intention of adversely affecting the lifestyle of the local residents. Given the past experience of the similar revetment on the abutting property, it is remote that the proposed structure would cause the fishing practices of the local residents to change.

8. Letter of Carol Wilcox, of July 26, 1993: The comments have been addressed in the final EIA and exhibits submitted therewith.

9. Letter of Michael Parke, of June 28, 1993: The comments have been addressed in the final EIA and exhibits submitted therewith.

XII. Determination

It is determined that an environmental impact statement for the proposed use is not necessary.

XIII. Findings and Reasons Supporting Determination

The purpose of the proposed wall or revetment, mauka of the certified shoreline, is to protect the Owner's property against further erosion of the berm during times of abnormal high waves. No endangered or threatened species of flora or fauna will be affected by the proposed action. As the wave action will normally not reach the proposed wall, except for periods of storm and unusually high surf, the beach and offshore waters will remain relatively unaffected by the proposed action. Moreover, the sloping design of the structure is intended to dissipate rather than reflect the energy of any wave which may reach it. This will minimize any scouring around the end of the wall and undermining of the structure.

The wall will be constructed wholly on the Owner's property, up to the existing grade of the partially eroded beach berm, and will be backfilled and re-topped with sand. As in the case of the revetment on the abutting property of similar design, vegetation will reestablish itself on the top of the wall, mitigating any visual impacts therefrom.

The proposed action will not affect nor change the existing drainage pattern of the area, and will not result in any adverse effect on traffic, sanitation, waste disposal, refuse disposal and use of water. It should not also interfere with the public's right to use the beach in any manner, as the wall would be placed away from the normal upper reaches of the waves and leave all of the public beach for use and lateral access.

Archaeological concerns have been identified by the archaeological investigation and trenching on the site, and the willingness of the Owner to adhere to the recommendations of the State Historic Sites Division should address and mitigate any archaeological concerns.

Concerns as to the effect of the proposed action on the littoral beach processes and acceleration of erosion along the area are unwarranted, in that the revetment will normally be beyond the reaches of the waves and not adversely infringing upon the littoral beach processes. Moreover, the presence of the revetment on the abutting property has shown that the revetment has caused the beach to accrete rather than erode.

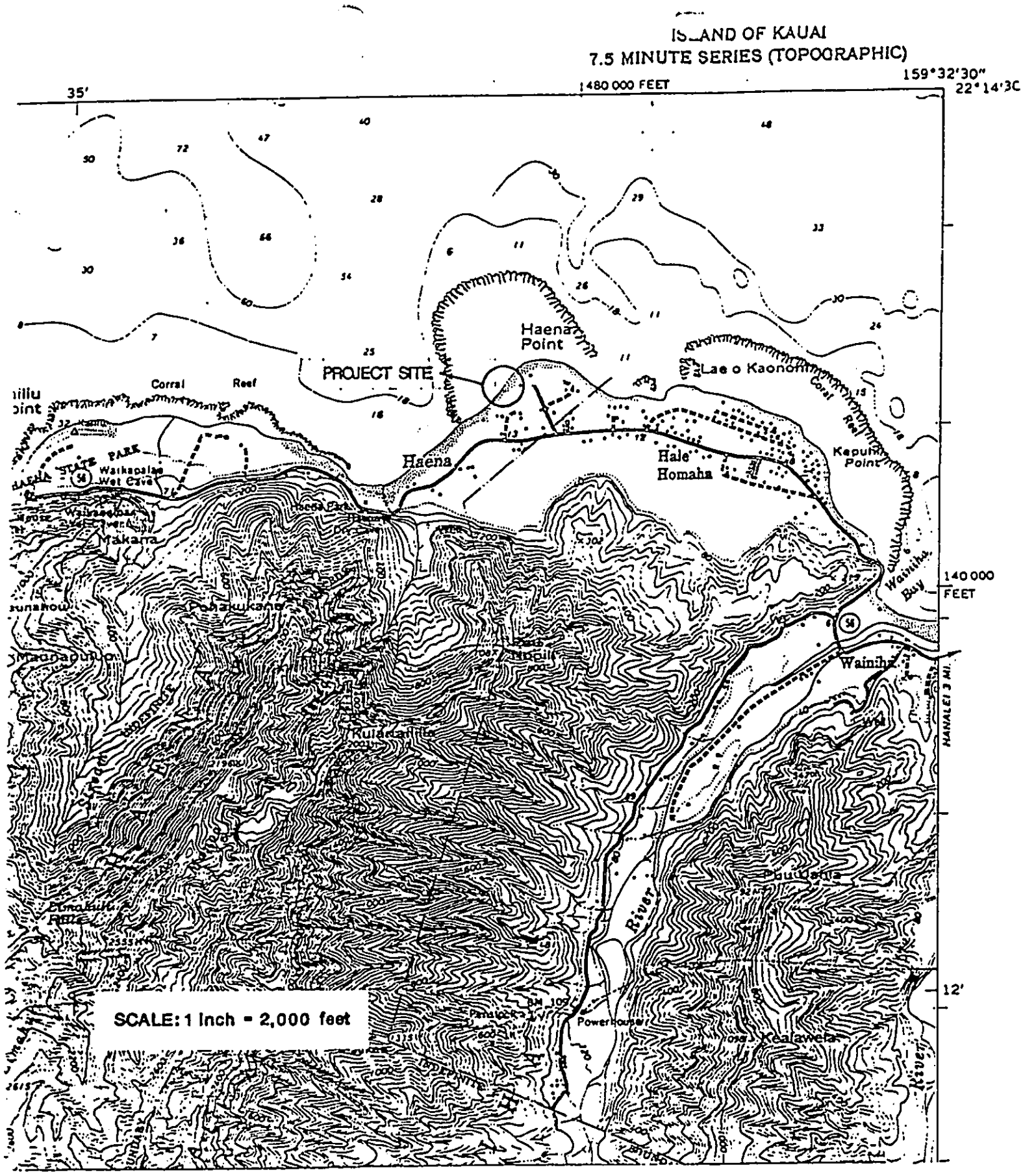

Figure 1. Project Site Location Map, Haena, Kauai

EXHIBIT A

Murcia-Toro, Inc.
TMK: 5-9-02-35

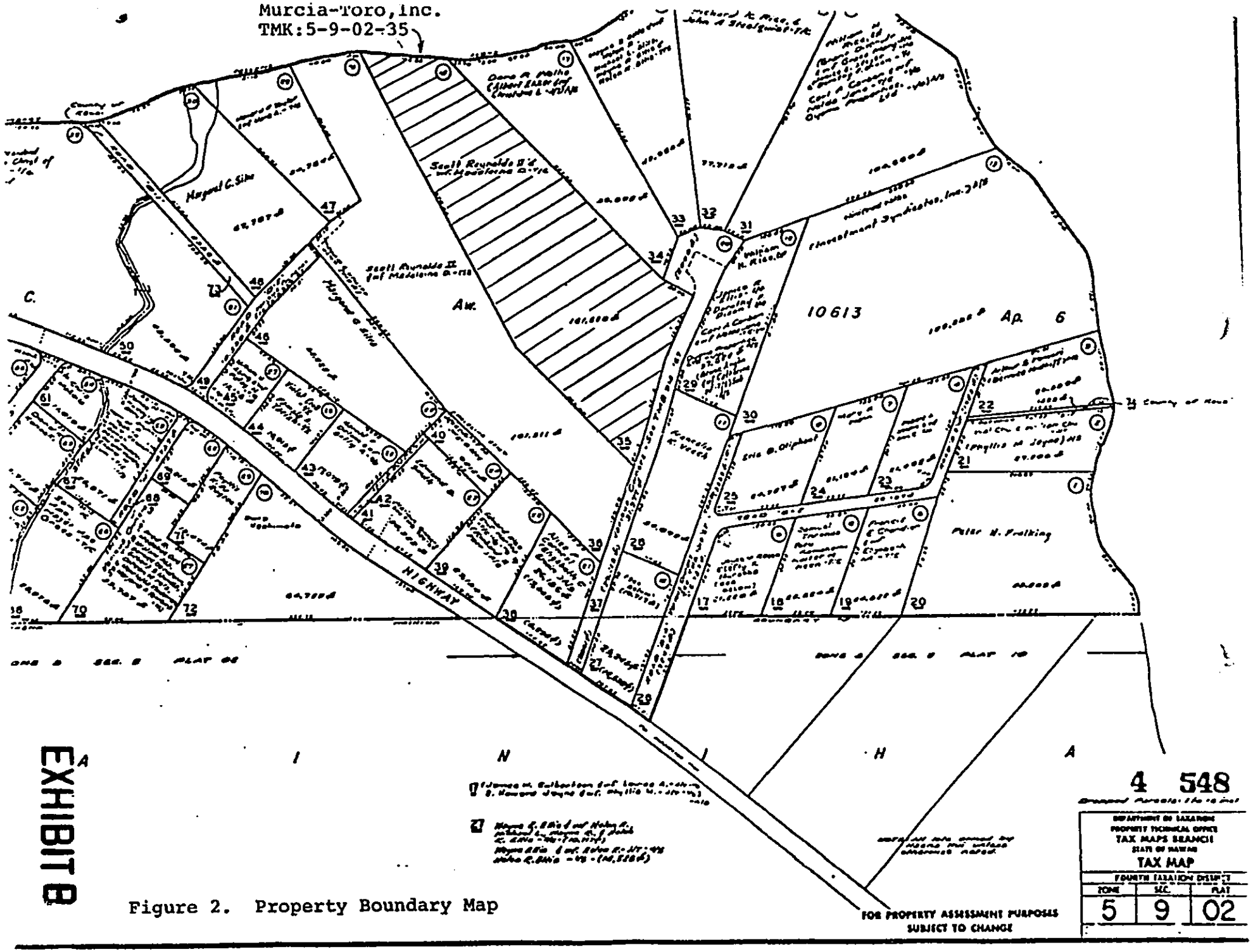

EXHIBIT B

Figure 2. Property Boundary Map

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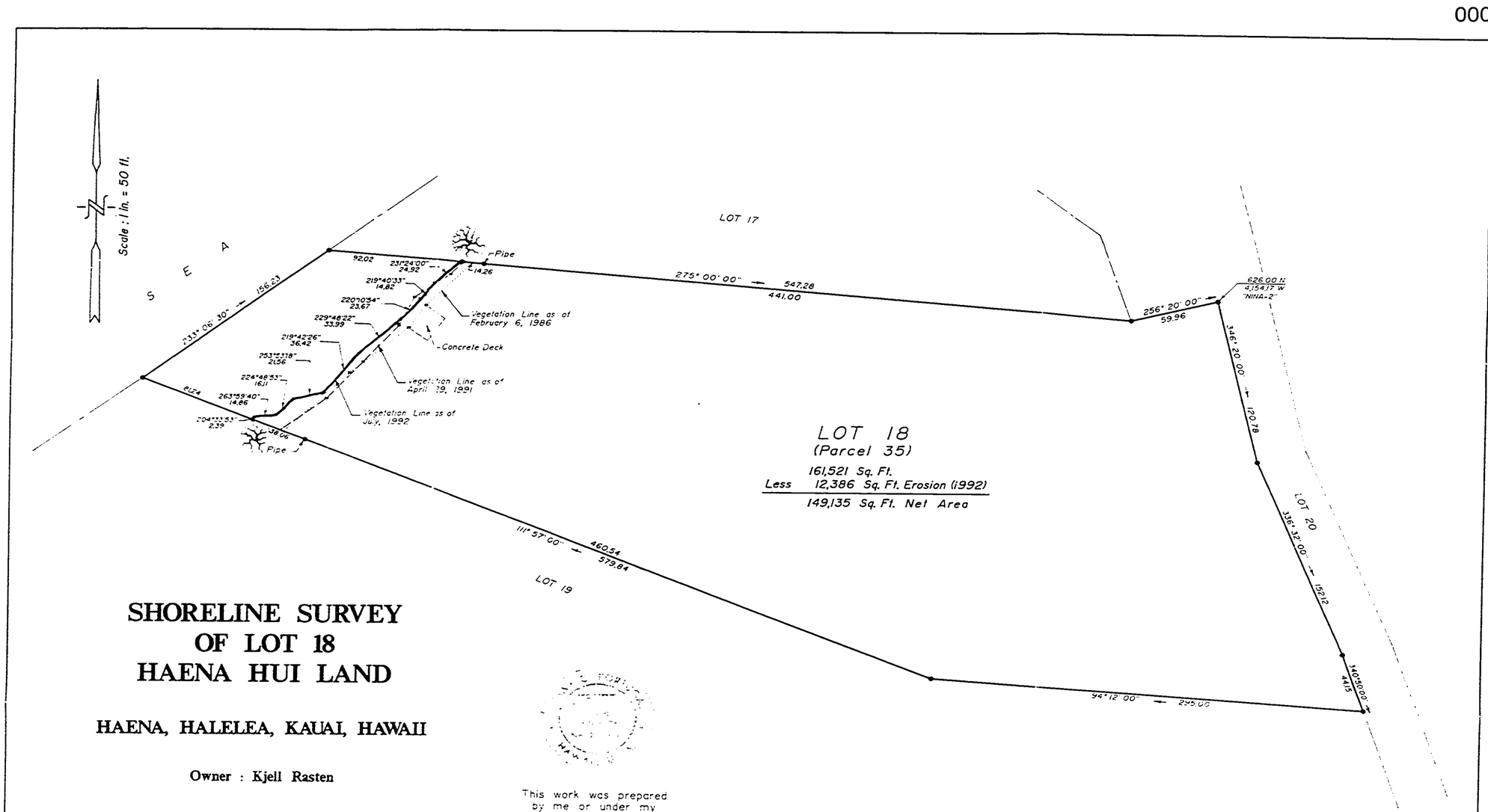


SHORELINE SURVEY OF LOT 18 HAENA HUI LAND

HAENA, HALELEA, KAUAI, HAWAII

Owner : Kjell Rasten

The shoreline as located and certified and delineated in red is hereby confirmed as being the actual shoreline.

DEC 1 1992

"John P. Keppeler II"
Chairman, Board of Land and Natural Resources

This work was prepared by me or under my supervision

Reg. Prof. Engineer & Land Surveyor
Certificate Number 2225-SE

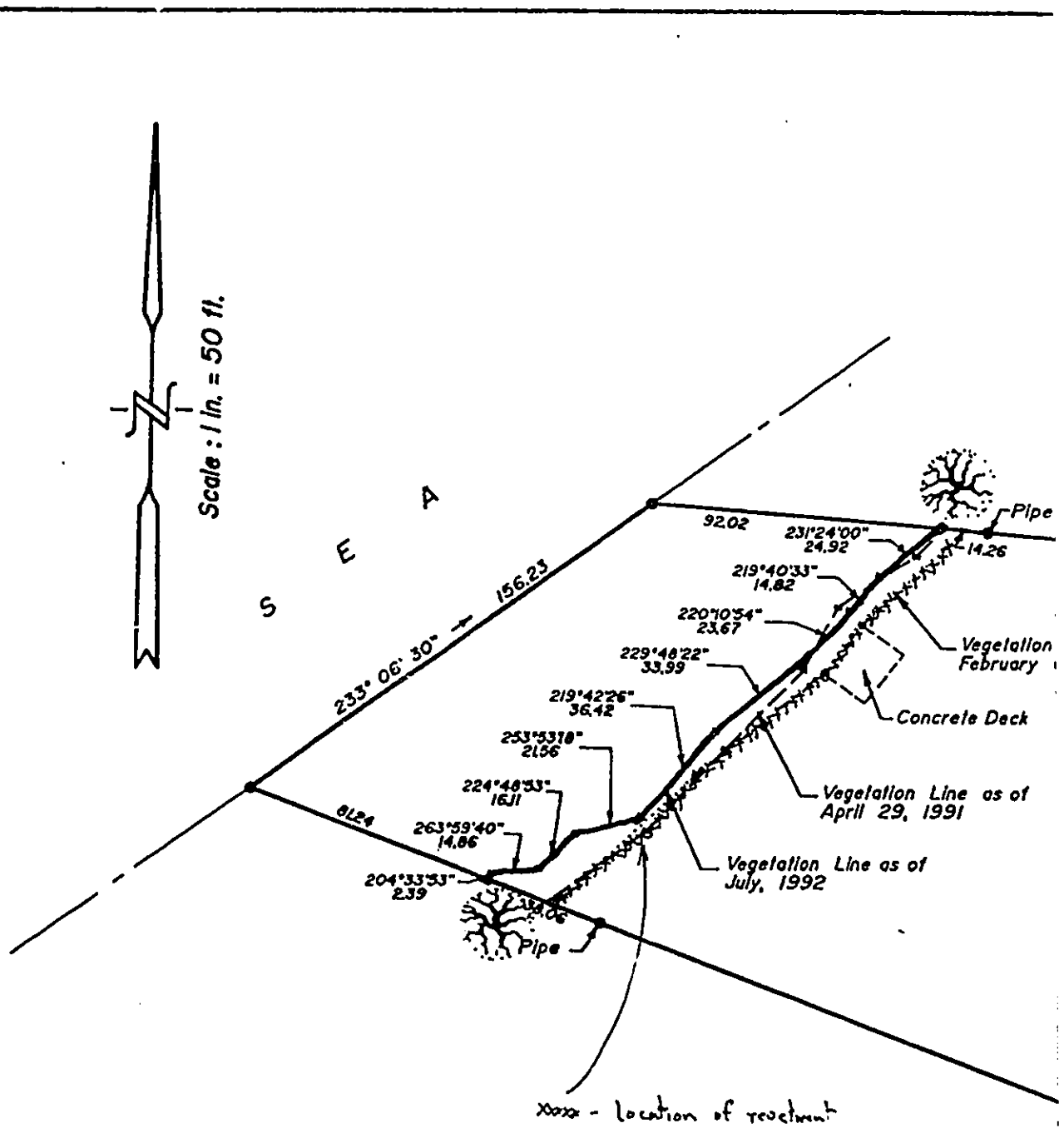
For : PORTUGAL & ASSOCIATES, INC.
Lihue, Kauai, Hawaii

August 3, 1992

Tax Map Key : 5-9-02 : 35

Job No. 2441

EXHIBIT C



SHORELINE SURVEY
OF LOT 18
HAENA HUI LAND

EXHIBIT D

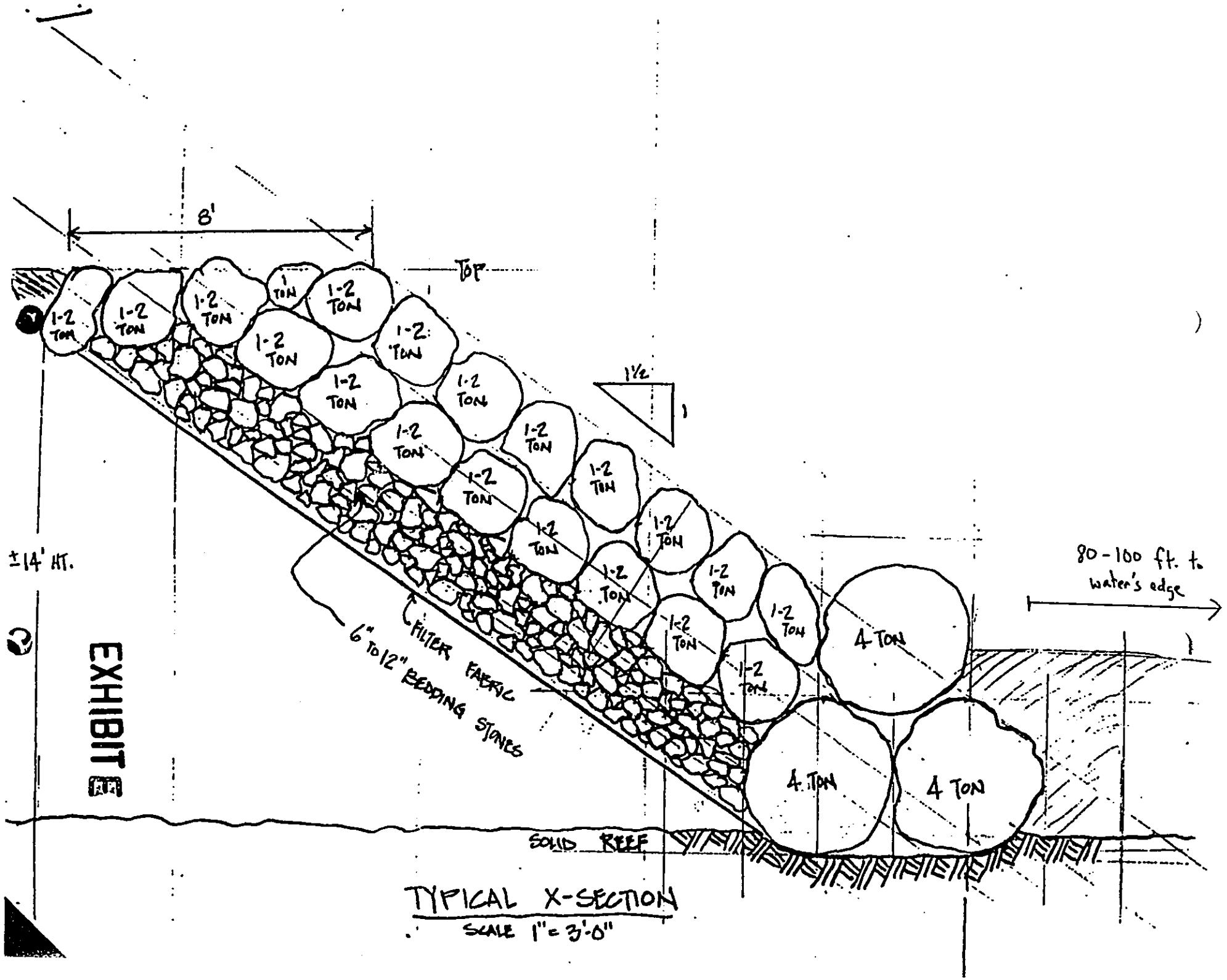


EXHIBIT E

TYPICAL X-SECTION
SCALE 1" = 3'-0"

EXCAVATIONS AT SITE 50-30-02-1809

AT A RESIDENTIAL PROPERTY (TMK 5-9-02-35)

HA'ENA, HALELE'A, KAUA'I (RASTEN PROPERTY)

Prepared by

Hallett H. Hammatt, Ph.D
David W. Shideler, M.A.

Cultural Surveys Hawaii

Prepared for

Mr. Kjell Rasten
October 1989

EXHIBIT F

Abstract

The report covers the results of archaeological research at State Site 50-30-02-1809 or the Rasten property (TMK 5-9-02-35) at Hā'ena Point, Halele'a, Kaua'i. This archaeological data recovery was performed for mitigation of impact of sea wall construction in accordance with a data recovery plan worked out between Cultural Surveys Hawaii and the State Historic Sites Section of the Department of Land and Natural Resources.

Ten trenches (total area 10.5 m^2) were excavated along the beach cut bank of the Rasten property. The midden recovered was notable for its high concentration index (1,353) and for the presence of albatross and goose bone. It is suggested that populations of albatross and goose were extirpated in polynesian times. The artifacts included attenuated chisel-like adzes, fishhooks, and a shell drill. Two carbon isotope dates of 1385-1500 A.D., and 1330-1430 A.D. were recovered and are typical for early Hā'ena occupations.

Acknowledgements

The field work was completed by Dr. Hammatt, Mr. Douglas Borthwick, Mr. Mark Stride, and Mr. Matt McDermott,and Ian Masterson. Laboratory analyses were performed by Ms. Kirstie Nakamura and Mr. Stride. Artifact photography was accomplished by Ms. Nakamura. Drafting was by Mr. Stephen Clark. Word processing was by Windword Processing.

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I. Introduction

In accordance with a data recovery plan worked out between the Rasten Family, the State Historic Sites Section, County Agencies, and Cultural Surveys Hawaii, archaeological investigations were carried out in July of 1989 in order to mitigate the impact of the construction of a sea wall on known cultural resources (State Site #50-30-02-1809). Previous studies in the area (Griffin et al., 1977; Hammatt and Meeker, 1979; Hammatt and Shideler, 1989) had identified a widespread prehistoric layer dating back to 1,000 A.D. This cultural layer was clearly visible along most of the eroding beach cut bank of the Rasten property. Ten archaeological trenches (total area 10.5 m^2) were excavated by hand along the beach cut bank of the Rasten property (Fig. 4). The midden assemblage, artifacts, stratigraphy, and carbon isotope dates recovered are herein reported and discussed.

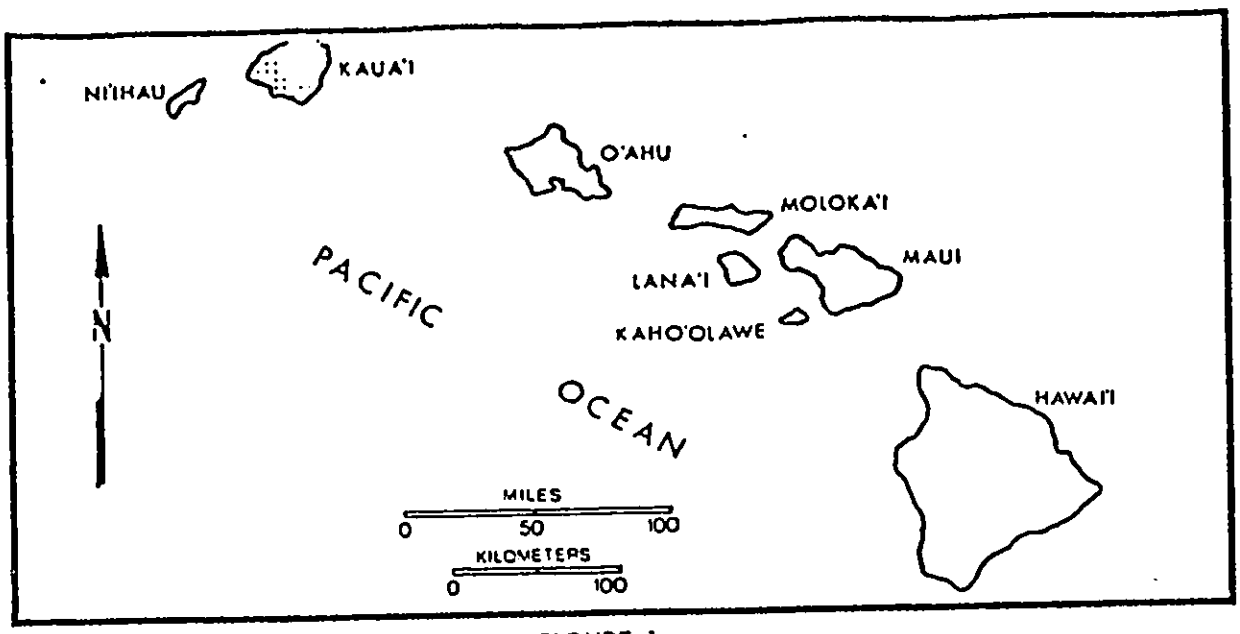


FIGURE 1
State of Hawai'i

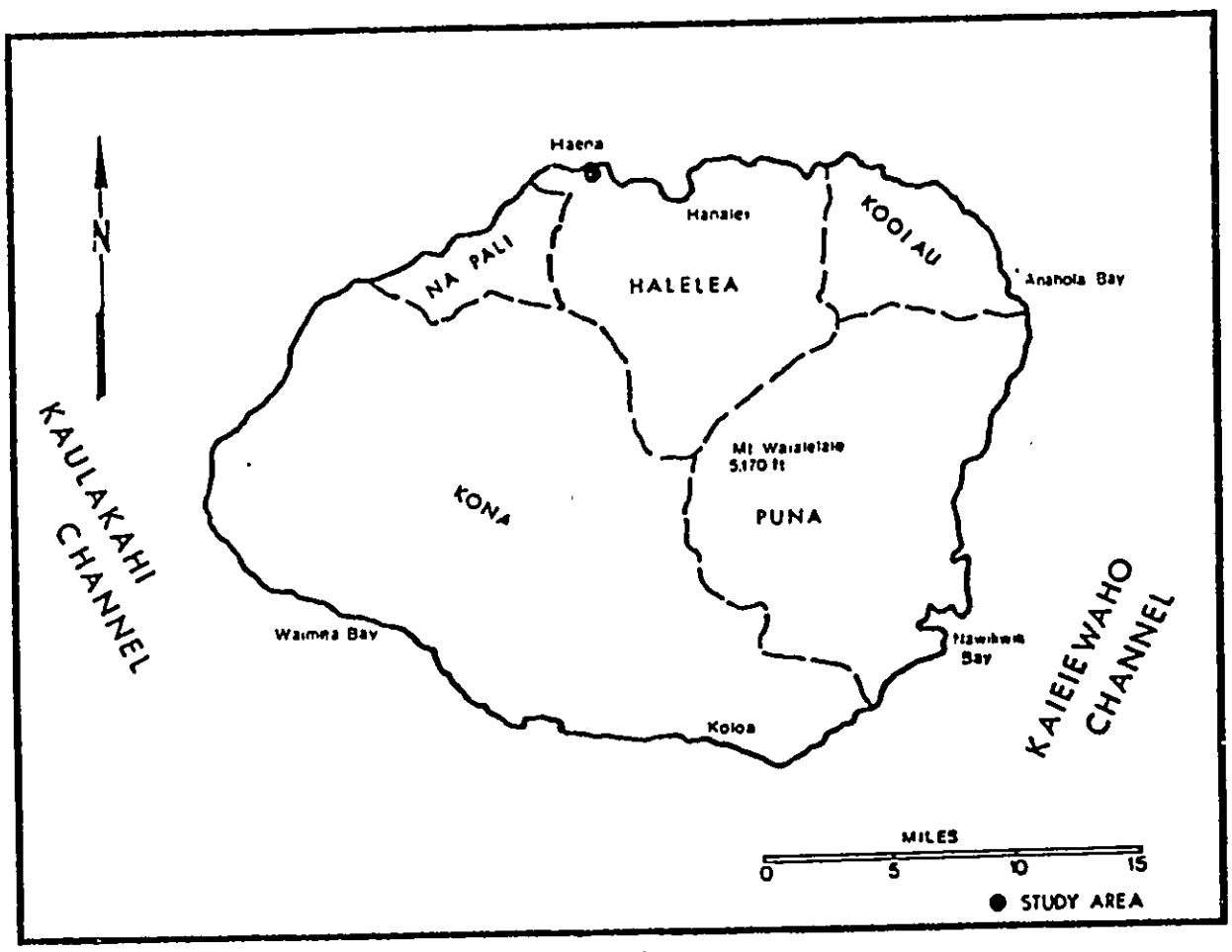


FIGURE 2
General Location Map, Kaua'i Island

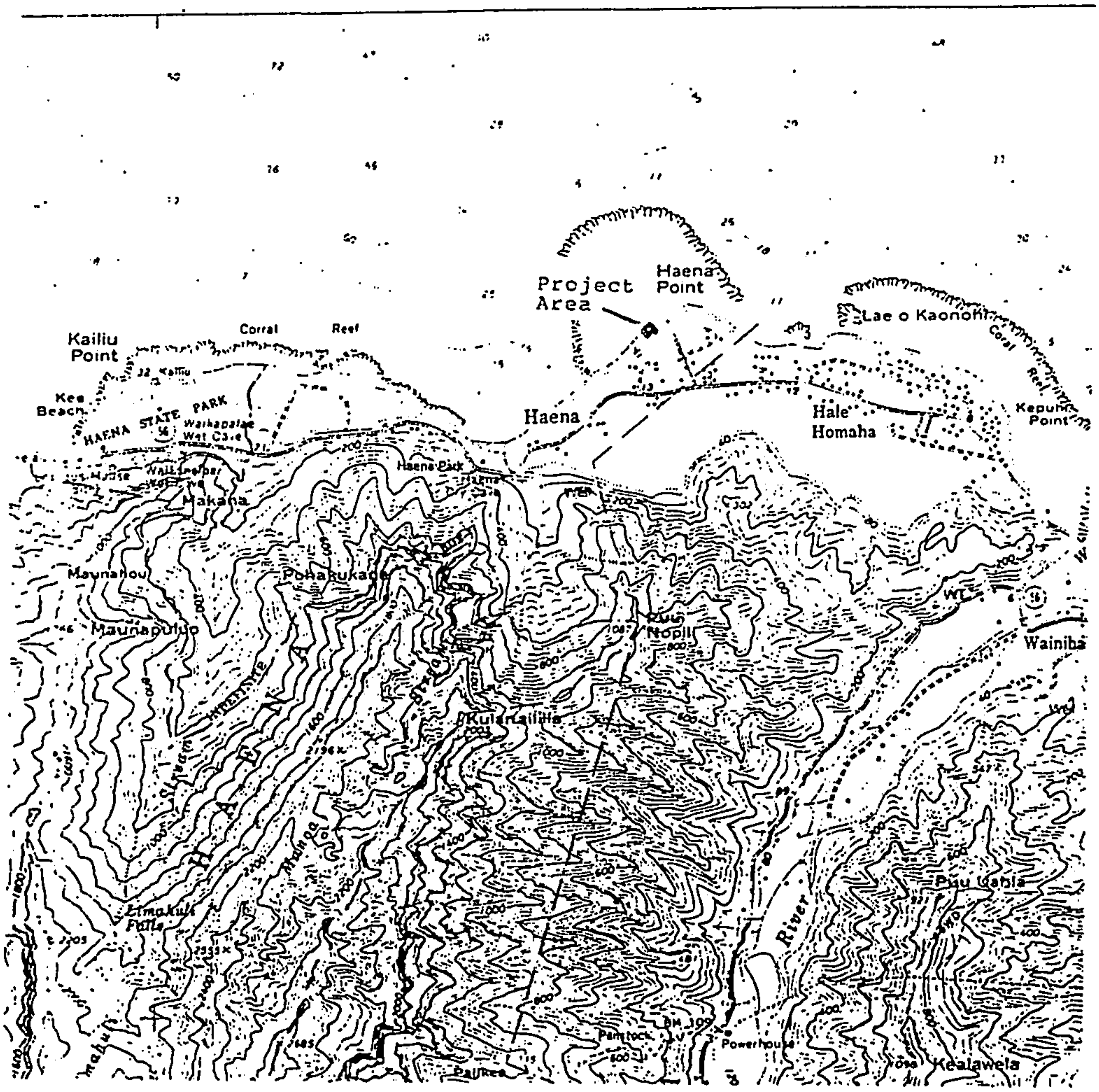


Fig. 3 USGS Hā'ena Quad showing Project Area (Shaded)

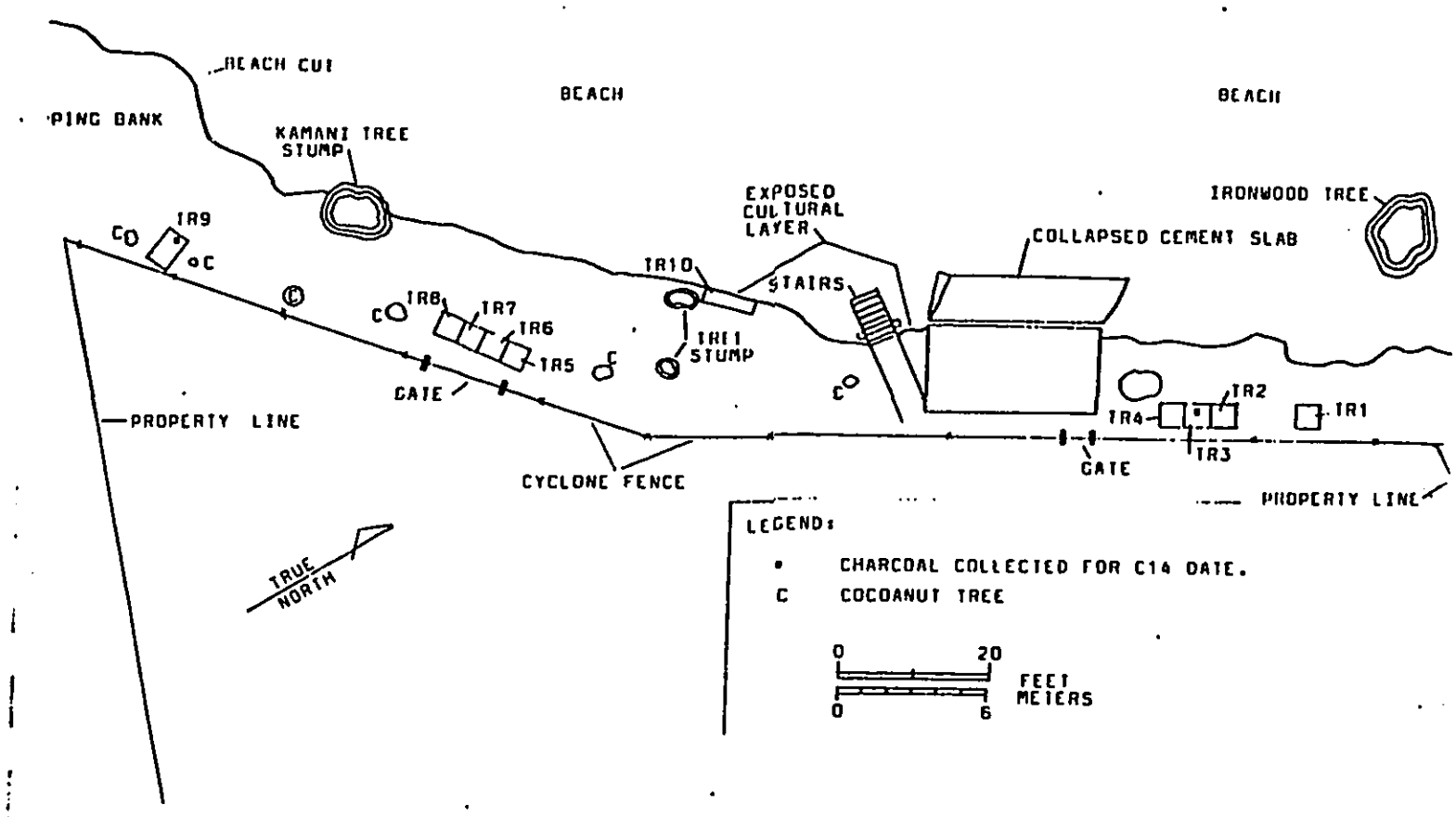


Fig. 4 Rasten Property, Site 50-30-02-1809, Showing Excavation Areas

II. Natural and Cultural Setting

The subject property is located along the shoreline at Hā'ena Point northeast of Hā'ena County Park within Hā'ena Ahupua'a, Halele'a, Kaua'i (Figs 1-4). The property (TMK 5-9-02:35) is a 161,520 square foot parcel which has been developed as a single family residence (by the Rasten Family). There is an existing residence on the west side of the parcel and a single family dwelling under construction on the east side. The Rasten property consists of a 2-story resident and a large level lawn area overlooking the reefed shoreline of Hā'ena Point. On the makai side of the parcel is an approximately 8 foot high vertical beach-cut bank, the base of which slopes down to the ocean and reef.

The ahupua'a of Hā'ena is relatively small (just less than 3 square miles) which is in itself a testimony to its richness. This land division could afford to be small as all necessities could be found close at hand.

About half of Hā'ena lies on a large, low, narrow coastal terrace which extends from the eastern edge of the Na Pali Cliffs at Ke'e Beach east to the mouth of Wainiha Stream. The coastal plain is never more than a third of a mile wide and is bounded by high ridges of the Na Pali formation of the Waimea Canyon volcanic series. The rough mountainous uplands have been deeply dissected by high gradient streams fed by high rainfall, which even at the coast averages about 75" a year. Hā'ena is drained by two shallow streams, Limahuli Stream to the east and Mānoa

Stream to the west. These stream valleys were foci for agriculture and habitation and were also sources of lithic raw material as the streams dissected dike formations revealing and transporting finer grained basalt and volcanic glass suitable for artifacts. The flat Hā'ena beach terrace is bordered by a thin, elongated, backshore dune which parallels the beach. This has accumulated largely from the action of trade winds and high winter surf, but also from the actions of seismic sea waves. These seismic sea waves have been reported to reach 32' elevation at Hā'ena Point (MacDonald and Abbott, 1974:258) and must have been well known to the ancient Hawaiians. It has been suggested that "the dune crest is almost certainly a historic land form whose deposition is controlled by 20th Century exotic tree growth, particularly ironwood" (Griffin et al. 1977:11). The vegetation in the coastal area of Hā'ena is mostly exotic with Ironwood (Casuarina equisetifolia) and Tropical Almond (Terminalia catappa), particularly common and well represented in the present study area. The native Beach Naupaka (Scaevola sericea) and coconut (Cocos nucifera) are also common.

Of the prehistory of Hā'ena little is known. Kaua'i was a backwater and Hā'ena was a backwater on Kaua'i. Most traditional references allude to Hā'ena as the site of the romance between Pele and Lohi'au which is thought to have given the area its name.

A Lohi'au-ipo i Hā'ena lā,
'ena 'ena Ke aloha Ke hiki mai

and beloved Lohi'au at Red-hot,
hot the love that comes

It has been suggested (Handy and Handy 1973:417-418) that this romance provided the name for not only Hā'ena, but for the entire district, Halele'a - "House of Delight."

In the absence of aboriginal accounts of prehistory, early censuses, land court award data and the work of anthropologists are our major sources of information. Two early census of Hā'ena indicate a population of 116 in 1835 (cited in Earle 1978:161) and 162 in 1847 (cited in Griffin et al. 1977:20). While precontact population estimates are a matter of some debate, most would agree that a precontact population for Hā'ena Ahupua'a would probably fall within the range of 220 ± 100 people.

The land ownership record for Hā'ena is somewhat complicated by the fact that after the Kaua'i insurrection of 1824 lands were divided among the chiefs of the Kamehameha monarchy who were largely from Hawai'i island. In the Great Mahele of the 1840s the ahupua'a of Hā'ena was awarded to Abner Paki (father of Bernice Pauahi). About 24 land court awards were filed by natives, but none appear to be near the present project area.

Earle deduced a number of interesting points about life at Hā'ena in Hawaiian prehistory on the basis of early historic records. He estimates that the average size of a household at Hā'ena in 1847 was 8.1 persons compared to the Halele'a District average of 5.6 persons (Earle 1978:147); that in 1850, 96% of the

land awards included taro lands (Ibid.:149); that 85% of the house lots were located in the sandy strip near the shore (Ibid.:149); that in Hā'ena there was almost no clustering of house lots (Ibid.:164); that warfare between local communities was not present (Ibid.:164); and that agricultural resources at Halele'a District were particularly underutilized (Ibid.:163). His work on mean distances from house lots to taro fields and the sea suggests a greater marine orientation at Hā'ena than elsewhere (Ibid.:150).

The picture this suggests for the vicinity of the present project area is of scattered house sites of about 8 people, typically spaced 150' or more apart along the coast, with intensive utilization of lower Mānoa Valley for wet taro cultivation and a particularly strong focus on marine resources. Handy's informants (Handy and Handy 1972:419) indicated that sweet potatoes were grown in sandy areas along the coastal plain while other crops were raised in the valleys. Peace and plenty prevailed.

III. Previous Archaeological Research

In their bibliography of Hawaiian archaeology, Spriggs and Tanaka (1988:300) list some eighteen archaeological studies specifically on the ahupua'a of Hā'ena but only one of these predates 1977 (Emory 1929). Until the 1970s what few studies and travelers' accounts there were on the prehistory of Hā'ena were largely focused on the wet and dry caves and the "ruins at Ke'e." These later sites, including Ka'ulu'a 'Paoa heiau, the immediately mauka hula platform and Lohi'au's house have been much mentioned in travelers' accounts as they figure prominently in Hawai'i's greatest saga -- the Pele and Lohi'au legend, also called the Hi'iaka myth (Emerson 1925).

Wendell Bennett (1931:136-138) conducted field work on Kaua'i in 1928 and 1929 but only recorded the above-mentioned three sites within the ahupua'a of Hā'ena proper.

In the early 1970s Timothy Earle conducted field work on the drainages of Hā'ena for his doctoral dissertation (1973) which was revised as a monograph titled Social and Economic Organization of a Complex Chiefdom: The Halele'a District, Kaua'i, Hawai'i. This research focused in detail on irrigation systems, terraces and pond fields near Limahuli and Mānoa Streams at Hā'ena, but paid relatively little attention to coastal areas like Hā'ena Point whose coral sandy soils were less intensively utilized for agriculture. His work is still the best overview on the prehistory of Hā'ena and Halele'a District.

Subsurface archaeological investigations at Hā'ena really

began with research for the Hā'ena State Park (Griffin et al. 1977; Hammatt et al. 1978) and continued with several related projects (Hammatt and Meeker 1979, Riley 1979, Yent 1980).

These studies identified prehistoric cultural layers which appear to be discontinuous, but widespread along the backshore beach and dune deposits of coastal Hā'ena and Wainiha. These deposits extend from Ke'e Beach in the west at least to Wainiha Bay in the east, and have been reported in a number of short archaeological reports prepared in conjunction with conservation district use permits for single family residences.

The largest exposure of these beach front cultural layers occurs at Hā'ena State Park and stretches from Limahuli Stream to Ke'e Beach. The Hawaiian occupation and adjacent mauka lo'i which occur along virtually every stream in Halele'a were the subject of the intensive studies from 1977 to 1979 (Griffin et al. 1977; Earle 1978; Hammatt et al. 1978; and Hammatt and Meeker 1979). The marine-oriented occupation at Ke'e Beach was dated to between 900 and 1,000 A.D. (Hammatt et al. 1978) and to date is the oldest Hawaiian occupation on Kaua'i. Intensive development of irrigated agriculture dates to after 1200 A.D. (Ibid. 1978).

Recent work at the Zimmerman Property (State Site #50-30-02-1089) at Hā'ena Point (Hammatt and Shideler, August 1989) dated an extensive prehistoric cultural layer to 1280-1410. This study noted that midden was generally less concentrated than at the earlier Ke'e Beach sites; suggesting less intensive utilization of the area, but the midden contained a higher percentage of

mammal and bird bone suggesting increased use of terrestrial resources in later Hā'ena occupations. The artifact assemblage in the Zimmerman excavations was sparse but the presence of an abundance of basalt waste flakes, eight polished adz flakes, and an adz tip reinforces the impression of a strong orientation toward terrestrial resources.

The cultural layer located within the present property is almost certainly of comparable age to that of Ke'e Beach and represents the beach occupation component of those people exploiting the extensive lo'i in Mānoa Stream which have a large associated ceremonial terrace (Earle 1978:93). Hā'ena is unique among the ahupua'a of the Halele'a District in being blessed with a long reef-fringed coastline and two permanent streams -- Limahuli to the west and Mānoa to the east. This richness in resources is reflected in an "archaeological richness, likely the greatest in the State" (Griffin et al. 1977:8). Hā'ena has been called "one big archaeological site" and has been suggested to "hold the key to understanding earliest Tahitian or Marquesan colonization in Hawai'i" (Kenneth Emory 1977 quoted in Ibid. 1977:2).

IV. Stratigraphy

The stratigraphy of the excavations at the Rasten property was relatively consistent and straight forward. All along the beach cut bank the parent material consists of well-sorted fine to coarse marine coralline sand derived from the fringing reef of Hā'ena Point and deposited primarily by wind. Stratum I refers to a sand matrix of recent deposition, containing a few modern artifacts. Stratum II is an organic stained layer that includes the prehistoric cultural layer. Stratum III is sterile beach sand. The specific strata are as follows:

Stratum IA is a modern A-horizon, typically 15-25 cm. thick, consisting of 10 YR 5/3 brown (dry) to 10 YR 6/3 pale brown (dry) medium to coarse sand with grass rootlets. Some historic artifacts, principally metal fragments and bottle glass and an occasional basalt waste flake, displaced as a result of bioturbation, were observed in this stratum.

Stratum IB is beach sand, C-horizon, 10 YR 8/4 very pale brown (dry) fine to medium coral sand. Typically, this extends from the base of the modern A-1 horizon to a depth of 30 cm. and coarsens with depth. This is understood as the result of relatively recent aeolian and tsunami deposition and is relatively free of either prehistoric or historic artifacts.

Stratum IIA is an A-horizon layer typically extending from the base of the IB Stratum to a depth of 55 cm. This stratum is 10 YR 6/3 pale brown, sandy loam, which commonly has a few coral and basalt cobbles and pebbles.

Stratum IIB is a discontinuous beach sand layer. This 10 YR 8/3 very pale brown, medium to coarse sand layer was probably deposited by storm or tsunami.

Stratum IIC is another buried A-horizon and designates the main prehistoric cultural layer. This 10 YR 2/2 very dark brown (moist), fine to medium sand contains many land snail shells, with the large extinct land snail Carelia dolei, which was endemic to a 2.5 miles stretch of the Hā'ena coastal plain, being particularly common. "The presence of Carelia shells with cultural material, e.g. kitchen midden, worked coral and basalt, suggests that the early Hawaiians may have altered the probable dry forest habitat of this genus of land snails" (Gage, 1989:4). These shells were often quite numerous in the lower portion of Stratum IIC, suggesting a death assemblage, but as at the Zimmerman property the distribution was quite spotty. Stratum IIC contained virtually all of the midden and indigenous artifacts. The Stratum IIC was generally thicker and darker than it was in the Zimmerman property.

Stratum III is culturally sterile beach sand C-horizon. This 10 YR 8/3 very pale brown to white medium to coarse sand was culturally sterile but contained some Carelia dolei in some places.

V. Artifact Analysis

All artifacts recovered are listed in the Master Artifact Accession List in Appendix B and the Volcanic glass Catalog - Appendix C and are summarized in Table 1. The artifact assemblage, as reported in the Master Artifact Accession List have 115 line entries which actually represents 307 artifacts since groups of a type of artifact, particularly waste flakes, were occasionally accessioned collectively by excavation unit.

The vast majority (74%) of the artifacts recovered are basalt waste flakes - discarded flakes not suitable for any function. Their number suggests that the reduction of raw material for the fabrication of stone tools was a common activity at this site as was the case on the Zimmerman Property. The next largest category of artifacts (9% of all artifacts) were polished flakes. The 29 recovered polished flakes suggest that the rejuvenation of tools as they would become dull or broken, was a common occupation. Eight adzes, adz fragments and adz preforms were recovered (Fig. 5 illustrates four of the best). An abundance of adzes usually suggests a strong terrestrial orientation. The cross section shape can be determined with reasonable certainty for six of these adzes. Five are quadrangular/trapezoidal and one (#66) is triangular/semi-lunate. These adzes were unusually attenuated or chisel-like which suggests their use in fine wood working - like the fabrication of canoe parts rather than for the felling of small trees. Additional lithic tools recovered included a hammerstone, two grinding stone fragments, a basalt file, and a

Table 1 Rasten Property Ha'ena

Artifact Totals		Tr.1	Tr.2	Tr.3	Tr.4	Tr.5	Tr.6	Tr.7	Tr.8	Tr.9	Tr.10	totals	%
Basalt													
	flakes	14	29	16	38	20	30	15	21	23	21	227	0.74
	polished flakes	1	5	1	5	2	3	2	1	1	8	29	0.09
	adzes/preforms					1					1	2	0.01
	adz fragments			1	1	1		1	1	1		6	0.02
	hammerstone	1										1	0.00
	grinding stone frag.							1	1			2	0.01
	file							1				1	0.00
	abraders								1			1	0.00
	vol. glass flakes			3	3	2		2		1		11	0.04
												0	0
Fishing Gear													
	coral file saw			1				2		2		5	0.02
	coral abrader									1		1	0.00
	sea urchin file				1	1	1		1	2	1	7	0.02
	bone fishhook							1				1	0.00
	cut bone									1		1	0.00
	shell fishhook						1					1	0.00
	worked shell		1	1		3				2		7	0.02
												0	0.00
Ornaments													
	shell						1				1	2	0.01
	dog tooth									1		1	0.00
	Miscellaneous			1								1	0.00
Total		16	35	24	48	30	36	25	26	35	32	307	

Total Artifacts	307.00
% of Basalt	0.88
% of V.G.	0.04
% fishing gear	0.07
% of coral	0.02
% of bone	0.01
% of shell	0.03

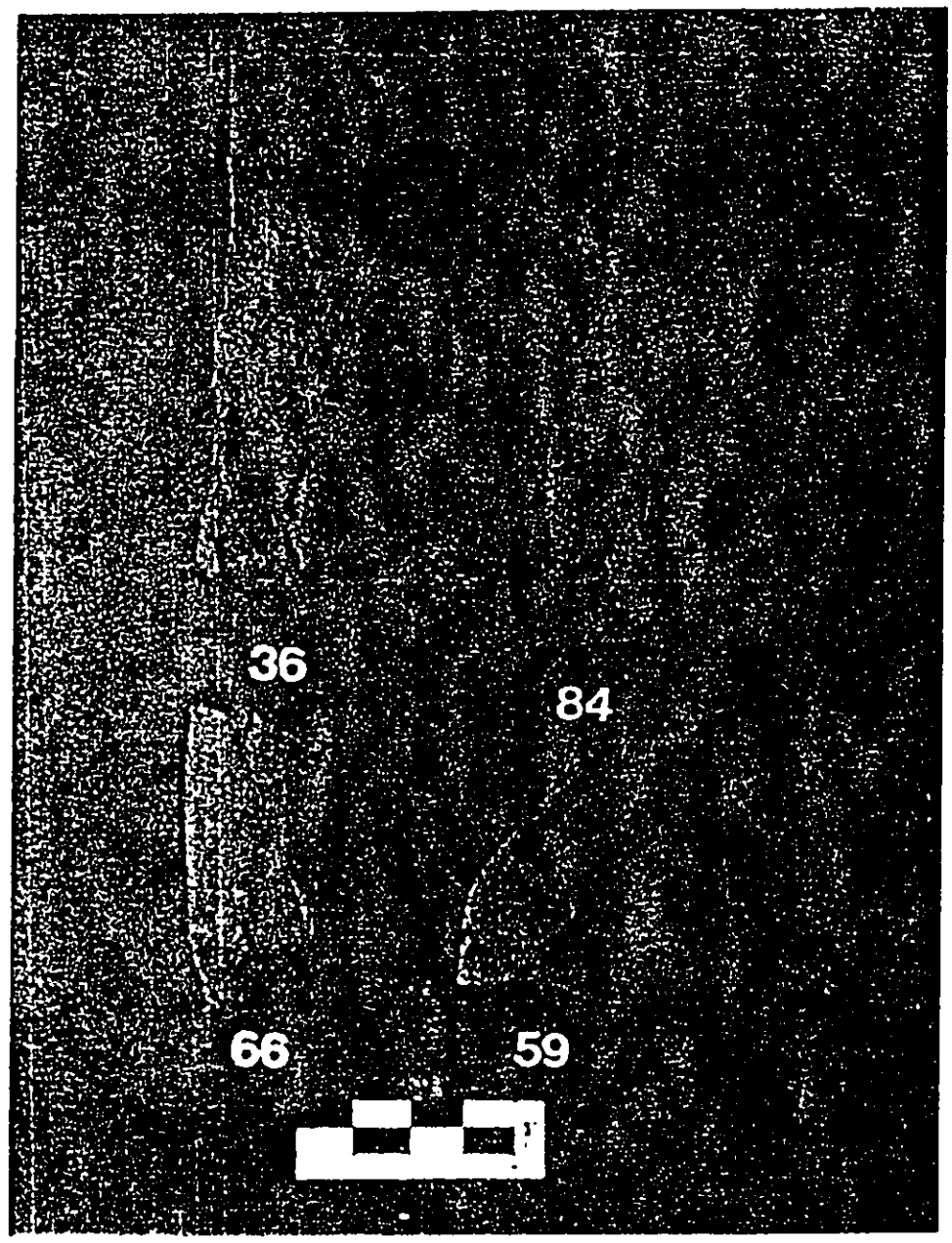


Fig. 5 Basalt Adzes (Acc.#36, adz; Acc.#84, #66, and #59, Adz Fragments

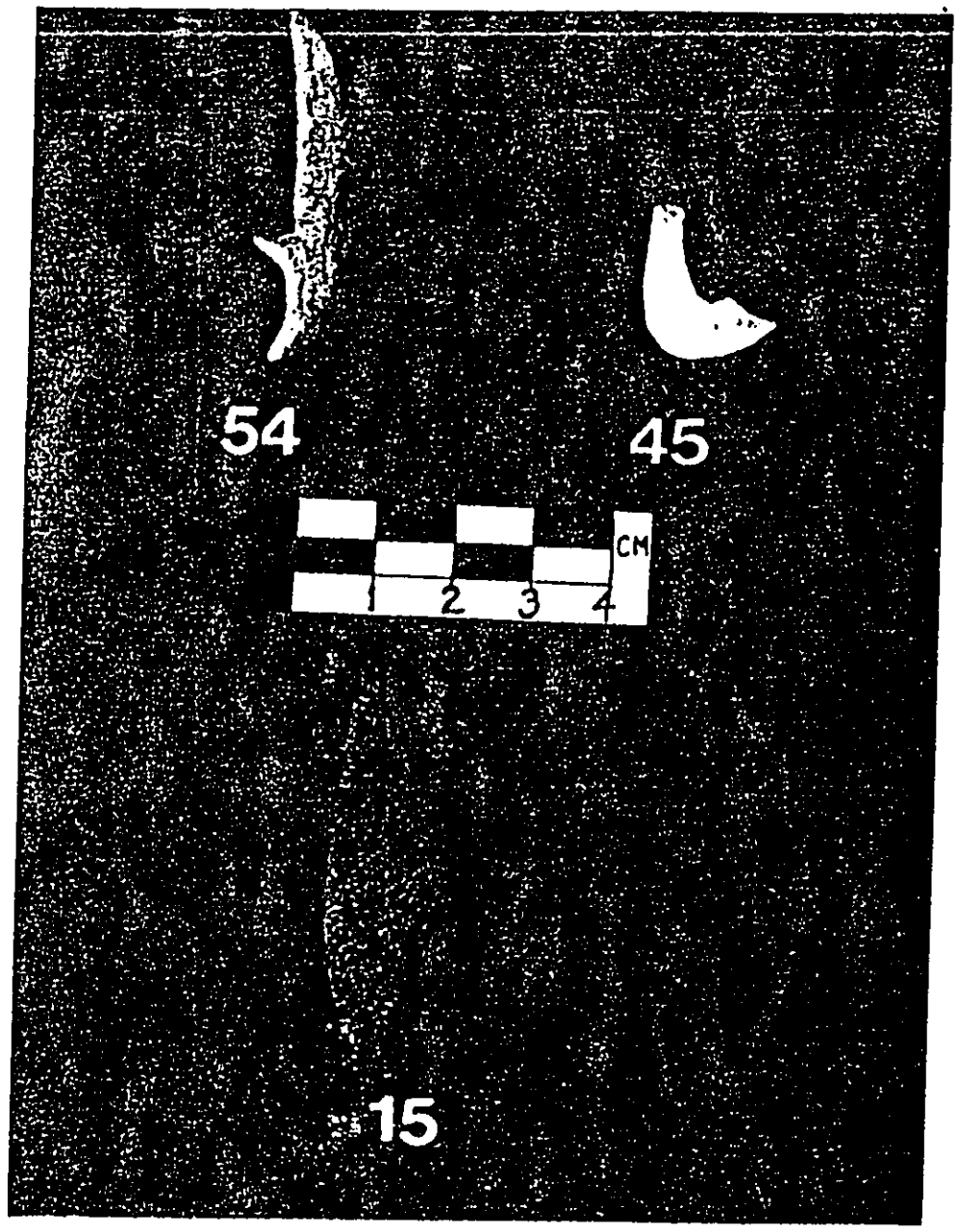


Fig. 6. Fishing Tools (Acc.#54, Bone Point Tip of Two-Piece Hook; Acc.#45 Pearl Shell Fishhook Fragment; Acc.#15, Coral File

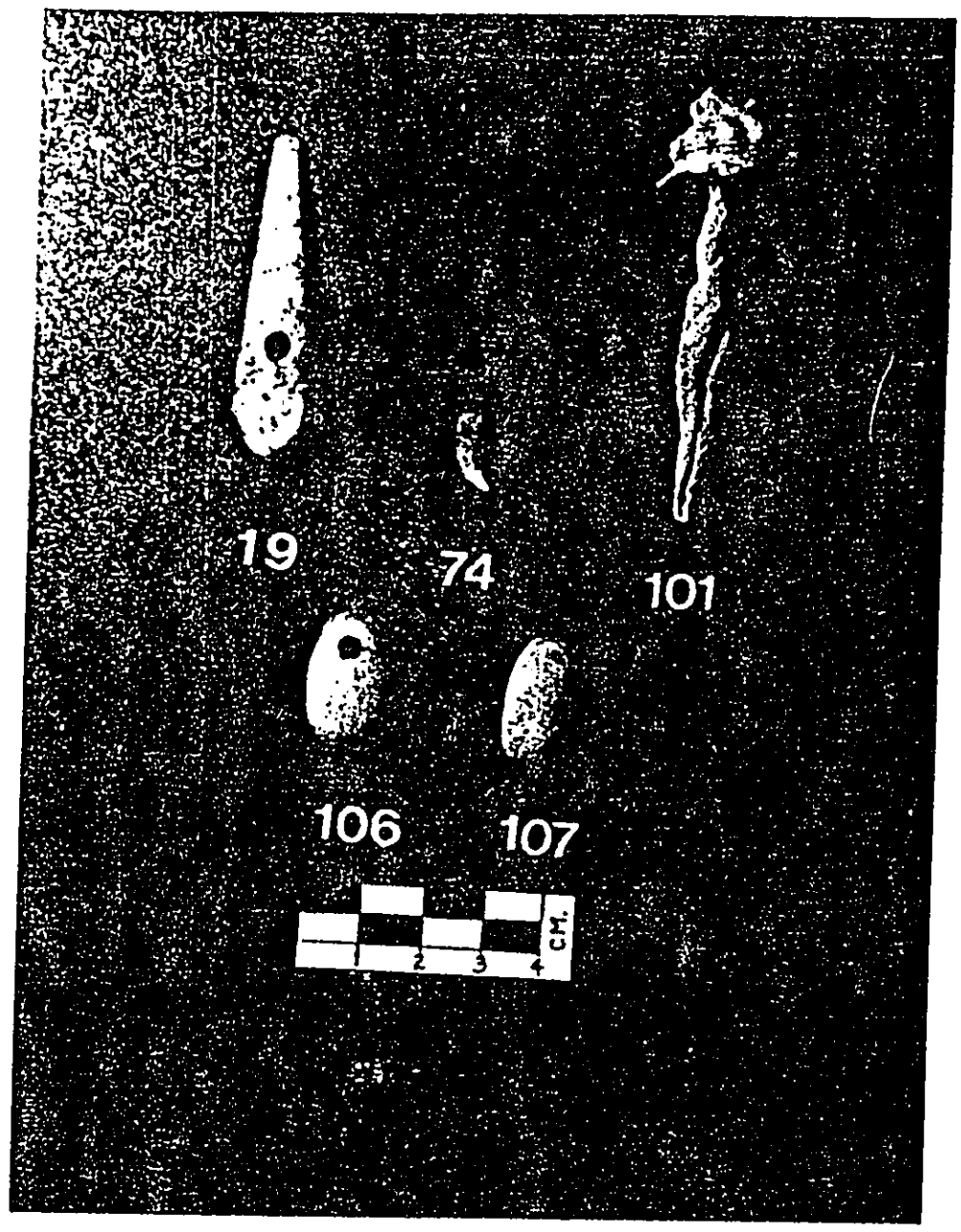


Fig. 7 Shell and Tooth Artifacts (Acc.#19, Perforated Auger Shell; Acc.#74 Perforated Dog Tooth; Acc.-#101 Spindle Shell Drill; Acc.#106 & #107 Cowry Shell Beads

basalt abrader which could have been used for a variety of tasks. Artifacts thought to be a fishing gear included five coral files, a coral abrader, seven sea urchin files, a bone point tip of a two-piece fishhook, a pearl shell fishhook fragment and seven pieces of worked shell. The bone point tip (#54, Fig. 6) is a particularly fine specimen with an inner barb. This artifact lacks the notches on the base which typically were carved into point tips to facilitate lashing. This suggests that the point tip was never completed. Neither of the two fishhooks recovered has a point of attachment (head and knob) which is useful in chronological assessment. The four pieces of cut shell and the shell fishhook are all of pearl shell (Isognomon sp. or Pinctada sp.). Only eleven pieces of volcanic glass were recovered. These were all flakes and would have been used for a wide variety of purposes where a sharp cutting tool was needed. Four perforated artifacts (Fig. 7) were recovered which are understood as ornaments. Artifact #74 is a dog canine tooth which has been drilled from both sides. Handy and Pukui (1958:89) report the practice of making charms for children from the fangs of dogs and this may be a remnant of such a practice. Artifact #10 is an apparently water-worn auger shell (Terebra dimidiata) perforated by abrasion at the second whorl. Auger shells were used as water gourd stoppers but the maximum diameter of this artifact is only 14 mm. which would seem too small and the fact that the perforation was in the second whorl, rather than the last whorl, suggests that it was intended as an ornament. Two perforated

cowry (Cypraea isabella; Fig. 7, Acc.#s 106 and 107) shells were also interpreted as ornaments. In the work at the Zimmerman property (Hammatt and Shideler, 1989:29-30) it appeared that the Granulated Cowry (Cypraea granulata) was particularly numerous in the midden and it was suggested that this species was being particularly selected for uses as ornaments. No such selection for C. granulata was observed in the midden from the Rasten property where C. isabella seems to have been preferred for ornaments.

Two other unusual artifacts were recovered. One (Acc.#109) is a piece of cut turtle bone and the other is a probable shell drill (Fig. 7). Turtles, while common in Hawaiian waters today, are rarely identified in Hawaiian middens. The intended purpose of the rectangular piece of cut turtle bone is uncertain. The probable drill is the columella (small column-like axis) of a Hawaiian Spindle Shell (Fusinus sandvicensis). The last whorl has been removed from the columella, probably by pecking, and the lower portion of the second whorl has been smoothed by abrasion. This tool may have been rotated in the hand or possibly was incorporated in a pump drill with a cord spiral wound up the columella.

VI. Midden Analysis

The analysis of floral and faunal remains (midden) recovered from archaeological sites yields data on environmental utilization, specialized economic activity, diet, and custom. The midden herein analyzed contained a variety of species of mollusk shells from ocean and stream environments, the remains of crabs, lobsters and sea urchins, and the bones of sea birds, chickens, rats, dogs and pigs.

A total of 6,835 gr. of midden was recovered from the ten excavation units at the Rasten Property. This is reported in detail in Appendix A and is summarized in Table 2. This midden was recovered from an estimated 5.05 m^3 of cultural deposit matrix which yields a Concentration Index (gr./m^3) of 1,353 which is relatively high for a Hawaiian site (Table 3). This suggests permanent and/or long-term occupation of the area in prehistoric times.

Vertebrate Analysis

Bone midden was recovered from all 10 of the archaeological trenches excavated and included a variety of fish and birds, pig (Sus scrofa), dog (Canis familiaris), and Polynesian Rat (Rattus exulans). No historically introduced species were recovered. This fact and the absence of historic artifacts suggests that the midden was all deposited in prehistoric times.

The largest component of the vertebrate midden was mammal bone (total weight 138 gr.) which included 84 gr. of identified pig bone, 6 gr. of dog bone, 1 gr. of rat bone, and 46 gr. of

Table 2 Rosten Property Ha'ena

		Tr.1	Tr.2	Tr.3	Tr.4	Tr.5	Tr.6	Tr.7	Tr.8	Tr.9	Tr.10	Total
Weight of Midden	gr	133.1	532.4	434.7	437.7	1031.3	955.2	748.2	539.6	1215.6	807.3	6835.1
Wt Mollusk		100.1	478.9	383.2	407.2	970.4	907.2	657.3	478.9	1041.5	724.4	6149.1
	%	0.752	0.900	0.882	0.930	0.941	0.950	0.879	0.888	0.857	0.897	0.900
Wt Sea urchin		0.3	26.2	12.0	15.7	35.0	34.1	26.0	23.6	124.3	54.5	351.7
	%	0.002	0.049	0.028	0.036	0.034	0.036	0.035	0.044	0.102	0.068	0.051
Wt Fish		0.7	10.3	18.8	3.9	9.2	6.5	19.9	13.0	20.0	13.4	115.7
	%	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.017
Wt Marine Midden		101.1	515.9	416.6	429.5	1024.5	949.8	709.0	514.5	1185.8	792.7	6639.4
	%	0.760	0.969	0.958	0.981	0.993	0.994	0.948	0.953	0.975	0.982	0.971
Wt Mammal		32.0	12.0	10.5	6.0	4.0	1.0	27.6	12.4	22.2	9.3	137.2
	%	0.240	0.023	0.024	0.014	0.004	0.001	0.037	0.023	0.018	0.012	0.020
Wt Bird		0.0	4.5	7.6	2.2	2.8	4.4	11.6	12.7	7.6	5.1	58.5
	%	0.000	0.008	0.017	0.005	0.003	0.005	0.016	0.024	0.006	0.006	0.009
Wt Seeds		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wt Terrestrial Midden		32.0	16.5	18.1	8.2	6.8	5.4	39.2	25.1	29.8	14.6	195.7
	%	0.240	0.031	0.042	0.019	0.007	0.006	0.052	0.047	0.025	0.018	0.029
Volume Excavated	m.	0.2	0.6	0.4	0.7	0.6	0.5	0.4	0.3	0.85	0.5	0.00 5.05
C.I.		665.5	887.3	1086.8	625.3	1718.8	1910.4	1870.5	1798.7	1430.1	1614.6	1353.5

Table 3 Comparative Analysis of Midden from Selected Sites in Hawaii

Site	Location	Weight of Sample (Gms)	Percentage of Sample: Mollusk	Sea Urchin	Fish	Marine Midden	Mammal	Bird	Seeds	Terres. Midden	C.I.	Source
Rasten Property	Ha'ena Kaua'i	6835	90	5.1	1.7	97.1	2.0	0.9	0.0	2.9	1353	Present Study
Zimmerman Property	Ha'ena Kaua'i	6022	85	7.0	2.6	95.0	4.4	0.5	0.3	5.0	350	Hammatt et al.
Beach Ke'e Excavations	Ha'ena Kaua'i	3062	98	2.0	100.0	<1	0.0	0.0	0.0	0.0	7	Hammatt, 1978
All Ke'e Excavations	Ha'ena Kaua'i	?	92		6.0	98.0	1.0	0.0	1.0	2.0	959	Griffin, 1977
Oa-C3-23 Str. II	W.A.R.C. Oa'hu	2654	67	17.0	4.1	89.0	10.0	0.0	1.6	11.0	248	Hammatt et al. 1985
01	Kuli'ou'ou O'ahu	?	?	?	1.5	71.0	0.5	1.2	27.0	29.0	?	Emory, 1961
OA A4 26	Waikiki O'ahu	620	38	46.0	3.0	90.0	10.0	0.0	0.0	10.0	620	Davis, 1984
D6-62 and D6-64	Near Waimea Bay, O'ahu	1627		98.0	99.0	1.0	<1	0.0	1.0	0.0		Athens & Shun 1982

unidentified mammal bone. Most of the unidentified mammal bone is assumed to be pig bone, but there may be more dog bone present as well (the ratio of identified pig bone to identified dog bone was 15:1). Collectively, mammal bone accounted for 2.0% of all midden recovered which is fairly typical for Hawaiian archaeological sites (Table 3). This value is notably lower than that from archaeological research at the Zimmerman Property immediately to the east, at which some 265 gr. of mammal bone accounted for 4.4% of all midden by weight (Hammatt and Shideler 1989:27). At the Zimmerman property occupation (and midden deposition) continued into the historic period, when consumption of meat typically greatly increased, and this is assumed to explain the difference. As at the Zimmerman site, the small size and unfused epiphyses of the pig bone suggests a husbandry practice which selected for young pigs as opposed to hunting of pigs.

The most interesting aspect of the midden assemblage from the Rasten property is the avifauna represented. Chicken was positively identified in three midden fractions from three trenches (total 7.9 gr.). Positively identified chicken accounted for 14% of the bird bone but some of the bone identified as "medium bird" is almost certainly chicken as well.

Sea birds were positively identified in thirteen midden fractions from nine of the ten trenches excavated. The vast majority of the bird bone was identified as medium procellarid which includes three species (Puffinus pacificus, Wedge-tailed Shearwater; Puffinus newelli, Newell's Shearwater; and Pterodroma

APPENDIX A

RASTEN PROPERTY HA'ENA	MIDDEN CATALOG											
Trench\Quad	1	1	2	2	2	2	2	2	3	3	3	3
Depth	50-60	60-70	60-70	70-80	80-90	90-100	100-110	110-120	50-60	60-70	70-80	80-90
Strata	IIC	IIC	IIC	IIC	IIC	IIC	IIC	IIC	IIC	IIC	IIC	IIC
Cellana sp.	17.2	1.0	3.4	11.3	27.6	9.6	20.2		0.5	14.5	34.8	8.5
Charonia tritonis											4.6	
Conus sp.			13.3	6.0				5.8		3.8	13.8	8.2
Cymatium sp.												
Cypraea caputserpentis		1.2		1.5	9.5				0.4		1.6	
Cypraea granulata												
Cypraea maculifera												
Cypraea mauritiana												
Hastula sp.											1.3	
Nerita picea	0.4	0.8		3.2	15.8	1.4	1.5		1.3	5.2	22.1	6.6
Neritina sp.	18.5	1.5	2.8	4.7	35.3	17.0	7.0		1.0	4.5	17.2	14.4
Strombus maculatus		2.6	4.0	7.1	27.7	2.1	16.7		3.2	6.7	14.8	3.7
Terebra sp.												
Thaididae sp.		2.4									18.9	
Trochus intextus		0.4			5.5							
Turbo sandwicensis	4.4	11.6	9.1	20.0	76.4	4.4	2.4		2.1	17.9	52.6	0.6
Chama isotoma	16.5									14.7		
Brachidontes crebistriatus	0.2	0.2		0.5	17.8	1.8					0.4	
Pearl shell				1.1	4.7				0.9		15.0	1.8
Periglypta reticulata	18.8	0.5	3.8	4.4	5.4		2.7		6.3	32.1	16.7	
Tellina palatam	0.7			20.2	4.4						1.0	0.5
Unidentified mollusca		1.2	7.2	3.3	28.7	0.6			1.2	5.0	2.8	
Total Marine Mollusca	76.7	23.4	43.6	83.3	258.8	36.9	50.5	5.8	16.9	104.4	217.6	44.3
Crab						0.5				1.2	1.4	
Sea urchin		0.3	0.5	3.2	14.3	8.2					6.5	5.5
Fishbones	0.4	0.3			8.1	2.2			7.2	2.0	8.6	1.0
Total Marine Midden	77.1	24.0	44.1	86.5	281.2	47.8	50.5	5.8	24.1	107.6	234.1	50.8
Bird Bone					4.5					1.4	4.0	2.2
Dog Bone												
Pig Bone	29.7	2.3		6.5	5.2				6.0		2.5	
Rat Bone					0.3							
Unidentified Mammals										1.1	0.9	
Total Mammal Bone	29.7	2.3	0.0	6.5	5.5	0.0	0.0	0.0	6.0	1.1	3.4	0.0
Total Terrestrial Midden	29.7	2.3	0.0	6.5	10.0	0.0	0.0	0.0	6.0	2.5	7.4	2.2
Total Midden	106.8	26.3	44.1	93.0	291.2	47.8	50.5	5.8	30.1	110.1	241.5	53.0

Trench\quad	4	4	4	4	4	4	4	5	5	5	5	5	5
Depth	60-70	70-80	80-90	90-100	100-110	110-120	120-130	40-50	50-60	60-70	70-80	80-90	90-100
Strata	IIC	IIC	IIC	IIC	IIC	IIC	IIC	IIC	IIC	IIC	IIC	IIC	IIC
Cellana sp.													
Charonia tritonis	2.5	28.7	26.0	1.9	2.3	2.6		1.8	24.5	15.8	109.1	19.8	11.0
Conus sp.	5.9	6.0	31.7	6.0	4.4	1.7			5.8	2.2	9.8	7.8	6.1
Cymatium sp.										2.0		3.7	
Cypraea caputserpentis	2.7	3.1			1.4			1.3	3.4	7.7	5.8	2.0	0.3
Cypraea granulata													
Cypraea maculifera									3.0	11.6			
Cypraea mauritiana													
Hastula sp.													
Nerita picea	1.0	9.3							1.8	1.4	7.4		
Neritina sp.	2.2	28.5	11.3	4.9	12.2	8.1	1.7	5.4	6.1	14.9	57.3	11.0	7.1
Strombus maculatus	3.0	25.4	2.1	3.3	2.7	1.0		1.7	11.6	33.2	44.1	18.2	10.1
Terebra sp.													
Thaididae sp.								2.7		2.1		0.6	
Trochus intextus									0.9				
Turbo sanduicensis	35.4	16.4	12.9	2.4	1.2	1.8	6.9	5.4	81.9	72.5	124.7	51.6	9.0
Chama isotoma		11.5								13.7			
Brachidontes crebistriatus		0.5							0.4	0.5	4.4	1.9	0.2
Pearl shell	2.1	8.2	0.6	1.8	0.3			0.3	1.5	1.6	4.3		0.4
Periglypta reticulata	4.8	15.9		6.3		6.0		5.5	11.9	6.6	32.4	4.1	
Tellina palatam	1.0	1.6							0.5	1.5			6.6
Unidentified mollusca	1.2	6.6			14.8	3.4		0.3	5.4	15.1	12.6	1.5	
Total Marine Mollusca	61.8	161.7	84.6	26.6	39.3	24.6	8.6	24.4	158.7	202.4	411.9	122.2	50.8
Crab						2.7		0.5		4.8	4.6		
Sea urchin	2.7	13.0						1.0	4.2	5.2	16.3	6.6	1.7
Fishbones	1.1	2.8							0.5	2.2	4.7		1.8
Total Marine Midden	65.6	177.5	84.6	26.6	39.3	27.3	8.6	25.9	163.4	214.6	437.5	128.8	54.3
Bird Bone	0.9	1.3									2.8		
Dog Bone													
Pig Bone													
Rat Bone													
Unidentified Mammals	1.8	4.2							0.5		3.5		
Total Mammal Bone	1.8	4.2	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	3.5	0.0	0.0
Total Terrestrial Midden	2.7	5.5	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	6.3	0.0	0.0
Total Midden	68.3	183.0	84.6	26.6	39.3	27.3	8.6	25.9	163.9	214.6	443.8	128.8	54.3

Trench\Quad	6	6	6	6	6	7	7	7	7	8	8	8	8
Depth	40-50	50-60	60-70	70-80	80-90	40-50	50-60	60-70	70-80	40-50	50-60	60-70	70-80
Strata	IIC	IIC	IIC	IIC	IIC	IIC	IIC	IIC	IIC	IIC	IIC	IIC	IIC
Cellana sp.	23.0	27.0	31.0	24.5	11.2	16.7	14.5	56.2	17.5	3.3	83.7	30.7	22.1
Charonia tritonis							3.1						
Conus sp.	23.0	27.0	16.6	6.5	9.7	3.4	10.1	25.9		20.7	9.4		
Cymatium sp.		3.0					2.6			2.4			
Cypraea caputserpentis	3.0	4.0	1.9	1.3			1.0	2.2			3.3		
Cypraea granulata			0.8			2.9		2.6					
Cypraea maculifera						3.2	7.4			4.9	16.7		
Cypraea mauritiana											20.7		
Hastula sp.													
Nerita picea	1.0	1.0	1.5			0.6	2.1	0.8		1.5			
Neritina sp.	8.0	24.0	19.0	9.5	12.2	2.9	8.9	19.8	7.5	1.0	3.3	4.9	
Strombus maculatus	20.0	39.0	43.5	10.3	4.8	14.8	8.2	25.6	7.2	4.8	4.5	6.4	
Terebra sp.	3.0	3.0				10.7							
Thaididae sp.			19.1			3.3				9.1	6.5	16.5	
Trochus intextus		1.0	2.2							3.5			
Turbo sandwicensis	96.0	87.0	125.4	24.1	20.0	105.9	92.0	46.9	27.3	79.8	67.8		
Chama isotoma						47.0							
Brachidontes crebistriatus	0.5	1.0	0.7	1.6	1.2			0.7					
Pearl shell	1.0	1.0	9.5	1.9					1.9				
Periglypta	4.0	22.0	12.5	6.0	21.2	9.5	17.3	14.9	3.3	11.6	7.4		
Tellina palatam		0.5	2.9								2.1		
Unidentified mollusca	5.0	1.5	9.3	7.9	7.9	0.9	5.6	2.4		10.7	14.1		5.5
Total Marine Mollusca	187.5	242.0	295.9	93.6	88.2	221.8	172.8	198.0	64.7	153.3	239.5	58.5	27.6
Crab				1.0	1.0		2.6	3.2					
Sea urchin	8.0	7.0	18.0	1.1		9.2	7.5	7.9	1.4	9.4	14.2		
Fishbones	0.5	2.7	2.5	0.8		6.8	6.5	5.4	1.2	3.1	5.8	3.1	
Total Marine Midden	196.0	251.7	316.4	96.5	89.2	237.8	189.4	214.5	67.3	165.8	259.5	61.6	27.6
Bird Bone		3.7	0.7			2.0	5.0	3.8	0.8		7.7	5.0	
Dog Bone						1.6	2.6						
Pig Bone						18.0							1.7
Rat Bone						0.9							
Unidentified Mammals	1.0					1.9		1.7	0.9		7.8	2.9	
Total Mammal Bone	1.0	0.0	0.0	0.0	0.0	20.8	0.0	1.7	0.9	0.0	7.8	2.9	1.7
Total Terrestrial Midden	1.0	3.7	0.7	0.0	0.0	22.8	5.0	5.5	1.7	0.0	15.5	7.9	1.7
Total Midden	197.0	255.4	317.1	96.5	89.2	260.6	194.4	220.0	69.0	165.8	275.0	69.5	29.3

Trench\Quad	9	9	9	9	9	9	9	9	10	10	10	10	10	All	% of
Depth	40-50	50-60	60-70	70-80	80-90	90-100	100-110	110-125	40-50	50-60	60-70	70-80	80-90	Trenches	Total
Strata	IIC	IIC					IIC/III	IIC/III	IIC	IIC	IIC	IIC	IIC		Midden
Cellana sp.	2.0	8.8	7.7	6.9	5.0	22.6	7.2	0.5	28.2	38.9	9.1	2.9		895.8	0.13
Charonia tritonis														7.7	0.00
Conus sp.	2.0	22.5	2.1	32.3	57.5	26.2			53.2	21.6	2.9			510.9	0.07
Cymatium sp.		2.1				10.0				1.5				27.3	0.00
Cypraea caputserpentis		1.8		1.0	2.7				13.3	23.2	2.3	2.0		104.9	0.02
Cypraea granulata	0.6	2.2												9.1	0.00
Cypraea maculifera	59.8	6.2			5.6				8.6					127.0	0.02
Cypraea mauritiana														20.7	0.00
Hastula sp.						3.5					0.8			5.6	0.00
Nerita picea						2.2			3.2	1.7	1.6	1.2		97.6	0.01
Neritina sp.		1.5	1.4			28.6	1.2		13.7	60.6	27.1	7.2	2.2	559.1	0.08
Strombus maculatus	2.3	24.0	4.2	12.9	33.5	7.1			83.4	25.6	4.4	4.9	1.1	637.5	0.09
Terebra sp.	2.1	1.3		3.4										23.5	0.00
Thaididae sp.		4.0	4.5		1.5	1.2			9.6					102.0	0.01
Trochus intextus		1.3		1.0	4.8				1.2				0.4	22.2	0.00
Turbo sandvicensis	36.4	111.0	51.3	74.0	155.8	67.6	8.1		98.8	74.6	13.1	4.0		2090.5	0.31
Chama isotoma		3.0		7.5		6.5								120.4	0.02
Brachidontes crebistriatus			0.2	0.5	4.9	1.1		0.2	0.5		1.5	3.1	0.9	47.4	0.01
Pearl shell		1.6	0.3	0.5		2.1	0.6		1.7	1.0		0.6		68.3	0.01
Periglypta reticulata	0.9	22.2	2.3	3.1	8.7	16.8			26.4	16.5	1.0			411.8	0.06
Tellina pelatam		1.0	1.9					0.7						47.1	0.01
Unidentified mollusca		4.2			1.1	2.6			18.0	3.9	1.2			212.7	0.03
Total Marine Mollusca	106.1	218.7	75.9	143.1	281.1	198.1	17.1	1.4	359.8	269.1	65.0	25.9	4.6	6149.1	0.90
Crab											0.4			23.9	0.00
Sea urchin	2.6	14.6	5.0	31.7	49.0	20.5		0.9	27.9	14.5	8.1	2.7	1.3	351.7	0.05
Fishbones	0.2		0.7	3.1	12.7	3.3			7.5	4.0	1.5	0.4		114.7	0.02
Total Marine Midden	108.9	233.3	81.6	177.9	342.8	221.9	17.1	2.3	395.2	287.6	75.0	29.0	5.9	6639.4	0.97
Bird Bone		1.1	0.2			1.1		5.2	1.6	1.6	1.2	0.3	0.4	58.5	0.01
Dog Bone										1.3				5.5	0.00
Pig Bone	7.2	2.1				0.5				2.3				84.0	0.01
Rat Bone														1.2	0.00
Unidentified Mammals	0.5		2.5	1.6	1.9	5.3	0.6		3.7	0.8	0.4		1.0	46.5	0.01
Total Mammal Bone	7.7	2.1	2.5	1.6	1.9	5.8	0.6	0.0	3.7	3.1	0.4	0.0	1.0	137.2	0.02
Total Terrestrial Midden	7.7	3.2	2.7	1.6	1.9	6.9	0.6	5.2	5.3	4.7	1.6	0.3	1.4	195.7	0.03
Total Midden	116.6	236.5	84.3	179.5	344.7	228.8	17.7	7.5	400.5	292.3	76.6	29.3	7.3	6835.1	1.00

Appendix B Rasten Property Ha'ena Kaua'i

Artifacts Catalog

Acc#	Bag	Trench	Depth	Strata	#of pcs	Length	Width	Thickness	Weight	Material	Function	Comments
1	1	1	50-60	IIC	1	6.0	5.0	4.2	166.0	Basalt	poss. hammerstone	beach-rounded & slightly vesicular
2	1	1	50-60	IIC	3	1.3-2.5	1.0-1.6	0.2-0.5	4.2	Basalt	flakes	
3	1	1	60-70	IIC	4	1.4-3.1	0.6-2.0	0.2-0.5	5.5	Basalt	flakes	
4	1	1	70-80	IIC	1	1.9	2.6	0.9	3.6	Basalt	polished flake	
5	1	1	70-80	IIC	7	1.5-5.9	0.9-5.7	0.3-1.6	55.1	Basalt	flakes	
6	2	2	60-70	IIC	2	2.7,1.6	2.7,1.5	0.4,0.3	4.8	Basalt	polished flake	
7	2	2	60-70	IIC	1	1.4	1.1	0.2	0.9	Basalt	flake	
8	2	2	70-80	IIC	8	1.5-5.2	0.9-3.7	0.2-1.1	49.2	Basalt	flakes	
9	2	2	80-90	IIC	1	2.2	1.3	0.1	0.7	Shell, pearl	cut shell	poss. a fishhook blank
10	2	2	80-90	IIC	3	2.7-2.8	0.6-1.7	0.4-0.7	4.6	Basalt	polished flakes	
11	2	2	80-90	IIC	18	1.6-5.0	0.9-2.3	0.2-0.9	42.0	Basalt	flakes	
12	2	2	90-100	IIC	2	2.3,1.6	0.9-1.3	0.3-2.2	1.5	Basalt	flakes	
13	3	3	50-60	IIC	2	1.5,6.8	1.1,1.5	0.2,1.5	55.4	Basalt	flakes	
14	3	3	60-70	IIC	1	4.0	2.2	0.7	6.5	Basalt	flake	
15	3	3	60-70	IIC	1	5.7	1.7	1.7	10.5	Coral	file	
16	3	3	60-70	IIC	1	3.6	1.1	2.4	2.7	Basalt	adz fragment	
17	3	3	70-80	IIC	1	1.5-4.8	1.1-2.3	0.3-0.9	27.2	Basalt	flakes	
18	3	3	70-80	IIC	1	2.0	1.7	0.2	0.9	Basalt	polished flake	
19	3	3	70-80	IIC	1	6.0	1.3	1.3	7.3	Shell, Terebra	gourd stopper	perforated poss.drill/ornament frag
20	3	3	80-90	IIC	1	3.5	0.7	0.6	2.8	Shell	cut shell	
21	3	3	80-90	IIC	2	2.0,2.1	1.7,1.6	0.6,0.6	3.9	Basalt	flakes	
22	4	4	60-70	IIC	8	1.4-5.4	1.1-5.1	0.3-1.1	52.8	Basalt	flakes	
23	4	4	60-70	IIC	1	2.4	2.4	0.8	5.6	Basalt	adz fragment	
24	4	4	60-70	IIC	1	1.8	1.1	0.2	0.2	Sea urchin	file fragment	
25	4	4	70-80	IIC	7	1.2-2.7	1.0-2.6	0.2-0.6	12.2	Basalt	flakes	
26	4	4	70-80	IIC	2	1.3-2.6	1.0,1.2	0.2-0.6	2.4	Basalt	polished flakes	
27	4	4	80-90	IIC	3	4.1-4.7	2.1-3.3	0.5-0.8	21.6	Basalt	flakes	
28	4	4	90-100	IIC	2	2.2,2.9	1.8-2.3	0.5,0.5	5.5	Basalt	flakes	
29	4	4	100-110	IIC/III	2	2.9-3.0	1.9-2.3	0.5,0.4	6.5	Basalt	flakes	
30	4	4	110-120	IIC/III	4	6.4	2.5	0.8	16.0	Basalt	polished flake	
31	4	4	110-120	IIC/III	4	1.3-3.8	1.2-2.5	0.2-1.0	11.9	Basalt	flakes	
32	4	4	120-130	IIC/III	5	2.4-4.2	1.3-3.7	0.4-0.6	26.0	Basalt	flakes	

Acc#	Bag	Trench	Depth	Strata	pcs	Length	Width	Thickness	Weight	Material	Function	Comments
33	5	5	40-50	IIC	5	1.8	1.8	0.4	1.2	Basalt	flake	
34	5	5	50-60	IIC	5	1.7-3.6	1.2-2.8	0.2-0.6	7.0	Basalt	flakes	
35	5	5	50-60	IIC	1	3.7	1.6	0.3	2.5	Basalt	adz fragment	
36	5	5	50-60	IIC	1	10.2	2.8	2.2	95.4	Basalt	adz	chisel shaped
37	5	5	60-70	IIC	1	1.5	1.1	0.2	0.3	Basalt	polished flake	
38	5	5	60-70	IIC	3	2.1-4.8	1.8-3.5	0.3-0.9	22.5	Basalt	flakes	
39	5	5	70-80	IIC	4	2.5-6.9	1.2-3.8	0.2-0.8	25.2	Basalt	flakes	
40	5	5	80-90	IIC	2	2.2,3.5	1.8,2.2	0.4,0.3	4.8	Basalt	flakes	
41	5	5	90-100	IIC	3	1.8-3.5	1.4-2.0	0.2-0.5	6.0	Basalt	flakes	
42	5	5	90-100	IIC	1	2.9	1.7	0.6	4.6	Basalt	polished flake	
43	6	6	40-50	IIC	4	2.0-4.9	1.1-3.2	0.3-0.7	32.7	Basalt	flakes	
44	6	6	40-50	IIC	1	3.7	3.0	0.5	5.2	Basalt	polished flake	
45	6	6	40-50	IIC	5	2.1	0.8	0.3	0.8	Shell, pearl	fishhook fragment	
46	6	6	50-60	IIC	9	1.5,2.7	0.8,1.2	0.3,0.4	1.9	Basalt	polished flakes	
47	6	6	50-60	IIC	10	1.7-4.5	1.1-3.3	0.2-0.4	2.1	Basalt	flakes	
48	6	6	60-70	IIC	1	1.9-3.8	1.8-2.4	0.2-0.6	19.0	Basalt	flakes	
49	6	6	60-70	IIC	6	1.6	0.9	0.5	0.4	Sea urchin	file fragment	
50	6	6	70-80	IIC	1	2.4-2.9	1.3-1.8	0.5-0.6	13.5	Basalt	flakes	
51	6	6	80-90	IIC	1	5.2	2.5	0.8	10.0	Basalt	flake	
52	7	7	40-50	IIC	5	3.2	1.5	0.6	2.7	Coral	file	
53	7	7	40-50	IIC	5	1.6-2.9	1.1-2.8	0.2-0.8	14.5	Basalt	flakes	
54	6	7	50-60	IIC	1	4.9	1.4	0.6	2.3	Bone	fishhook	point tip of 2-piece fishhook
55	6	7	50-60	IIC	1	6.1	2.8	0.9	2.7	Basalt	file	
56	7	7	50-60	IIC	1	3.0	2.2	1.0	5.2	Coral	file/saw	
57	7	7	50-60	IIC	1	5.7	5.0	1.4	33.3	Basalt	grinding stone fragment	
58	7	7	50-60	IIC	2	2.0,2.2	1.2,1.5	0.4,0.4	4.2	Basalt	polished flakes	
59	7	7	50-60	IIC	1	4.0	3.5	3.0	67.8	Basalt	adz fragment	
60	7	6	50-60	IIC	7	1.6-2.2	1.0-2.2	0.2-0.7	13.5	Basalt	flakes	
61	7	6	70-80	IIC	3	2.0-3.2	1.3-2.2	0.4-0.3	4.5	Basalt	flakes	
62	7	6	40-50	IIC	1	7.9	4.1	3.7	123.6	Basalt	abrader	dikestone
63	7	6	40-50	IIC	1	2.1	1.2	0.7	1.6	Sea urchin	file fragment	
64	7	6	40-50	IIC	1	2.4	2.0	0.4	2.5	Basalt	polished flake	
65	7	6	40-50	IIC	9	1.3-4.0	0.8-2.2	0.1-0.6	19.6	Basalt	flakes	
66	7	6	50-60	IIC	1	6.0	2.7	2.6	58.8	Basalt	adz fragment	mid-section of adz
67	8	7	50-60	IIC	10	1.0-5.9	0.8-2.8	0.1-0.8	84.4	Basalt	flakes	
68	8	7	60-70	IIC	2	1.3,6.8	1.0,3.2	0.3,1.6	48.1	Basalt	flakes	
69	8	7	60-70	IIC	1	5.0	4.2	0.9	16.4	Basalt	grinding stone fragment	
70	8	7	50-60	IIC	1	3.5	1.0	0.7	1.7	Sea urchin	file fragment	
71	8	7	50-60	IIC	5	1.0-5.7	0.9-4.5	0.2-1.2	41.6	Basalt	flakes	
72	9	8	60-70	IIC	3	1.7-2.2	0.8-1.2	0.3-0.4	2.5	Basalt	flakes	
73	9	8	60-70	IIC	4	2.6-4.9	1.5-3.8	0.5-0.8	27.2	Basalt	flakes	

74	9	9	80-90	IIC	1	1.2	0.6	0.4	0.5	Dog tooth	ornament/pendant	
75	9	9	80-90	IIC	1	3.9	2.6	0.7	8.2	Basalt	flake	one very large sheet
76	9	9	80-90	IIC	2	2.5,3.9	2.4,2.2	0.7,0.5	7.4	Coral	file/saw	
77	9	9	80-90	IIC	1	5.4	2.6	1.6	10.5	Coral	abrader	
78	9	9	80-90	IIC	1	1.8	0.7	0.2	0.3	Shell, pearl	cult shell	
79	9	9	80-90	IIC	1	0.9	0.9	0.4	0.4	Sea urchin	file fragment	
80	9	9	80-90	IIC	4	1.7-6.3	1.2-4.6	0.4-1.3	53.0	Basalt	flakes	
81	9	9	90-100	IIC	1	2.8	1.9	0.4	1.5	Shell, pearl	cut shell	
82	9	9	90-100	IIC	1	3.0	1.6	0.3	1.9	Basalt	polished flake	
83	9	9	90-100	IIC	3	1.8-2.7	1.2-1.5	0.2-0.5	2.9	Basalt	flakes	
84	9	9	100-110	IIC/III	1	1.7	2.4	2.4	74.0	Basalt	adz fragment	rectangular shaped
85	9	9	100-110	IIC/III	3	2.8-3.0	1.9-2.7	0.4-0.6	11.9	Basalt	flakes	
86	10	10	40-50	IIC	2	0.9,1.6	0.9,1.1	0.2,0.2	0.8	Basalt	polished flakes	
87	10	10	40-50	IIC	5	1.4-2.2	0.6-1.8	0.3-0.5	5.0	Coral	flakes	
88	10	10	50-60	IIC	3	1.3-2.7	0.8-1.9	0.3-0.5	4.3	Coral	polished flake	
89	10	10	50-60	IIC	8	1.3-2.3	0.8-1.8	0.2-0.4	5.5	Basalt	flakes	
90	10	10	60-70	IIC	1	2.7	2.0	0.5	2.5	Basalt	polished flake	
91	10	10	60-70	IIC	4	1.5-2.3	1.1-2.6	0.3-0.4	2.7	Basalt	flake	
92	10	10	70-80	IIC	1	7.1	2.6	2.3	58.2	Basalt	adz preform fragment	
93	10	10	70-80	IIC	2	1.2	0.5	0.4	0.5	Basalt	polished falke	
94	10	10	70-80	IIC	2	1.5,2.5	0.9,1.5	0.5,0.5	2.0	Basalt	flake	
95	10	10	80-90	IIC	7	0.7	0.7	0.2	0.2	Basalt	polished flake	
96	10	10	80-90	IIC	1	1.3,2.5	1.2,1.7	0.3,0.6	5.0	Basalt	flakes	
97	4	11	70-80	IIC	1	1.6-3.2	1.0,2.7	0.2,0.7	16.1	Basalt	flakes	
98	4	11	70-80	IIC	1	2.8	1.3	0.4	1.8	Basalt	polished flake	
99	4	11	110-120	IIC	1	2.2	1.7	0.3	1.9	Basalt	polished flake	
100	5	11	50-60	IIC	1	1.2	0.5	0.5	1.2	Sea urchin	file fragment	
101	5	11	50-60	IIC	1	7.8	1.9	1.9	6.7	Shell	drill	
102	5	11	60-70	IIC	1	3.5	2.3	0.7	5.4	Basalt	flake	
103	5	11	70-80	IIC	1	1.8	1.5	0.4	1.7	Coral	flake	
104	5	11	70-80	IIC	1	2.6	1.6	0.4	2.3	Shell, pearl	cut shell	
105	5	11	80-90	IIC	1	2.7	2.1	1.8	9.6	Shell	gourd stopper	perforated Rhinoclavis
106	6	11	50-60	IIC	1	2.6	1.5	1.7	5.2	Shell	bead	C. isabella
107	10	11	40-50	IIC	1	2.4	1.1	0.9	2.2	Shell	bead	C. isabella
108	10	11	40-50	IIC	1	4.0	0.9	0.8	2.4	Sea urchin	file	
109	9	9	80-90	IIC	1	2.9	2.2	1.1	2.9	Bone	cut turtle bone	

Appendix C Volcanic G. .ss Catalog
Rasten Property - Ha'ena

Acc#	Trench	Depth	Stratum	#of pcs	Length	Width	Thickness	Weight	Function
1	3	70-80	IIC	3	1.1-2.7	0.7-1.7	0.4-1.2	2.8	flakes
2	4	70-80	IIC	2	1.5,1.5	0.9,1.4	0.7,0.7	2.1	flakes
3	4	60-70	IIC	1	1.4	0.7	0.3	0.2	flake
4	5	50-60	IIC	2	1.4-1.5	1.1,0.6	0.3,0.3	1.0	flakes
5	7	40-50	IIC	2	1.1,2.1	0.8,1.3	0.2,0.9	2.5	flakes
6	9	90-100	IIC	1	2.0	0.5	0.5	1.7	flake

Appendix D Rasten Property
Charcoal Samples

Tr#	Depth cm.	Stratum	Weight	Comments
*3	90-100	IIC	203.4	
3	110-130	IIC	533.7	
3	120-130	IIC/III	569.8	
7	70	IIC	476.6	SW Quad
*9	110	IIC	399.3	East Wall

* Submitted for C-14 Dating

APPENDIX E

Photographs

Fig. 11 Cut Bank, View to SW from East portion of the Property Showing Cultural Layer

Fig. 12 Cut Bank, Showing Collapsed Cement Slab and Trench 10, View East

Fig. 13 NE Profile, Trench 2

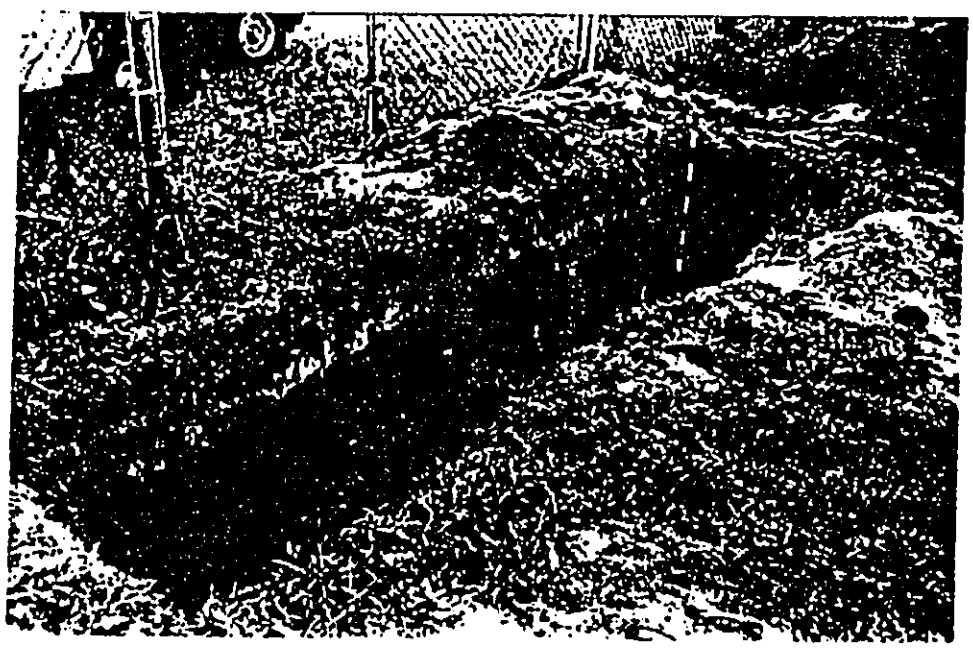


Fig. 14 View of Trenches 5, 6, 7 and 8, View to South

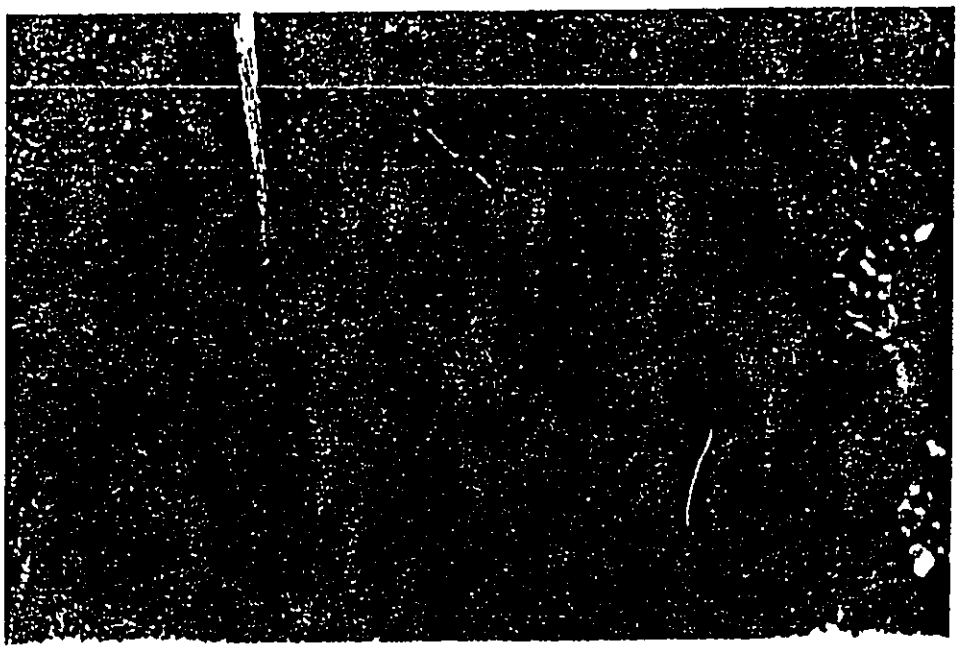


Fig. 15 West Face, Trench 9

Fig. 16 Trench 10, View to SE

phaeopygia, Hawaiian Petrel or Dark-rumped Petrel) which are difficult to discriminate on the basis of fragmented bones. Newell's Shearwater was indicated in three of the midden fractions and it is assumed that most of the procellarid bones belong to this species. The Dark-rumped Petrel also seems to be well represented.

Of greater interest was the presence of the bones of Albatrosses (Diomedea) in three midden fractions from two trenches. The first historically known albatross nesting (a Laysan Albatross, Diomedea immutabilis) on Kaua'i occurred near Kilauea Point in 1977 (Berger 1983:41). Thus, it would seem highly probable that albatross nested on the north shore of Kaua'i previously, but were locally extirpated by Polynesian predation and/or the introduction of the Polynesian Rat and/or the introduction of historically introduced species (cats and dogs). The albatross bone found at 70-80 cm. in Trench 3 must post date 1385 A.D.

The most interesting faunal identification was that of Branta sandwicensis (Hawaiian Goose, or Nene) from Trench 9 at 110-125 cm. This level of this trench was dated at 1330-1430 A.D. Thus, it can be assumed that a goose was consumed at Hā'ena in this time frame. Breeding populations of geese are only known from Hawai'i Island in historic times. It is possible that the goose bone in the Rasten midden was a Canada Goose (Branta canadensis; it would not be possible to discriminate the specie from the single bone present) which arrived on Kaua'i by chance. Such straggler Canada geese have been "reported infrequently from

Hawai'i, Mau'i, Moloka'i, O'ahu and Midway" (Berger 1983:229). It is also possible that a native goose population from Hawai'i Island was established on Kaua'i by Polynesian introduction. However, we agree with Dr. Ziegler that the most likely possibility is that this bone represents a Kaua'i goose population that was extirpated by Polynesian predation and the introduction of Polynesian animals (dog, pig, Polynesian rat). In recent times, goose bones have been identified in Polynesian middens on Moloka'i and O'ahu and it seems not unlikely that the impact of the arrival of Polynesians wiped out native geese on all the northern Hawaiian islands. This is the first known example of a goose bone from a Kaua'i prehistoric site.

A bone from a small Passeriformes (song bird) was also recovered but the taxonomy could not be determined.

Fish species in the midden included parrot fish (uhu, family Scaridae) identified in seven midden fractions, shark or ray (Elasmobranchii) in six fractions, surgeon fish (Acanthuridae) in three fractions, porcupine fish (Diodontidae) in two fractions, wrasses (Labridae) in two fractions, and one identification each of the Grand-eyed Porgy (Mu, Monotaxis grandoculis), Hawkfish (Pu'u pa'a Cirrhitidae), barracuda (Kaku, Sphyraenidae) and file fish (Monacanthidae). Of particular interest is the number of sharks and/or rays. These identifications were all made on vertebrae centra and it is not possible to discriminate between sharks and rays on this basis. While no shark teeth were recovered, it seems probable that most of these bones are from

sharks of between four and eight feet in length. A similarly large number of shark and/or ray centra were recovered from the excavations at the neighboring Zimmerman project. This suggests that the consumption of shark and/or ray was a common occurrence at Hā'ena Point and that shark and/or ray supplied a substantial percentage of the protein consumed. Another large predator was the barracuda which is estimated to have been more than 4' long. While the shark and/or ray and the barracuda could have been caught in the open ocean, they also could have been caught quite close to shore. There is no clear evidence for fish taken by trolling or deep water bottom fishing. The large number of parrot fish may reflect fishing on the reef at night when they might have been more easily acquired.

It may be noted in passing that a piece of cut turtle bone (Artifact Acc.# 109) was recovered but that there was no turtle bone in the midden. Turtle bone seems quite uncommon in Hawaiian sites.

Invertebrate Analysis

The marine invertebrates present in the midden generally represent the natural population in the immediate area and show little selectivity in harvesting. There are two exceptions. One is in the importation of Hihiwai (Neretina sp.) which were almost certainly collected in Mānoa Stream. Neretina were the fourth-most common shell remains, accounting for 8% of all midden, but these shells may have been casually harvested in the course of

many trips to bathe and fetch water from Mānoa Stream, and thus, they may not represent the degree of reliance on riverine shellfish that their abundance suggests. The other exception was in the Opihi (Cellana sp.) which were the largest fraction of the midden and accounted for 13% of all midden recovered. Opihi would have been uncommon in the immediate area. Opihi accounted for less than 5% of the midden at the Zimmerman Property. This suggests that at the Rasten Property, Opihi were being imported from somewhere else, probably from the Na Pali coast where Opihi would have been abundant. This suggests a greater use of canoes and a larger marine resource catchment area for the residents of the Rasten Property than for the residents of the Zimmerman Property. This may also be suggested by the fish bone recovered from the two properties. The other shellfish species present are mostly those species that prefer sandy sheltered shallows. These included, in order of their decreasing percentage of the midden, Turbo sandwicensis (31% of all midden), Strombus maculatus (10%), Conus sp. (7%) and Periglypta reticulata (6%). Conspicuous in their absence were those species which prefer more wave-washed inter-tidal zones (ex. Cypraea species). The abundance of shellfish species that prefer sheltered sandy shallows suggests the traditional subsistence pattern of localized inshore collection which was historically a function of the women and children (Handy and Pukui 1958). The Opihi may have been collected by members of either sex on canoe trips up the Na Pali coast or may have been brought to Hā'ena Point by residents of the Na Pali

Coast. In the analysis of midden from the abutting Zimmerman Property a relative abundance of the distinctively textured Granulated Cowry (Cypraea granulata) was noted. These were assumed to have been selectively imported to that area for ornaments. No such abundance was noted in the midden from the Rasten Property. The three perforated shell artifacts identified as ornaments from the Rasten Property included Cypraea isabella (2) and Terebra dimidiata.

Botanical Analysis

No plant remains were recovered. The complete absence of kukui nuts (Aleurites molluccana endocarps) is surprising considering their importance as a source of food, light, and medicine and their use to aid visibility through the surface of the sea. A similar lack of kukui nuts was noted at the Zimmerman Property where they accounted for only 0.3% of the midden.

Food Value of the Hā'ena Midden

Estimates of food value based on recovered midden are potentially useful as an indicator of the degree of reliance on various resources and for comparative purposes. There is some dispute over midden fraction to meat ratios. Following Kirch's (1982) estimates for conversion factors and percent protein conversion factors (extrapolated from U.N. Food Composition Tables) yield the data in Table 4.

Table 4 Midden To Food Value Conversion

Food	Midden Weight (grams)	Conversion Midden:Meat Ratio	MeatWeight Represented	Conversion Meat: Protein	Protein Represented (grams)
Shellfish	6,523	1:1.11	7,240	15%	1,086
Fish	116	1:20	2,320	20%	464
Bird	58	1:10	580	30%	174
Mammals	138	1:16.7	2,304	50%	1,152
					2,876

These values should not be construed as anything more than a "ballpark" estimate of the order of magnitude of the meat consumed in the area actually excavated based on the weight of recovered midden fractions. The most striking aspect is the suggested importance of mammal (pig) meat in the diet which accounts for 40% of all protein consumed in the estimates of Table 4. This strong reliance on mammals was also noted at the Zimmerman Property but is quite atypical for most Hawaiian sites where fish were relatively much more important in the diet. The large amount of mammal meat is thought to reflect the greater productivity of Hā'ena Ahupua'a. It should be noted that in the excavations at Hā'ena Point there has been a particularly large amount of shark and/or ray vertebrae and that these largely cartilaginous fishes would have a much lower midden (bone) weight to meat weight ratio than bony fishes which would result in an underestimate of the importance of fish in the diet.

A Comparison with Midden from Earlier Hā'ena Research

The Concentration Index (C.I.) of midden at the Rasten Property (1353) is far higher than that for the neighboring Zimmerman Property (C.I. 350) which suggests much more prehistoric activity at the Rasten Property. Why this should be so is unclear but it probably involves the slightly closer proximity to Mānoa Stream and the major break in the reef through which canoes would pass and the fact that the Rasten Property appears to be slightly higher. The midden C.I. is slightly higher than that for the Ke'e Beach excavations (Table 3) but is of the same order or magnitude. As at the Zimmerman Property, there was a relatively high degree of reliance on birds. While mammal bone was less as a percent of the midden than at the Zimmerman Property, it was still quite high for a prehistoric site which further suggests that this site had a particularly strong terrestrial orientation and was probably intimately associated with Mānoa Valley which is also the most likely source of the riverine Neretina shells that were so common in the midden.

VII. Quantitative Dates

Two carbon isotope dates were recovered from discrete archaeological features within the cultural layer underlying the Rasten Property (Fig. 4). The results are reported and discussed below:

CSHACC#	Beta Analytic#	Location	Depth(cm)	Klein Adjusted Age*
1	32484	Tr3, St.IIC	90-100	1385-1500
5	32485	Tr9, East Wall St.IIC	110	1330-1430 AD

*Klein et al. 1982, 95% confidence level

These findings are similar to the dating results from other projects on the north shore of Kaua'i. Griffin et al. (1977:48) reports 30 volcanic glass dates from the Ke'e Beach area as all falling between 1260±16 and 1494±20 and reports three carbon dates for Nualolo Kai in Na Pali as 1370±50, 1380±50, and 1430±80. Hammatt et al. (1978:143ff.) reports 30 more volcanic glass dates as ranging from 989-to mid-1800s but places the first use in the Hā'ena State Park visitor facilities area at 1118-1347 AD. Hammatt and Meeker (1979:42) report 13 volcanic glass dates, but these are all somewhat later at 1650-1850.

Hammatt and Shideler (1989:34-35) reported four carbon isotope dates for archaeological features in the neighboring Zimmerman property that all overlap 1400 A.D., as do the two dates presently reported.

On the basis of present evidence it would appear that occupation of the north shore of Kaua'i does not predate the 10th Century and that by the Fourteenth Century the population was substantial and widespread.

VIII. Summary of Excavation Results

Ten archaeological trenches (numbered 1-10) were hand excavated along the beach cut bank of the Rasten Property. This report section provides a summary of the findings in each excavation unit.

Trenches 1-4 were excavated just east of the east beach gate parallel to and just seaward of the makai fence (Fig. 4).

Trench 1 (1 m^2) was shoveled off down to a depth of 50 cm. as the cut bank exposure 4' (1.3 m.) to the north had shown that 50 cm. of sterile wind deposited sand overburden overlay the cultural layer in this area. Excavation then proceeded in arbitrary 10 cm. levels in the absence of a plurality of discrete cultural strata. The 50-60 cm. level yielded three basalt waste flakes and a possible hammerstone. The abundant (107 gr.) of midden was mostly mollusks but there was 30 gr. of pig bone. The 60-70 cm. level yielded only four basalt waste flakes and much less midden (26 gr.) which included some pig bone. At 70 cm. a pavement of basalt and coral cobbles in a darker gray, more compact sand matrix was encountered which extended across the entire unit. This was interpreted as a constructed prehistoric living surface. The 70-80 cm. level yielded seven basalt waste flakes and one polished flake. This unit contained only sterile sand below 85 cm. and excavation was halted at 110 cm.

Trench 2 (1 m^2) (Figs. 4, 8, 9) was located 6' (2 m.) to the west of Trench 1 and was situated in an attempt to delimit the prehistoric cobble pavement encountered in Trench 1. The trench

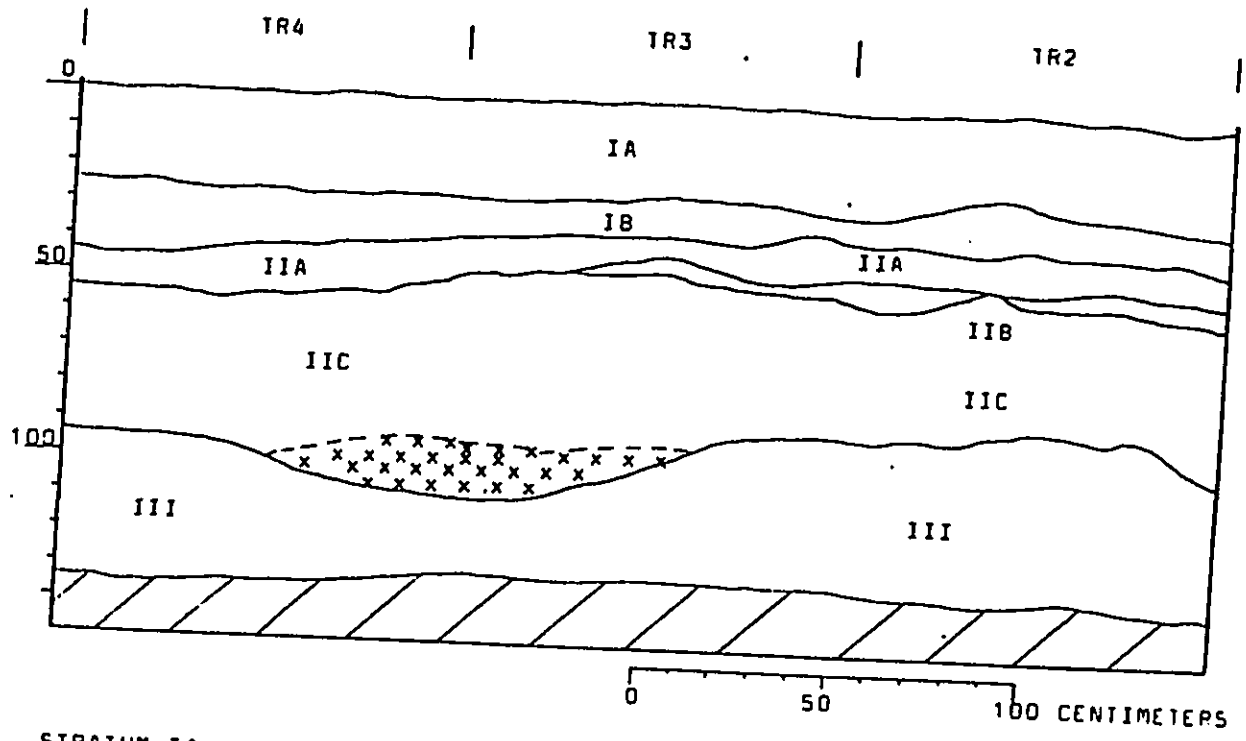
was shoveled out to the top of the prehistoric cultural layer (Stratum IIC) at a depth of 60 cm. In the absence of internal stratification, the cultural layer was excavated in arbitrary 10 cm. levels. The 60-70 cm. level yielded two polished basalt flakes and one basalt waste flake and a moderate amount (44 gr.) of shellfish midden. The 70-80 cm. level yielded eight basalt waste flakes and substantially more midden (03 gr.) which included some pig bone. The 80-90 cm. level yielded a piece of cut pearl shell, three polished basalt flakes and eighteen waste flakes. The sandy soil matrix became notably darker (almost black) and much more compact. This layer yielded the greatest concentration of charcoal and the most midden (201 gr.) of any level in the unit. The midden assemblage was mostly shellfish (273 gr.) but there was a significant amount of fish, bird, and pig bone as well. In the 90-100 cm. level evidence of culture greatly decreased. This level yielded only two basalt waste flakes and 48 gr. of mostly shellfish midden. The sand matrix was notably less compact and was lighter in color. The Stratum IIC layer ended at 100 cm. but a small 25 cm. diameter pit (probable post hole) in the southwestern portion extended 45 cm. down into Stratum III. In the 100-110 cm. layer the soil appeared to be a mix of the cultural Stratum IIC and the sterile Stratum III. No artifacts were found and the midden consisted of 50 gr. of shellfish. The number of land snails, including the extinct land snail Carelia dolei, greatly increased in this level suggesting that it was a stable surface in early Hawaiian times.

In the 110-120 cm. level no artifacts were encountered and the midden (6 gr.) consisted of one shell. Occasional charcoal was observed and there were still plentiful land snails present. Below 120 cm. the sand was sterile and excavation was halted at 135 cm.

Trench 3 (1 m^2) (Figs 4, 8, 9) was excavated abutting the west side of Trench 2. The top 50 cm. of windblown overburden was shoveled off. The cultural layer (Stratum IIC) began at 55 cm., and the 50-60 cm. level yielded two basalt waste flakes and a moderate (30 cm.) amount of midden (30 gr.) which included the bones of pig, parrot fish, and porcupine fish. The 60-70 cm. level showed an increase in midden (110 gr.) which was mostly shellfish, but included some fish and bird bone. Artifacts included a basalt waste flake, coral file (Acc.#15, Fig. 6) and a polished basalt adz tip. The 70-80 cm. level yielded eleven basalt waste flakes, one polished basalt flake, three volcanic glass flakes, and one perforated auger shell (Terebra dimidiata, Acc.#19, Fig. 7) which may have been used as an ornament or a gourd stopper. This level showed an increase in charcoal and midden (242 gr.) which included bird bone, pig bone, and the bones of parrot fish and shark and/or ray. The 80-90 cm. level had a darker, more compact soil which was almost black in the northwest quadrant. This layer yielded one piece of cut shell and two basalt waste flakes, a large amount of charcoal but much less midden (53 gr.). The midden included some fish and bird bone. In the 90-100 cm. level a possible hearth was noted in the

western portion defined primarily by the abundance of charcoal and loosely piled boulders in the south face. No artifacts were recovered and only scant fragments of midden were observed. A corrected carbon isotope date of 1385-1500 A.D. was obtained from the charcoal feature at this level which is thought to span the time of the first major occupation of the site. In the 100-110 cm. level there was still a great deal of charcoal in the hearth feature but the rest of the unit was sterile Stratum III. A few pieces of basalt shatter, possibly associated with basalt flaking were noted but there were no artifacts or midden. The charcoal of the hearth feature extended down to 130 cm. but no artifacts or midden were observed. The trench was sterile below 130 cm.

Trench 4 (1 m^2) (Figs. 4, 8, 9) was excavated abutting the west side of Trench 3. The sterile overburden overlying the cultural layer to a depth of 60 cm. was shoveled out and discarded. Stratum IIC began at 60 cm., and the 60-70 cm. level yielded eight basalt waste flakes, a basalt adz fragment, a sea urchin file fragment, and a volcanic glass flake. The moderate amount of midden (68 gr.) included some bird bone and the mouthparts of a Grand-eyed Porgy fish (Mu, Monotaxis grandoculis). The 70-80 cm. level yielded fourteen basalt waste flakes, three polished flakes, two volcanic glass flakes, and a substantial amount (183 gr.) of midden which included some fish, bird and mammal bone. In the 80-90 cm. level the soil changed from a grayish sand to a much darker brown sand. This level yielded only three basalt waste flakes, and 85 gr. of shell midden. In



STRATUM IA LIGHT BROWN, MEDIUM TO COARSE SAND; MODERN A HORIZON.

STRATUM IB VERY PALE BROWN, FINE TO MEDIUM CORAL SAND.

STRATUM IIA LIGHT BROWN, SANDY LOAM; CONTAINS HISTORIC CULTURAL MATERIALS.

STRATUM IIB VERY PALE BROWN, MEDIUM TO COARSE CORAL SAND; DISCONTINUOUS.

STRATUM IIC VERY DARK BROWN, SANDY LOAM; CONTAIN PREHISTORIC CULTURAL MATERIALS.

STRATUM III VERY PALE BROWN TO WHITE, MEDIUM TO COARSE CORAL SAND; CULTURALLY STERILE.

UNEXCAVATED.

x x x x CHARCOAL CONCENTRATION.

Fig. 8. Trenches 2, 3, and 4; North Profile.

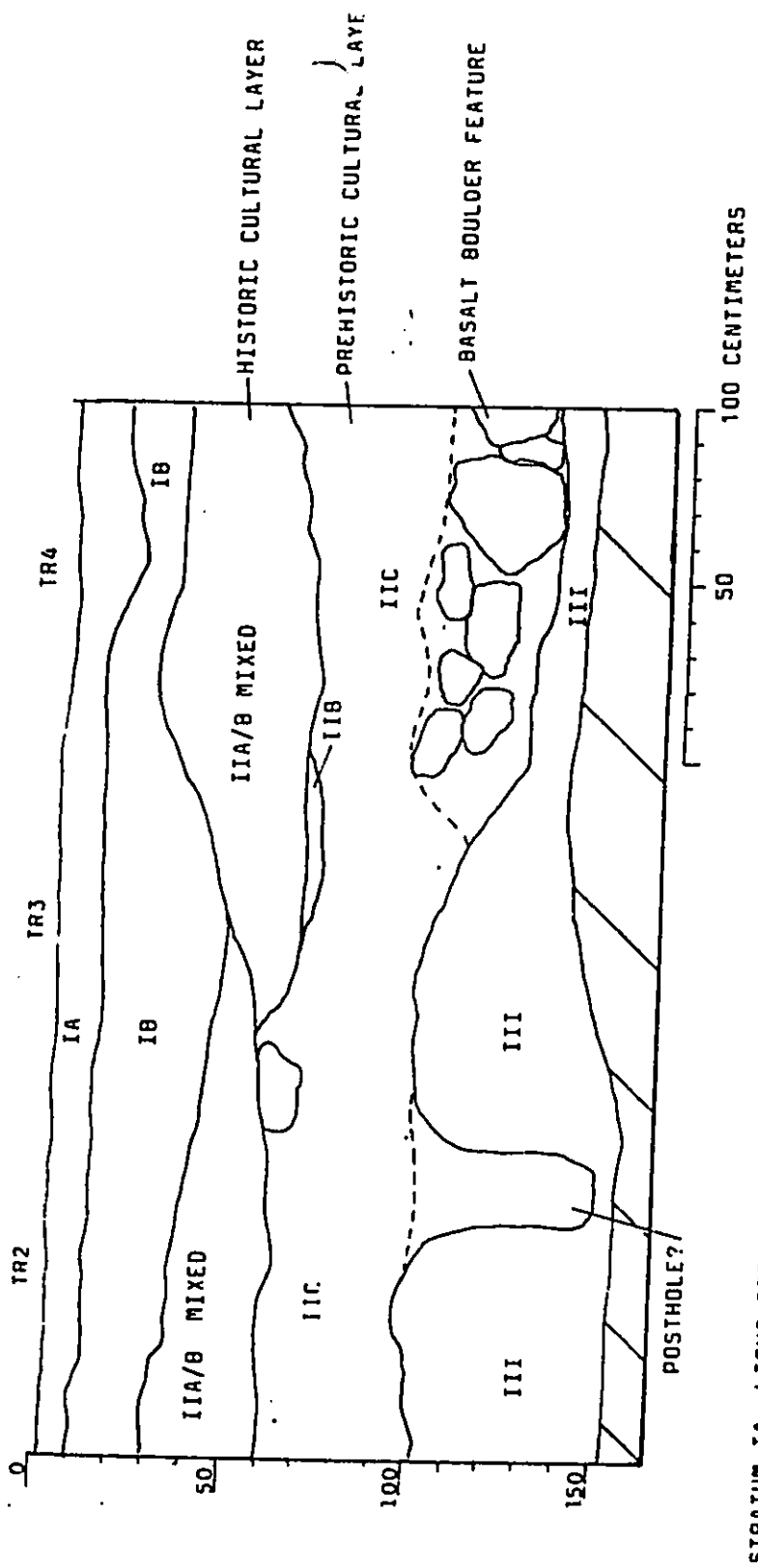


Fig. 9. Trenches 2, 3, and 4; South Profile.

the 90-100 cm. level the decrease in artifacts and midden continued with only two basalt waste flakes and 27 gr. of shell midden recovered. The 100-110 cm. level showed a sharp increase in charcoal in the northeast quadrant where the soil was stained black and had associated loose basalt boulders in the southern half of the unit. This was the same feature encountered in the northwest quadrant of Trench 3 from which a charcoal sample was dated. Only two basalt waste flakes and 39 gr. of shell midden were recovered. The 110-120 cm. level yielded four basalt waste flakes and two polished flakes but only sparse (27 gr.) shellfish midden. The 120-130 cm. level was mostly sterile Stratum III but Stratum IIC extended down into this level in the SW quadrant. Five basalt waste flakes and a couple pieces of shell midden (0 gr.) were recovered. The trench was sterile below 130 cm.

Trench 5 (1 m^2) (Figs 4, 10) was excavated just northeast of the west gate to the beach. The top 40 cm. of sterile overburden was shoveled off and was not screened. Stratum IIC began at 40 cm., but the 40-50 cm. level yielded only one basalt waste flake and 26 grams of shellfish midden. The 50-60 cm. level yielded five basalt waste flakes, a basalt adz fragment, a chisel shaped basalt adz (Acc.#36, Fig. 5), two volcanic glass flakes, a sea urchin file fragment, and a probable shell drill (Acc.#101, Fig. 7). This artifact assemblage suggests great industry in this portion of the site. The ample midden (164 gr.) was almost all shellfish with traces of fish and mammal bone. The 60-70 cm. level yielded four basalt waste flakes, a polished basalt flake,

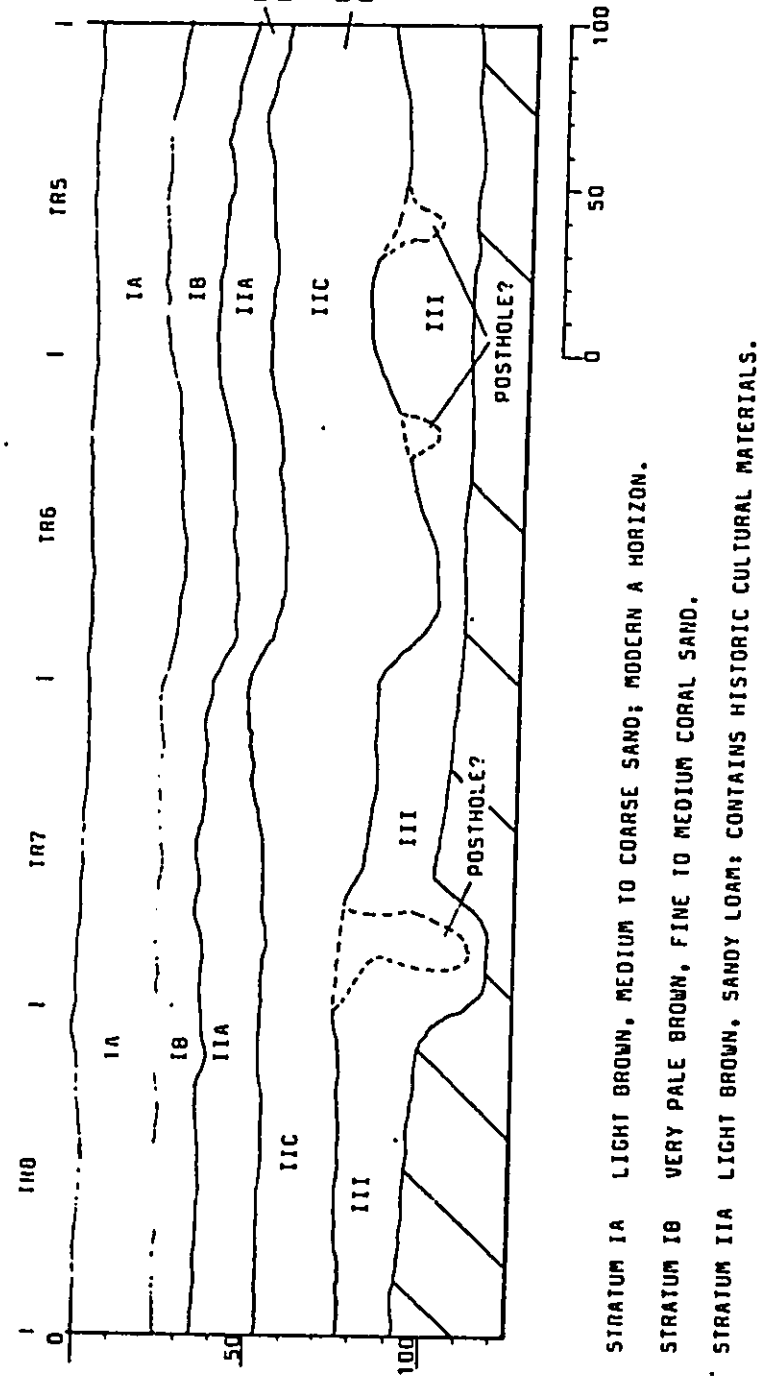


Fig. 10. Trenches 5, 6, 7, and 8; North Profile.

and 215 gr. of midden which was almost all shellfish with a couple grams of fish bone. The 70-80 cm. level produced five basalt waste flakes, and a piece of cut pearl shell which was probably intended for a lure or small hook. While the artifact assemblage for this level was not impressive, it produced the most midden (444 gr.) of any trench level in this project. The midden was almost all shellfish with some parrot fish and bird bone. The 80-90 cm. level was Stratum III in the northern half and Stratum IIC in the southern half and had a dramatic decrease in artifacts and midden. This level yielded two basalt waste flakes, a perforated Horn Shell (Rhinoclavis sp.) which may have been used as a gourd stopper, and 129 gr. of shellfish midden. The 90-100 cm. level
yielded three basalt waste flakes, one polished flake and 54 grams of mostly shellfish midden with a couple grams of fish bone. This trench was sterile below 1 meter.

Trench 6 (1 m^2) (Figs 4, 10) was excavated abutting Trench 5 to the northwest. The overburden of sterile sand was shoveled off down to the top of Stratum IIC at a depth of 40 cm. The 40-50 cm. level yielded four basalt waste flakes, one polished basalt flake and one pearl shell fishhook fragment (Acc.#45, Fig. 6). The ample midden (197 gr.) was almost all shellfish with traces of fish and mammal bone. The 50-60 cm. level had nine basalt waste flakes, two polished flakes and a perforated Cowry Shell (Cypraea isabella; Acc.#106, Fig. 7) bead. The ample midden (255 gr.) was mostly shellfish but did include the ver-

tebrae of a medium-sized shark or ray and bird bone. The 60-70 cm. level had ten basalt waste flakes and a sea urchin file fragment. The substantial midden was almost all shellfish but included some bird bone and shark or ray. The 70-80 cm. level had a decrease in midden and artifacts yielding only six basalt waste flakes and 96 grams of midden which was almost all shellfish. At 80 cm. the outline of a 17 cm. diameter possible post hole feature was observed in the south central portion of the trench. This feature extended down to 100 cm. intrusive into Stratum III, but contained no midden or artifacts. The 80-90 cm. level had only one basalt waste flake and 89 gr. of shellfish midden. In the northeastern corner of the unit there was a small dip of Stratum IIC matrix down into Stratum III. While only 25 cm. across, this feature extended down to 140 cm. This feature also failed to yield any artifacts or significant midden. With the exception of the two intrusive features, Trench 6 was sterile below 90 cm.

Trench 7 (1 m^2) (Figs 4, 10) was excavated abutting the northwestern side of Trench 6. This unit was shoveled down to the top of Stratum IIC at a depth of 40 cm. The 40-50 cm. level yielded five basalt waste flakes, two volcanic glass flakes, a coral file and ample midden (262 gr.). The midden included parrot fish, bird, rat, and pig bones. The 50-60 cm. level produced a bone point tip of a two-piece fishhook (Acc.#54, Fig. 6), a basalt file, a coral file, a basalt grinding stone fragment, seven basalt waste flakes, two polished flakes, and an adz

fragment (Acc.#59, Fig. 5). The ample midden (197 gr.) included vertebrae of a medium-sized shark or ray and bird bone. The 60-70 cm. level had a small hearth feature in the western side of the south wall which was 26 cm. wide and extended out from the south wall 12 cm. This small hearth extended from 65 cm. to 105 cm. and contained 25-30 basalt pebbles. This level yielded no artifacts but a substantial 220 gr. of midden which included the bones of a medium-sized shark or ray, a surgeon fish (Acanthuridae), bird, and mammal. At 70 cm. three small possible post holes were observed. These were only 10 cm. in diameter but extended down intruding into the Stratum III to a depth of 90-105 cm. The 70-80 cm. level yielded only three basalt waste flakes and 69 gr. of midden which contained small amounts of fish, bird and mammal bone. Trench 7 was sterile below 80 cm. except for the four small intrusive features.

Trench 8 (1 m^2) (Figs. 4, 10) was excavated abutting the northwestern side of Trench 7. This unit was shoveled off to the top of Stratum IIC at 40 cm. The 40-50 cm. level yielded nine basalt waste flakes, one polished flake, a basalt abrader, and a sea urchin file fragment. The substantial 262 grams of midden included parrot fish, bird, rat and pig bone. At 50 cm. in the southeastern corner of Trench 8 was a probable small hearth. There was little charcoal but there was dark-stained sand and a number of dark-stained basalt cobbles down to a depth of 70 cm. The 50-60 cm. level yielded ten basalt waste flakes and a basalt adz fragment (Acc.#66, Fig. 5). The 275 grams of midden included

fish, bird and mammal bone. The 60-70 cm. level yielded two basalt waste flakes and a basalt grinding stone fragment. The 70 grams of midden included fish, bird and mammal bone. The 70-80 cm. level yielded a couple of fragments of basalt shatter, possibly a by-product of flaking, and 29 grams of midden which included some bird and mammal bone. Trench 8 was sterile below 80 cm.

Trench 9 (1 m^2) was a 1 m. by 1.5 m. trench excavated just outside of the makai fence near the northwestern corner of the property. The overburden of Trench 9 was shoveled off down to the top of Stratum IIC at 40 cm. The 40-50 cm. level yielded no artifacts but contained 117 grams of midden, including a trace of fish bone and some pig bone. In the 50-60 cm. level there were five basalt waste flakes, and a sea urchin file fragment. The ample 236 gr. of midden was almost all shellfish but did include a small amount of bird and pig bone. In the 60-70 cm. level there were three basalt waste flakes and 84 grams of midden which included small amounts of fish, bird and mammal bone. In the 70-80 cm. level there were four basalt waste flakes and 180 grams of midden, including surgeon fish (Acanthuridae) and mammal bone. In the 80-90 cm. level there were a great many artifacts including five basalt waste flakes, a drilled dog tooth ornament (Acc.#74, Fig. 7), a coral file, a coral abrader, a piece of cut pearl shell and a sea urchin spine file fragment. There were 345 gr. of midden, which included the bones of parrot fish, shark or ray, and some mammal. In the 90-100 cm. level there were three

basalt waste flakes, one polished flake, one volcanic glass flake, and one piece of cut pearl shell. There was still a great deal of midden (229 gr.) which included fish, bird, and pig bone. The 100-110 cm. level yielded three basalt waste flakes and a basalt adz fragment (Acc.#84, Fig. 5). The midden dropped way down (18 gr.) but did include some mammal bone. There was a small, poorly defined hearth feature in this level, the charcoal of which yielded an adjusted carbon isotope date of 1330-1430 A.D. The last of Stratum IIC was excavated as a 15 cm. level (down to 125 cm.) but yielded no artifacts and only 8 grams of midden which was notable, however, for being mostly bird bone. Excavation ended at 135 cm.

Trench 10 was a 2m by 0.5 m. trench which was excavated on the wave cut bank which exposed the cultural layer and was located about 15' west of the steps down to the beach. The top 40 cm. of overburden was shoveled off without screening down to the top of Stratum IIC at 40 cm. The 40-50 cm. level yielded five basalt waste flakes, two polished basalt flakes, a sea urchin file, and a Cowry Shell (Cypraea isabella) bead. This level yielded the second greatest amount of midden of any excavation level (400 gr.) which included a small amount of fish, bird, and mammal bone. The 50-60 cm. level yielded eight basalt waste flakes, three polished flakes and a substantial 294 gr. of midden which included fish, bird and pig bone. The 60-70 cm. level yielded four basalt waste flakes and a one polished flake and 77 gr. of midden which included the bones of surgeon fish (Acan-

thuridae), bird and mammal. The 70-80 cm. level contained two basalt waste flakes, a polished flake, and a basalt adz preform fragment. Only 29 grams of midden were recovered which included a small amount of bird bone. The 80-90 cm. level had two basalt waste flakes and 7 gr. of midden, which included some mammal bone.

IX. Conclusions and Recommendations

Conclusions

Concentration indices of midden and artifactual materials at this Hā'ena Point locality indicates more intensive occupation than that documented for the Zimmerman property immediately to the east and slightly more than that documented for the Ke'e Beach site to the west. Carbon isotope dates show Hā'ena Point occupation to range 200-400 years younger than Ke'e Beach but additional information from adjacent localities could eventually prove Hā'ena Point to have the full range of the prehistory of Kaua'i.

Recommendations

It is our judgement that an appropriate amount of important archaeological information has been gathered from the Rasten Property to mitigate impact of sea wall construction. However, given the indicated intensity of Hawaiian occupation at this portion of State Site 50-30-02-1809 and given that human burials have been found in recent excavations at the Zimmerman project (within 30' of the Rasten property), at the Anawalt property, and on the beach near the Rasten property it is recommended that an archaeological monitor be present for initial excavation activity associated with sea wall construction. The monitor should be present to document unexpected findings and to take appropriate action on the possible uncovering of human burials.

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EXHIBIT "G"

UPDATE TO COASTAL ENGINEERING EVALUATION

UPDATE TO COASTAL ENGINEERING EVALUATION

1.0 LOCATION AND PROBLEM DEFINITION

The project site is located along the Haena cost on Kauai's north shore, on real property identified as Kauai Tax Map Key: 5-9-02-35, owned by Murcia-Toro, Inc. Figure 1 is a project site location map, and Figure 2 shows the tax key parcel.

The Owner proposes to construct a sloping rock wall/revetment, inland of the certified shoreline, into the face of an eroding embankment. Figure 3 shows the location of the proposed revetment.

2.0 PREVIOUS STUDIES

A coastal engineering study was done in July 1987, evaluating the proposed revetment on the project site. A copy of that study, "Coastal Engineering Evaluation Of Potential Impacts Due To Construction Of Shore Protection At Haena, Kauai", by Field Services Hawaii, Inc., ("FSH Study"), is attached hereto. As the FSH Study contains substantial technical information, reference is thereto made rather than restating the same herein.

Since the preparation of the FSH Study, the owners of the property abutting the project site on the east have constructed a rock revetment similar to that proposed on the project site. This report is intended to be an update of the earlier FSH Study, based on the experience following the construction of the revetment on the abutting property.

3.0 COASTAL SETTING

3.1 Beach and Shoreline Characteristics

The FSH Study indicates that the shoreline southwest of Haena Point is relatively stable, except for a short 400-foot stretch of shoreline just on the west side of the point which was then actively eroding. This 400-foot stretch fronts the project site and the abutting properties to the east.

It is explained that the erosion in this short stretch of beach is the result of a discontinuity of the shallow offshore reef west of Haena Point through the reef paralleling the shore and terminating the beach fronting the area of erosion. During

periods of large northwesterly swell conditions, the convergence of currents fronting the area allows waves to attack the shoreline at higher elevations on the beach.

The then vertical facing of the backshore escarpment would be highly reflective of the wave energy and would increase the scouring action on the waves on the beach. Sediments which are eroded from the backshore and beach area were then carried by the currents offshore through the channel.

3.2 Feasibility of Revetment

The FSH Study recognized that a properly designed rock revetment would dissipate the wave energy and would not change the natural coastal processes in general. The study also noted that by placing the revetment along the existing escarpment and not protruding beyond the active nearshore swash zone, the revetment would not create a barrier to longshore transport of sediment moving past the revetment.

4.0 CONDITIONS SUBSEQUENT TO CONSTRUCTION OF NEIGHBORING REVETMENT

The abutting property (TMK: 5-9-02-34) was also part of the 400-foot stretch of active erosion found in the FSH Study. The owners thereof constructed a revetment along the shoreline of a design identical to that proposed on the project site in October of 1989.

Prior to the construction of the revetment on the abutting property, its shoreline was similarly highly eroded as the project site. Figure 4 are photographs of the shoreline fronting the abutting property prior to the construction of the revetment.

Since the completion of the revetment almost four years ago, sand has accreted fronting the revetment and has created a wider sandy beach than previously existing. Figure 5 are recent photographs of the shoreline fronting the abutting property.

An explanation for the accretion is that the sloping face of the wall effectively dissipated the wave energy, causing the sand to be deposited on the shore fronting the structure during such times as the wave action is sufficiently high to reach the revetment. This is opposite of the condition existing prior to

the construction of the revetment, whereby the vertical face of the eroded bank highly reflected the wave energy and caused scouring and accelerated erosion.

Further, the placing of the revetment above the reaches of the waves during normal tidal and water conditions, does not pose any barrier to the longshore transport of sediment in the area. This has permitted the natural beach processes to operate, such that the shoreline to the west of the area of erosion identified in the FSH Study continues to remain relatively stable.

5.0 POTENTIAL IMPACTS

5.1 Littoral Erosional Processes

The proposed revetment will be situated inland of the certified shoreline, and above the upper reaches of the waves during normal tidal and water conditions. It will not be a barrier to the longshore transport of sediment in the area. During times of normal tidal and water conditions, the proposed revetment will not affect the littoral erosional processes occurring in the offshore waters.

During times of storm and high wave conditions, where the wave action reaches the wall, the sloping face of the structure would be less adverse than the existing vertical face of the eroding escarpment. Wave energy would be dissipated, rather than reflected, and reduce scouring of the beach and further undermining of the escarpment. Dissipation of wave energy may also cause the increased deposit of sand on the beach.

5.2 Hardening of Shoreline

There is always a concern as to the effect which hardening a shoreline through protective devices may have. Case studies of various beaches with such devices as seawalls, revetments, groins, and jetties have concluded that such devices tend to accelerate erosion. Hawaii Shoreline Erosion Management Study; Hwang, Beach Management Plan With Beach Management Districts (Draft);

However, those studies also recognize that protective devices may be appropriate under certain circumstances.

> "(N]ot all seawalls and revetments have led to the loss of the beach. Very infrequently, some of the structures are not located in the tidal zone where they can influence the nearshore sediment transport. Some landowners may have constructed these structures during a rare or unusual period of erosion. When more normal conditions return, these structures are significantly inland of the foreshore. Therefore, another factor that influences the impact of a seawall or revetment is the frequency that these structures are in or directly near the tidal zone where they can influence nearshore processes." Hwang, Beach Management Plan With Beach Management Districts (Draft), 1992, at page 40.

As noted, the proposed wall on the project site will not be located within the tidal zone, and will be accessible to the reaches of the waves only during high storm wave conditions. The experience with the revetment on the abutting property, similarly built outside of the tidal zone, and the favorable beach processes thereafter is an indication that the proposed revetment will likely not adversely affect and may benefit the fronting shoreline.

Moreover, the concern over shoreline hardening centers around those structures which are place in the water (i.e., groins and jetties), or structures within the tidal zone and subject to the littoral processes (i.e., seawalls and revetments), and which hardens the shoreline. The proposed structure does not fall within these categories, as it will not be placed within the water nor be within the tidal zone where it may affect the littoral shoreline processes. It will not harden the shoreline, as it is 80 to 100 feet inland of the water's edge.

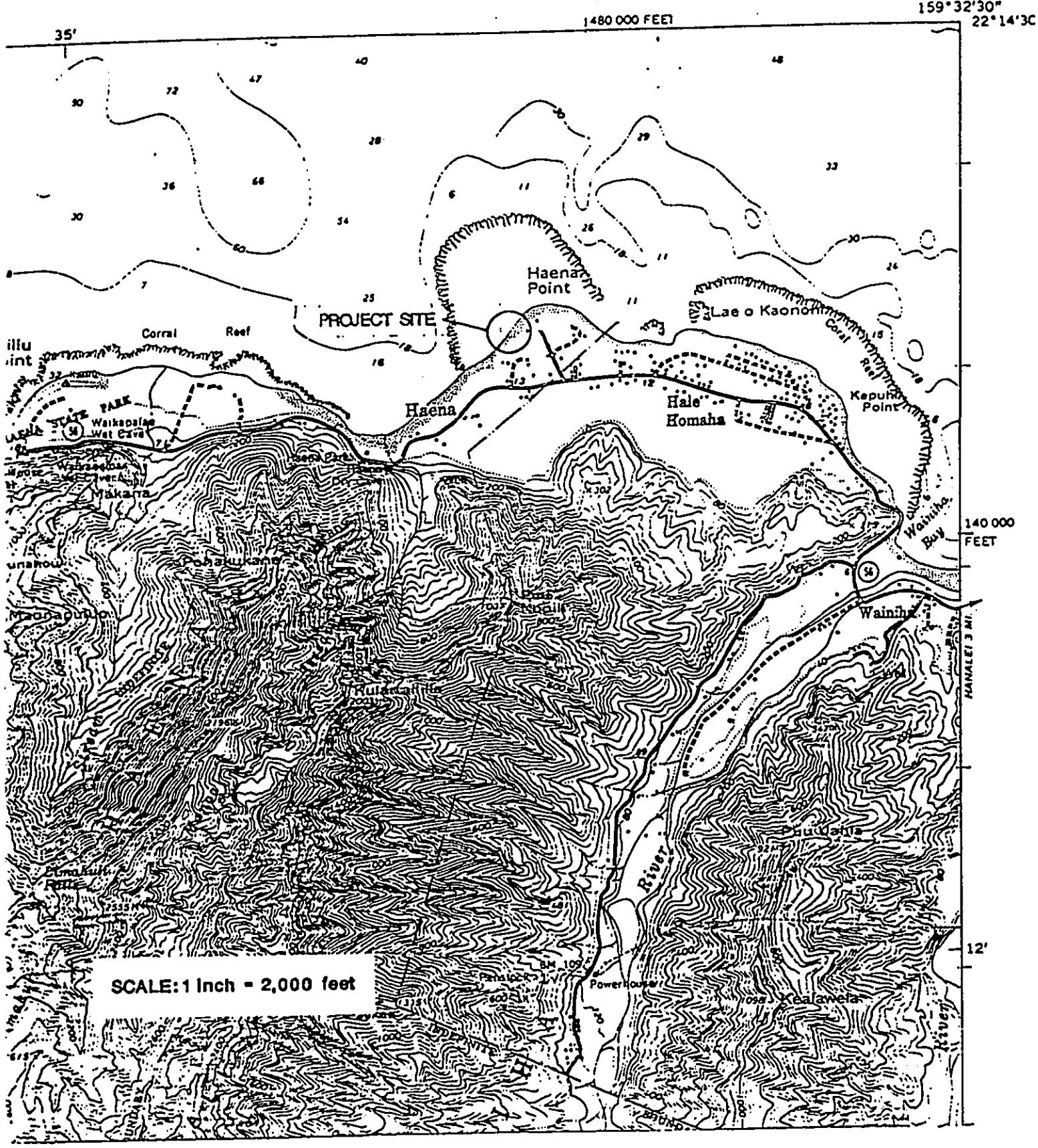


Figure 1. Project Site Location Map, Haena, Kauai

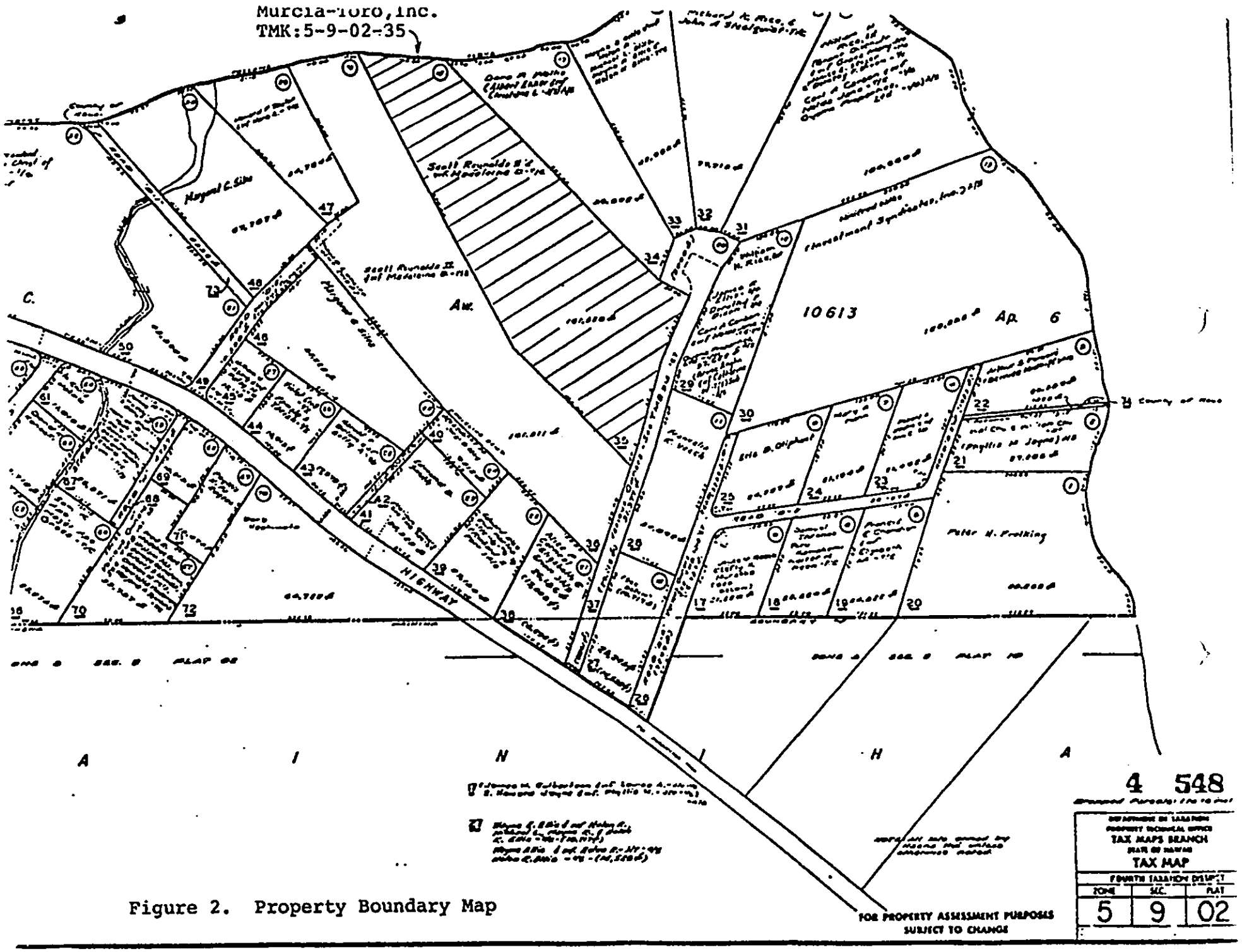
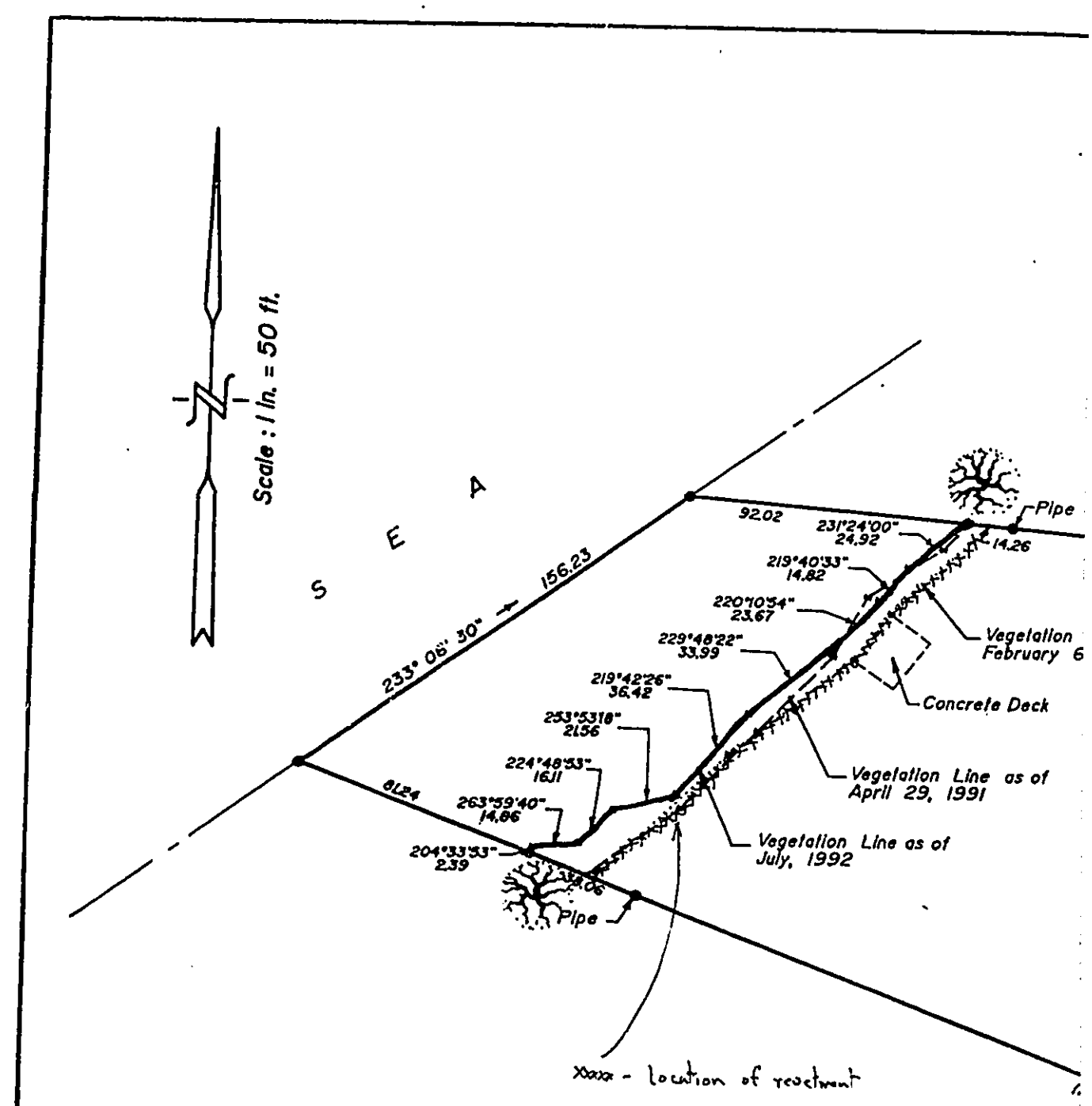


Figure 2. Property Boundary Map



SHORELINE SURVEY OF LOT 18 HAENA HUI LAND

Figure 3. Location of proposed rock wall

Figure 4 - Photographs of shoreline before revetment

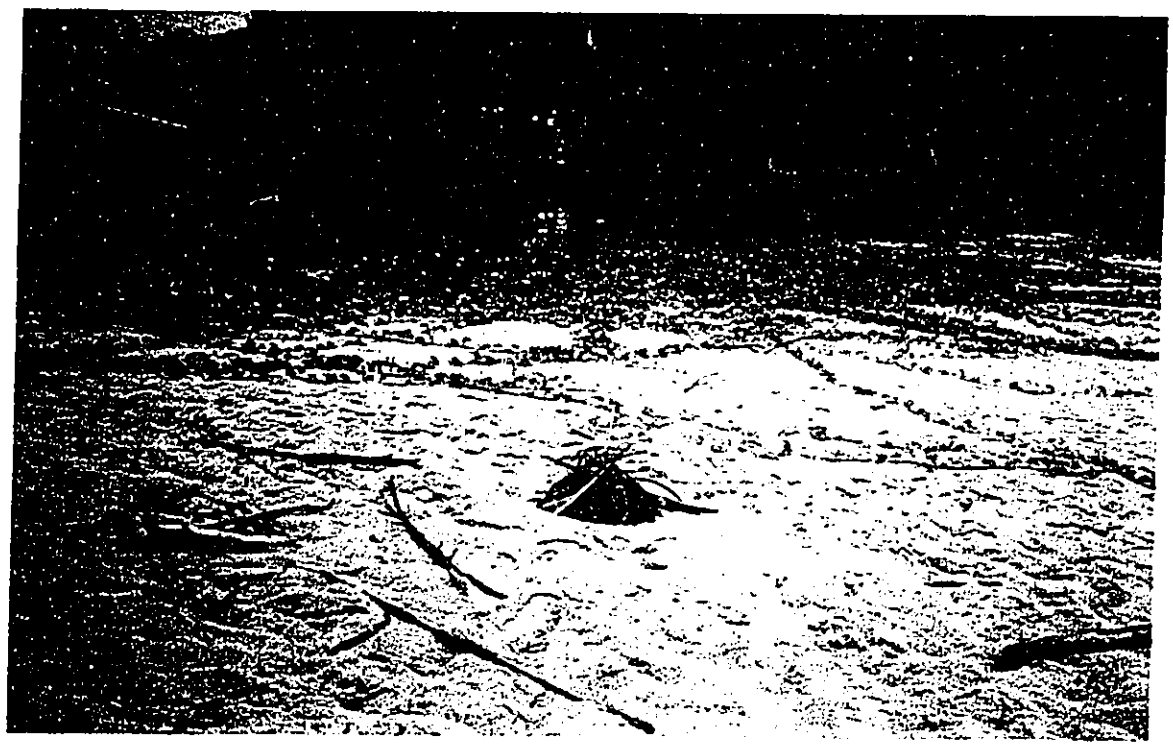


Figure 5 - Photographs of shoreline with revetment

FIELD SERVICES HAWAII, INC.
OCEANOGRAPHIC CONSULTANTS

COASTAL ENGINEERING EVALUATION OF POTENTIAL IMPACTS DUE TO CONSTRUCTION OF SHORE PROTECTION AT HAENA, KAUAI

(TMK: 5-9-02-35, Murcia-Toro, Inc.)

July 1987

615 Piikoi Street, Suite 1000 / Honolulu, Hawaii 96814 / Phone (808) 537-5856
Oceanographic Analysis Coastal Surveys Computer Modeling

1.0 LOCATION AND PROBLEM DEFINITION

The project site is located along the Haena coast on the north shore of Kauai (Figure 1). The subject property is shown on Figure 2 (TMK: 5-9-02-35, Murcia-Toro, Inc), having about 180 feet of shoreline frontage which has suffered severe erosion damage. Due to the present condition of the shoreline, high water levels and large wave conditions will cause continued erosion of the subject property from scouring and undermining of the high vertical escarpment. The property owners desire to construct shore protection to prevent further loss of fast lands.

2.0 COASTAL SETTING

2.1 Beach and Shoreline Characteristics

The 3500 feet long Haena shoreline is bounded to the southwest by the Haena mountain ridge, which slopes steeply down to the waters edge, and to the northeast by Haena Point, a sandy promontory protected by a broad reef which extends about 1500 feet offshore the point. The offshore reef narrows southwestward and is only about 200 feet wide midway down the Haena coast.

The shore is fronted by a white sand beach which varies in width. The sand is very coarse-grained except at Haena Point where the sand is finer. This is indicative of the lower wave energy levels at Haena Point due to the wide protective offshore reef, as compared to the shoreline west of the point which is less protected. The beach slope is about 1V:6H and flattens to about 1V:11H at Haena Point. This is also indicative of the lower wave energy levels at the point. Beachrock fronts most of the shoreline at the waters edge.

The subject property is located a few hundred feet southwest of Haena Point. Figure 3 shows the eroded condition of the property shoreline. In Figure 3a, the northeastern property boundary is about where the ironwood trees stand with roots exposed on the beach. In Figure 3b, the southwestern property boundary is where the vertical escarpment transitions landward to a flatter slope. The top of the beach slope is about elevation +8 feet MLLW. The height of the vertical eroded escarpment is about 5 feet above the beach.

The shoreline northeast of the property to the tip of Haena Point has also suffered erosion damage. Figure 4 shows the undermined trees and narrow beach fronting about 200 feet of shoreline between the subject property and Haena Point. Apparent erosion lessens at the point and the beach widens (Figure 5).

The shoreline southwestward of the property appears relatively stable with no apparent signs of major erosion damage. Figure 6 shows the adjacent property shoreline to the southwest and Figure 7 shows northeast and southwest views of the shoreline from the

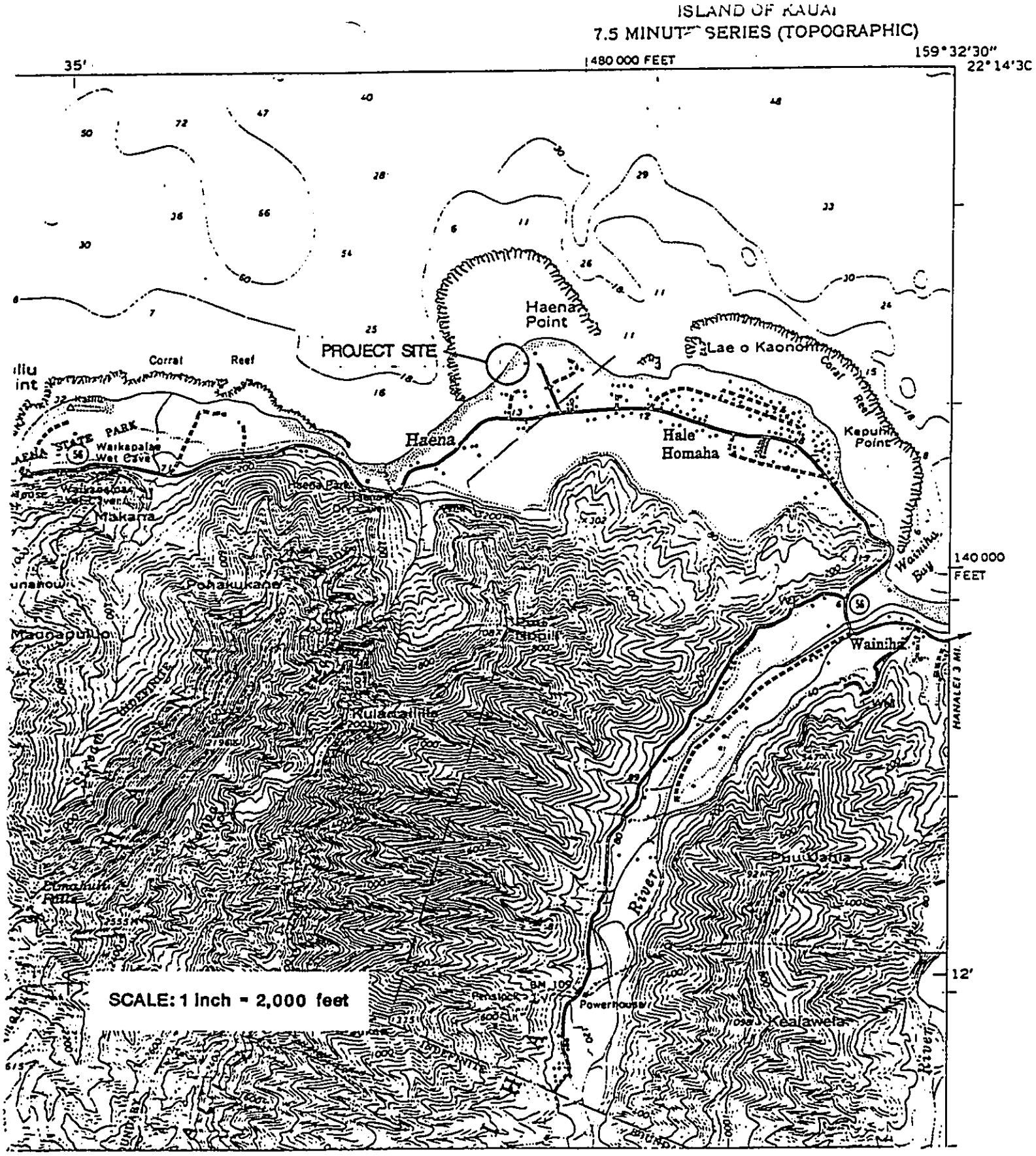


Figure 1. Project Site Location Map, Haena, Kauai

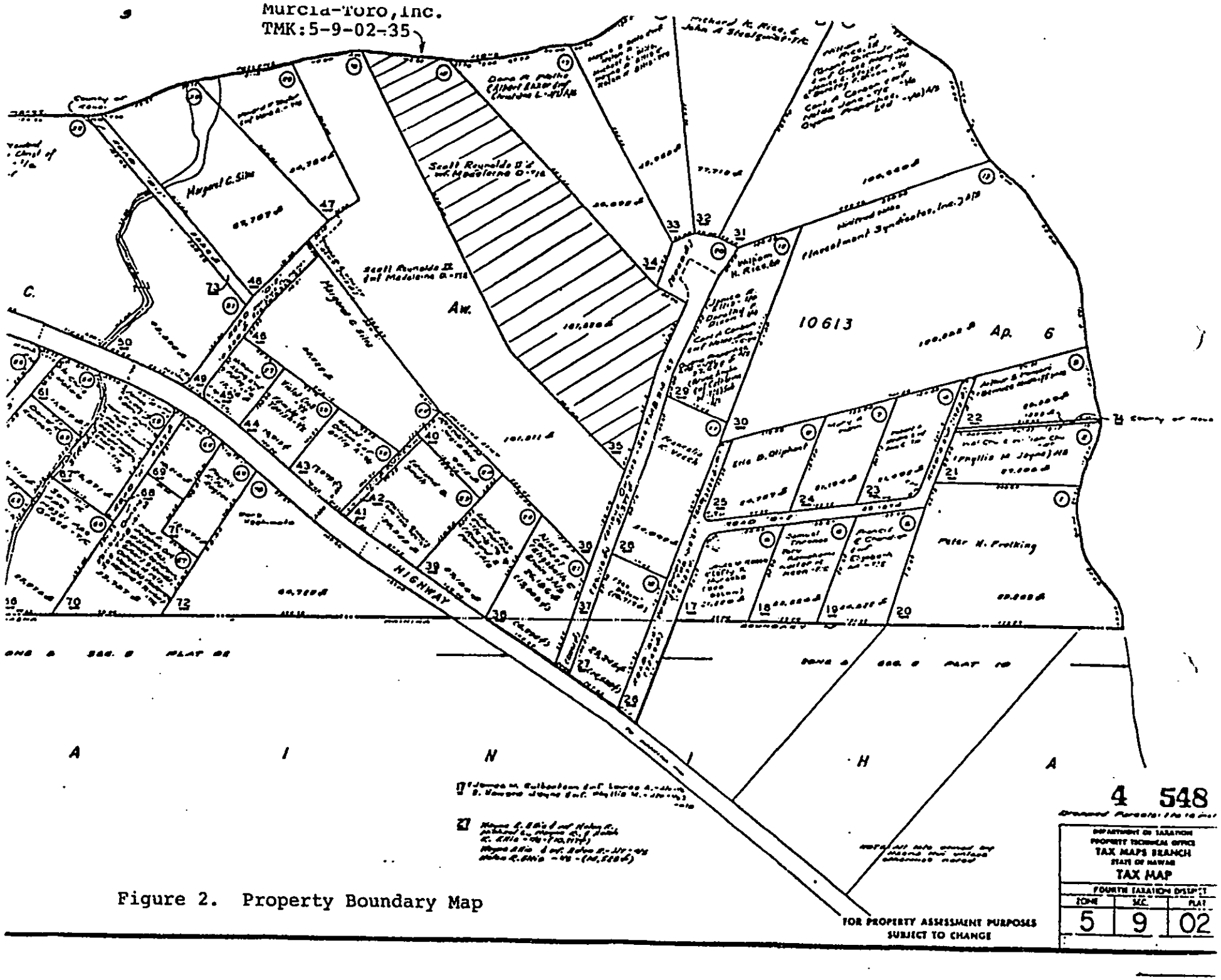


Figure 2. Property Boundary Map

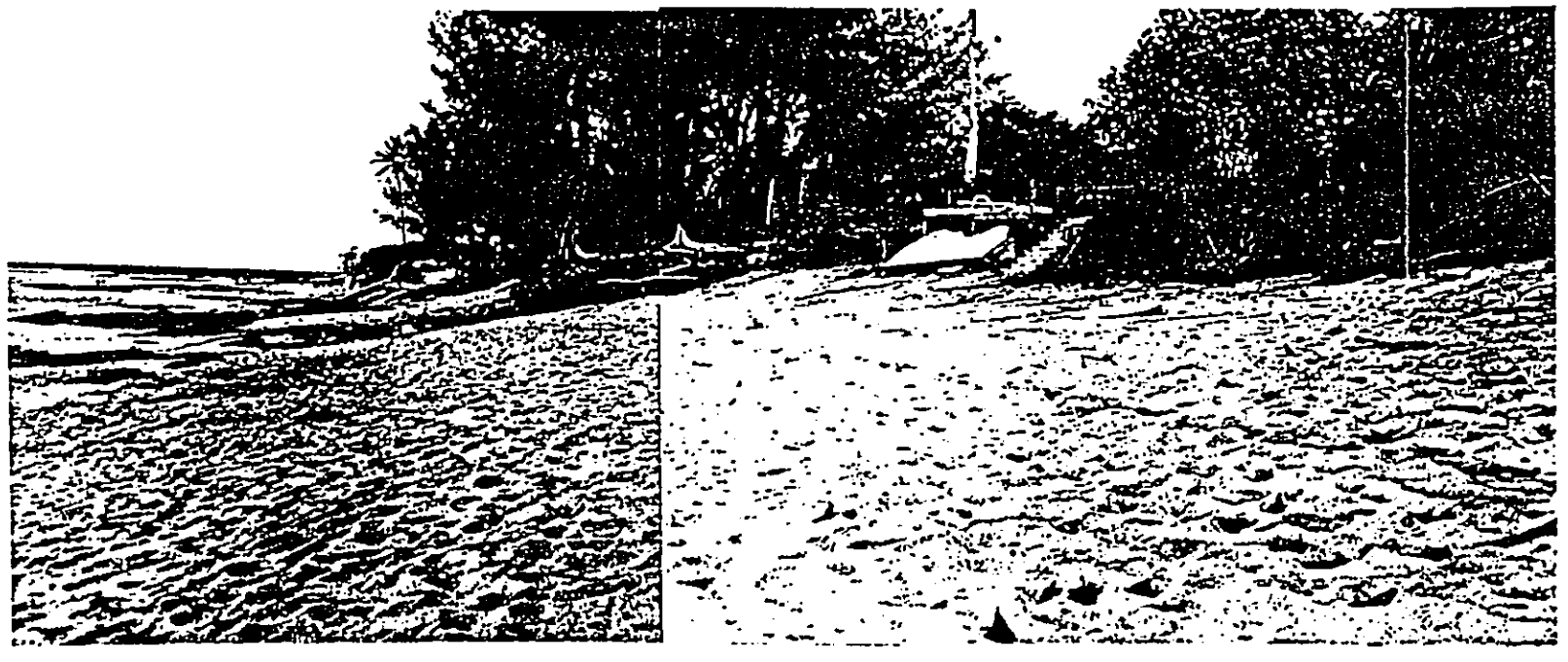


Figure 3a. Northeast View of Subject Property Shoreline

Figure 3b. Southwest View of Subject Property Shoreline

Figure 4. Eroded Condition of Adjacent Property on Northeast Side

Figure 5. Shoreline at Haena Point

Figure 6. Adjacent Property Shoreline on Southwest Side

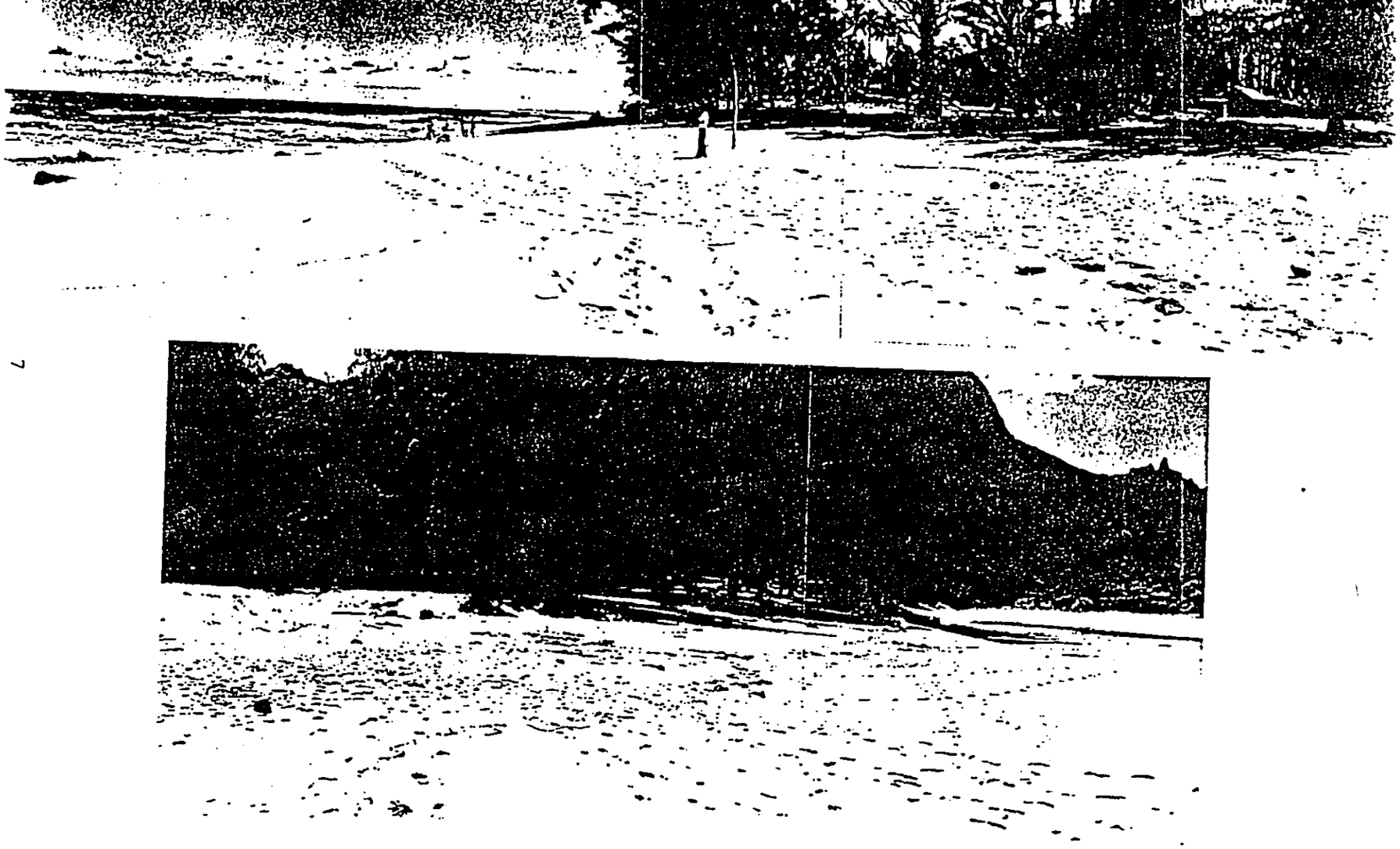


Figure 7. Northeast View (top) and Southwest View (bottom) From Location of Stream Outlet about 400 Feet Southwest of Subject Property

location of a small stream outlet about 400 feet southwest of the subject property. This shoreline reach has lower backshore elevations, and while erosion of fast land is not evident, wave runup during high surf conditions can probably cause flooding of backshore areas.

2.2 Winds and Waves

The Haena coastline is exposed to the predominant northeasterly tradewinds and tradewind-generated waves during the summer months, and to the north through northwesterly winds and North Pacific swell during the winter months. The broad offshore reef surrounding Haena Point provides much sheltering of the Haena coastline from the northeasterly tradewind waves. These waves break at the seaward edge of the reef where most of their energy is spent. What little energy remains is dissipated across the wide reef prior to reaching shore. Thus, during the summer months, nearshore wave heights along the project shoreline are very small. The reef provides less protection from the larger northwesterly swell. While North Pacific swell energy is reduced somewhat by refraction and divergence of wave energy due to the offshore bathymetry and wave breaking over the reef, substantial wave energy still reaches the shoreline especially during high tide when deeper water depths on the reef allow greater wave energy to reach shore. During typical high tides and moderate northwesterly swell conditions, the wave uprush on the beach reaches the base of the eroded escarpment. Very large northwesterly swell in the recent past has overtopped the subject property shoreline and caused flooding of the backshore areas.

The frequency of occurrence of the North Pacific swell can vary from year to year. These swell are generated by winter storms in the western North Pacific or by mid-latitude low pressure systems passing to the north of the Hawaiian Islands. These waves have relatively long periods (typically 10-15 seconds) with large heights to 20 feet. Based on wave data from a Waverider Buoy offshore Barking Sands Pacific Missile Range Facility, North Pacific swell waves can occur more than 90% of the time during the months of January through March. On an annual basis, these North Pacific swell waves are expected to occur less than 40% of the time during a typical year. About 30% of the time, these swell have deepwater heights greater than 5 feet, with surf heights greater than about 8 feet.

2.3 Coastal Processes

Haena Point serves as a focal point of wave approach due to the protruding offshore reef and bathymetry. Waves approaching the shore at an angle will move beach material alongshore in the direction of breaking. Once the beach is aligned parallel with the wave crest, then it may stabilize until the wave conditions change. The eastern side of Haena Point faces the northeasterly tradewind waves. Due to the broad reef offshore the point, very little tradewind wave energy is available at the shore to move

beach sediment southwest around the point. Hence, the northeasterly-facing shore at Haena Point would remain relatively stable.

The shoreline southwest of Haena Point is also relatively stable with an alignment facing the northwesterly swell. However, a short 400-foot stretch of shoreline just on the west side of the point is actively eroding. At first glance, this seemed puzzling since northwesterly swell would be expected to move beach material northeast towards the point along this stretch of shoreline. And as with the tradewind waves, the broad reef offshore the point would significantly reduce the northwesterly swell energy at the shore and hence minimize the potential for continued movement of the beach sediment northeastward around the point. Thus, this segment of shoreline immediately in the lee of the broad reef would be expected to be stable or to even accrete if there is sufficient downstream sand source.

There are several factors which may be contributing to the erosion problems along this short stretch of shoreline just west of Haena Point. Examination of aerial photos provides clues to this mystery. From the aerial photos, the detailed offshore reef configuration and shoreline features can be clearly distinguished. Figure 8 shows a sketch of the shallow reef features and the wave and current patterns which potentially contribute to the localized severe erosion at the project site. There is a discontinuity of the shallow offshore reef west of Haena Point. The depression or "channel" through the reef parallels the shore and terminates at the beach fronting the subject property and adjacent property to the east. The beachrock, or limestone reef platform, at the waters edge is also discontinuous along this short 400-foot stretch of beach.

During large northwesterly swell conditions, waves breaking over the shallow offshore reef cause a rise in water level known as set-up. The increased water levels allow more wave energy to propagate across the reef. The water which accumulates over the reef seeks to flow towards areas of hydraulically least resistance. Thus, the water drains into the deep channel area towards shore. Waves breaking along the southwest shore also cause a longshore current flow towards the deep channel. This convergence of currents within the channel increases the water elevation fronting the project site and drives the flow out through the break in the reef.

The increased water levels at the project site allow waves to attack the shoreline at higher elevations on the beach. This is also aggravated by high tide conditions. The beachrock at the waters edge is discontinuous and does not afford the same beach toe stability as along the western shore. The vertical backshore escarpment is highly reflective of wave energy and increases the scouring action of the waves on the beach. The sediments which are eroded from the backshore and beach area are carried by the currents offshore through the channel. Hence, all of these

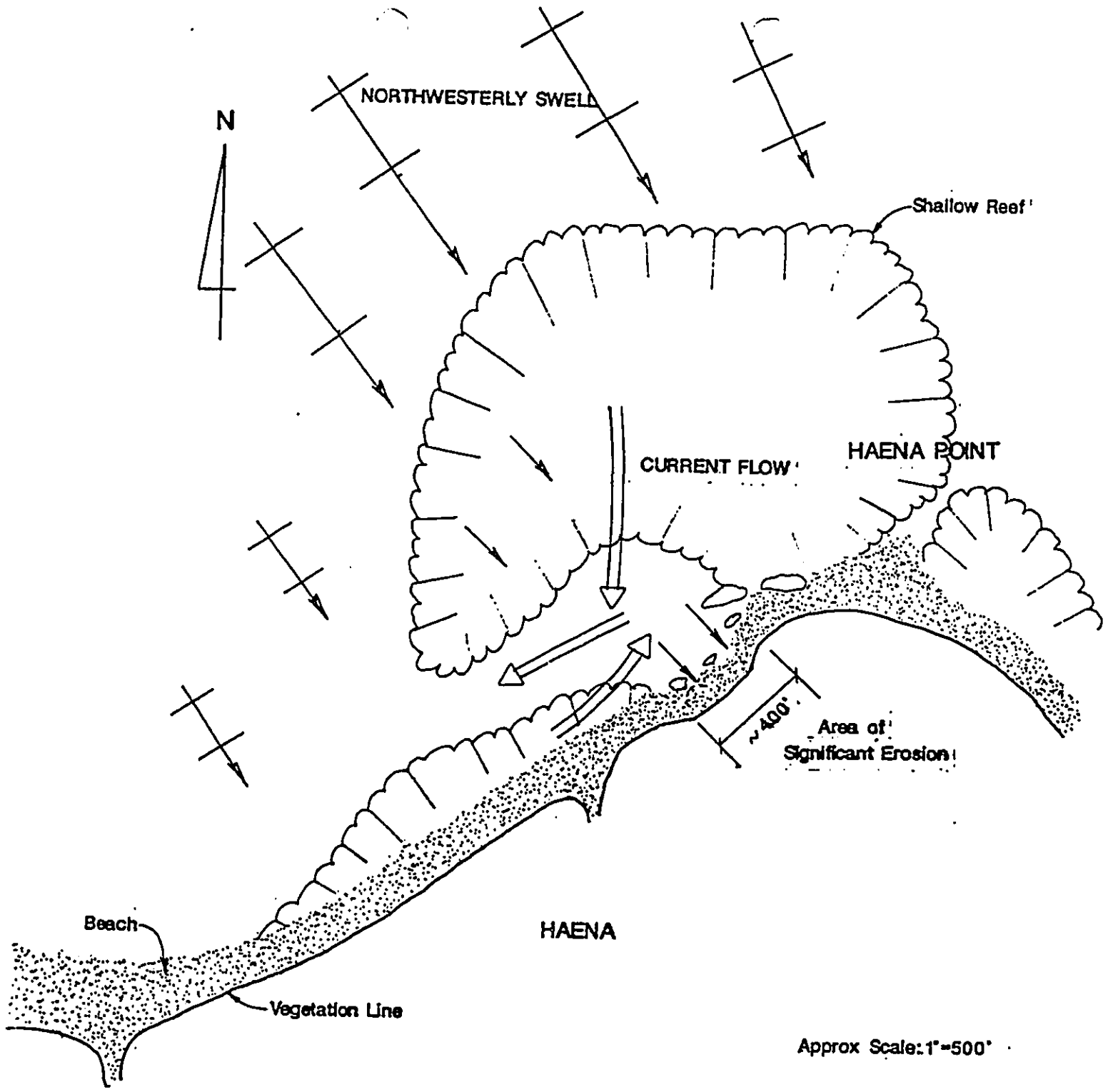


Figure 8. Sketch of Reef and Shoreline Features and Wave and Current Patterns Which Contribute to Erosion at the Project Site

factors presently contribute to the localized erosion problem at the project site.

The above scenario only occurs during periods of large northwesterly swell or storm waves since the typical tradewind waves are not capable of causing any appreciable set-up over the reef and very little wave energy reaches the shore.

The relative stability of the Haena coastline can be ascertained from historical aerial photos spanning a 32-year period. These aerial photos, taken in November 1950, October 1963, April 1975, and January 1983, were enlarged to a scale of 1 inch = 200 feet to better define the horizontal scale of shoreline changes. The photos show no significant chronic recession of the beach toe, as the same beachrock features are visible in the 1950 and 1983 photos. However, there is indication of erosion of fast land along the project reach, as revealed by a recession in the vegetation line relative to existing houses and large trees. The vegetation line appears to have receded about 30 feet over the 32-year period of the aerial photos. The present high vertical escarpment along this shoreline reach can accelerate the rate of erosion because of scouring and undermining of the bank. It is not unreasonable to assume that erosion of vegetated land along the project reach will continue into the future.

3.0 JUSTIFICATION FOR SHORE PROTECTION

The existing vertical eroded escarpment along the subject property shoreline necessitates protection to stop continuing erosion damage. During high tide and large swell conditions, the uprush of waves will continue to scour the bank, causing undermining and collapse of the embankment. There has been an average loss of about 1 foot per year along the property shore frontage over the past 30 years.

4.0 CONSIDERATION OF ALTERNATIVES

4.1 No Action

Taking no action is not a viable alternative, since erosion damage is likely to be progressive. The present condition of the shoreline is conducive to erosion damage under large swell conditions.

4.2 Beach Nourishment

Beach nourishment involves the placement of sufficient quantities of sand to create a sloping beach face which can dissipate the wave energy. The beach would have to be built to high enough elevations above the uprush of waves to prevent scouring of the existing vertical embankment. This alternative will not stop any potential long-term loss of beach sand and may

require frequent nourishment to maintain the beach volume. It is a costly alternative since the large quantities of sand must be quarried at a hereto unknown location and trucked to the site.

4.3 Seawalls and Revetments

Seawalls and revetments are the most direct alternatives to protect the land from wave attack. There are a variety of materials and methods which can be used depending on desired durability, availability of materials and constructability considerations at the site. Seawalls are vertical structures, typically concrete or grouted masonry walls. Revetments are sloping structures typically constructed using rock. Vertical impermeable seawalls are not appropriate on sandy shorelines. These walls are highly reflective of wave energy, which can cause scouring and undermining at the base of the structure. The high reflectivity will also discourage any accretion of sand fronting the structure, therefore precluding the possible build-up of the beach during potential accretion cycles. Sloping rock revetments are more effective in dissipating wave energy. If properly designed and constructed, these rubble-type structures are durable, not prone to catastrophic damage due to its flexibility, and more conducive to beach accretion than vertical impermeable seawalls. The disadvantages are the requirement for heavy equipment and special skills to place the large stones used for the armor layer, and the cost of large stones to quarry and haul to the site. Other types of material which can be used for revetments include gabions, grout-filled bags or mattresses, or interlocking concrete blocks. These have the advantages of being easily constructed without the need for heavy equipment. However, they are less durable than large rock, requiring frequent maintenance, and are aesthetically less acceptable.

4.4 Detached Offshore Structures

Offshore structures can stabilize the shoreline by dissipating wave energy prior to reaching the beach. These structures are placed parallel to the shoreline and at various offshore distances from the beach depending on the littoral processes and desired function. The offshore breakwater at Haleiwa Beach Park on Oahu is an example of a type of offshore shore protection. If there is sufficient quantity of littoral transport in the area, the beach may accrete substantially in the lee of the structure. The offshore structures may be built high, extending above the water surface, or may be built low and wide, as submerged reef-type platforms. A variety of materials may be used depending on the design wave conditions, required durability, availability of materials and constructability considerations at the site. Since offshore construction requires specialized marine equipment and carries a higher risk than onshore construction, it is generally desired that the structure be designed and constructed to require little or no maintenance.

5.0 POTENTIAL IMPACTS

If a vertical seawall is constructed adjacent the existing escarpment, the high reflectivity of the wall will probably result in loss of beach sand fronting the structure. During high water levels and large wave conditions, wave energy reflecting off the seawall will scour the beach and may result in undermining of the wall unless the footing is placed on hard non-eroding foundation. Due to the high backshore elevations and the need to excavate to at least mean sea level in order to place the footing on hard beach rock, the seawall would necessarily by very massive.

If a rock revetment is constructed, the permeability of the structure will dissipate wave energy and would not be expected to cause the scouring and loss of beach sand to the extent that a vertical seawall would. However, the revetment should be properly designed and constructed since there may still be localized scouring of individual stones. If proper care is not taken to prevent leaching of sand through the voids of the structure, then differential settling of the stones may cause unravelling and collapse of the structure.

A properly designed rock revetment would not change the natural coastal processes in general. Since the revetment would be placed along the existing escarpment and would not protrude beyond the active nearshore swash zone, it will not create a barrier to longshore transport of sediment moving past the revetment.

The revetment, while protecting the land immediately behind it, will not prevent erosion of adjacent unprotected lands. Hence, if erosion along this shoreline persists, continued erosion of adjacent lands may result in the revetment protruding seaward of the adjacent eroding embankment. This may result in localized accelerated erosion to the adjacent shores which is more severe than would normally occur. This localized impact is due to wave energy reflecting off the corners and ends of the revetment, causing increased turbulence and scouring of the unprotected shore. This is likely to occur on the east end of the revetment where active erosion of the backshore area is evident. If feasible, it would be prudent to extend the revetment along the entire reach that is presently suffering severe erosion damage. By extending the revetment to the tip of Haena Point where wave energy is very diminished, end effects due to future potential erosion would be minimized. While the shoreline west of the revetment appears relatively stable, long-term insidious erosion may also ultimately lead to localized accelerated erosion at the west corner of the revetment. However, since the adjacent west shoreline presently extends seaward of the subject property shoreline, the potential for end effects to occur is probably not as great as on the eastern end.

An offshore structure can probably be designed to minimize the present severe erosion at the project site. The structure could be placed offshore the toe of the beach and essentially be designed as an extension of the limestone reef platform at the waters edge. The effectiveness of the structure will depend on the actual design height, width and length. If properly designed, the man-made reef could help to stabilize the beach as well as minimize erosion of fast lands. However, there is more uncertainty associated with this shore protection alternative than with a shoreline revetment insofar as effectiveness at preventing future loss of fast lands. An offshore structure would have potentially minimal impacts to adjacent lands since it would mimic the natural protective characteristics of the reef platform.

Prepared by:

Elaine E. Tamaye

Elaine E. Tamaye
Coastal Engineer

EDWARD K. NODA & ASSOCIATES
OCEANOGRAPHIC CONSULTANTS

ELAINE E. TAMAYE — OCEAN ENGINEER

EDUCATION

University of Hawaii, M.S. Ocean Engineering, 1977 Specializing in Coastal Engineering
University of Hawaii, B.S. General Engineering, 1974 Specializing in Marine Environmental Engineering

EXPERIENCE

- Ocean Engineer
  Edward K. Noda and Associates
  1983 to present

  Ms. Tamaye is the senior coastal engineer responsible for coastal design analysis and oceanographic criteria evaluations. Major programs in which she has been involved include the OTEC 40-MW Pilot Plant Program, the Hurricane Vulnerability Study for Honolulu, Hawaii and Vicinity, and the Hawaii Ocean Science and Technology (HOST) Park plannning and design. As part of the OTEC Pilot Plant Program, oceanographic design criteria were established for the preliminary design of the Land Based Containment System (LBCS), including evaluation of the typical and extreme wave and current conditions, hydrodynamic loads on the LBCS, and potential impacts on littoral processes. As part of the Hurricane Vulnerability Study for Honolulu, she was involved in the development of a unique computer model which determines the overland flooding effects due to hurricane waves. The model incorporates wave refraction, wave breaking, wave setup, wave runup/overtopping effects, and determines the overland flooding limits. For the HOST Park project, oceanographic criteria were developed for the cold water intake pipeline, including design waves and currents in the nearshore zone. Ms. Tamaye has most recently been involved in a harbor study for the American Samoa Government. This study evaluates the feasibility of constructing a harbor facility at Leone Bay, based on estimated costs of construction versus anticipated economic benefits to be derived from the harbor.

- Civil/Hydraulic Engineer
  U.S. Army Corps of Engineers, Pacific Ocean Division
  1977 to 1983

  Served as civil engineer with the Tripler Resident Office, performing a full range of contract administration functions for the Tripler Army Medical Center construction project, 1982-1983. Responsible for preparing change orders, negotiating and processing contract modifications, and evaluating contractor claims.

ELAINE E. TAMAYE (cont'd.)

Served as hydraulic engineer performing coastal engineering planning and design studies, 1977-1982. Responsible project manager for design of navigation and shore protection projects, preparation of planning/project reports, and plans and specifications for construction.

Involved in numerous coastal projects throughout the Pacific Basin, including Hawaii, Guam, Commonwealth of the Northern Marianas Islands, and American Samoa. Experience in American Samoa included planning/design/construction of shore protection for the Pago Pago International Airport Runway, planning/design of shore protection of Matafao School and Masefau Village, design inspection during construction of small boat harbors at Tau and Aunuu-Auasi, and Coastal Zone Management (CZM) coordination activities. Due to the numerous projects in American Samoa and coordination with Ports Administration and Department of Public Works, familiar with local conditions, rock sources as required for coastal construction and airport operations.

- Graduate Student
  Department of Ocean Engineering, University of Hawaii
  1975 to 1977

  Assisted on a bathymetric survey off Keahole Point, Hawaii, in conjunction with OTEC program, 1977. Served as marine apprentice technician on a 3-month oceanographic cruise to obtain geological/geophysical data in the Western Pacific, 1977. Co-authored two technical papers, 1976.

AFFILIATION

Society of Naval Architects and Marine Engineers
Society of Sigma Xi

APPENDIX "1"

Comments to Environmental Assessment Determination

JOHN WAIHEE
GOVERNOR

BRIAN J. J. CHOY
Director

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
220 SOUTH KING STREET
FOURTH FLOOR
HONOLULU, HAWAII 96813
TELEPHONE (808) 586-4185

93 JUN 9 AM 8:16

STATE OF HAWAII

June 8, 1993

The Honorable Keith W. Ahue, Chairperson
Department of Land and Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809

Attention: Mr. Roy Schaefer,
Office of Conservation and Environmental Affairs

Dear Mr. Ahue:

Subject: Draft Environmental Assessment for a Sloping Rock Seawall at Haena, Kauai
KA-2646

Thank you for the opportunity to review the subject document. We have the following comments.

Please include the following information in the draft environmental assessment:

1) Description of impacts to the flora, fauna, and ocean resources.

2) Maps and drawings showing:
   a) the certified shoreline;
   b) the location of the sloping rock seawall in relation to the certified shoreline, adjacent beaches, and neighboring seawalls; and
   c) a typical cross-section of the sloping rock seawall.

3) Findings and reasons to support the determination.

If you have any questions, please call Jeyan Thirugnanam at 586-4185.

Sincerely,

Brian J. J. Choy
Director

c: Walton Hong

OFFICE OF STATE PLANNING
Office of the Governor
MAILING ADDRESS: P.O. BOX 3540, HONOLULU, HAWAII 96811-3540
STREET ADDRESS: 250 SOUTH HOTEL STREET, 4TH FLOOR
TELEPHONE: (808)587-2846, 587-2800
FAX: Director's Office 587-2848
Planning Division 587-2824

Ref. No. C-122

June 24, 1993

MEMORANDUM

TO: The Honorable Keith W. Ahue, Chairperson
Department of Land and Natural Resources

SUBJECT: Conservation District Use Application to Construct a Sloping Rock Seawall, Hanalei, Kauai (KA-5/20/93-2646)

The proposed project involves the construction of a rock seawall immediately mauka of and along the certified shoreline. The proposed wall will have a slope of 1.5V:1H. We have reviewed the subject application relative to the Hawaii Coastal Zone Management (CZM) Program and have the following comments.

The CZM Program advocates the protection of beaches for public use and recreation. Protection of beaches is enhanced by limiting the construction of shoreline stabilization structures. This is because building shoreline stabilization structures often involves a tradeoff of public beach protection for protection of private property.

It is not clear from the application if a seawall is warranted in this case. Although general information is given concerning the amount of erosion that has occurred over the years, no specific information or diagrams are included. In addition, it appears that the only structure threatened by erosion is a concrete slab that is used as a sundeck. The application does not indicate whether or not the concrete slab was constructed within the

shoreline setback area. The shoreline setback area serves as a buffer between the natural migrations (erosion and accretion) of the shoreline and any structural improvements. Therefore, any uses allowed by variance within the shoreline setback area should be understood to be expendable if threatened by erosion. Further, beachfront land owners do not have an inherent right to alter the shoreline. It appears that construction of a seawall in this case may not be appropriate.

The importance of beach protection in the Hanalei-Haena area has been highlighted in a number of government-sponsored studies. The North Shore Development Plan Update (1980) indicates that, "maintenance of the natural beauty, and ecological systems that characterize the North Shore must take priority over any new development." The Plan Update also identifies the area as a "special value recreation area." The Statewide Recreation Resources Inventory Principle Swimming Areas (1987) identifies the area as having "high statewide significance." The Kauai Shoreline Erosion Management Study (1990) indicates that, "beach preservation should be the priority in the Haena area." This report goes on to say:

> "If shore protection measures other than improved regulatory measures are deemed absolutely necessary to prevent the erosion of shorefront property and loss of backshore improvements, effort must be taken to minimize negative impacts on the complex littoral processes which result from poorly designed shore protection structures. Beach nourishment is the form of active shore protection that generally has the least negative impacts, and may be economically feasible for this study site. . . . Given the apparent stability of the shoreline in the study area, other structural measures should only be considered after demonstration of continual, progressive erosion of the shoreline over a long time (30 years) period."

Based on these reports, shoreline stabilization structures do not appear to be appropriate in this area.

Although we question the appropriateness of a seawall in this area, we offer the following specific comments on the seawall design. The slope of the proposed seawall is a concern. The steep slope may not allow for the retention of placed sand or the accumulation of additional sand. Constructing the wall with a gentler slope will allow for more of the wave energy to dissipate over the wall, thereby decreasing turbulence and reducing erosion of the sand. The City and County of Honolulu has instituted a policy of prohibiting shoreline stabilization structures with slopes steeper than 1V:3H. This type of gentle slope should be considered if a stabilization structure is deemed appropriate for this site.

Thank you for the opportunity to comment. Please feel free to contact Valerie McMillan of the CZM Program at 587-2877, if there are any questions regarding this matter.

Harold S. Masumoto
Director

JOHN WAIHEE
GOVERNOR OF HAWAII

JOHN C. LEWIN, M.D.
DIRECTOR OF HEALTH

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

In reply, please refer to:

July 29, 1993

93-168/epo

To: The Honorable Keith W. Ahue, Chairperson
Department of Land & Natural Resources

From: for John C. Lewin, M.D.
Director of Health

Subject: Request for Comments
Conservation District Use Application

Application:	Walton D.Y. Hong
File No.:	KA-5/20/93-2646
Request:	Sloping Rock Seawall
Location:	Hanalei, Kauai
TMK:	5-9-2: 35

Thank you for allowing us to review and comment on the subject request. We have the following comments to offer at this time:

Clean Water

The proposed project will be located along "Class AA, Marine" waters. Mr. Hong, the applicant, has indicated in his June 18, 1993 telephone conversation with Mr. Edward Chen of the Clean Water Branch that:

1. The design of the seawall is similar to the existing one located at TMK: 5-9-2:34.

2. The seawall will be sized between 160 to 170 feet fronting the entire property;

3. The certified shoreline is approximately 81 to 90 feet seaward from the toe of the seawall;

4. The proposed seawall will be located above the mean higher high water mark. Only during the winter will the water hit the seawall;

5. There will be no construction debris or sediment discharged into State waters.

Kauai Environmental Health Services Office

1. In accordance with State Administrative Rules, Title 11, Chapter 11-60, "Air Pollution control," the property owner/developer shall be responsible for ensuring that effective control measures are provided to minimize or prevent any visible dust emission caused by the construction work from impacting the surrounding areas including the off-site roadway used to enter/exit the project. These measures include but are not limited to the use of water wagons, sprinkler systems, dust fences, etc.

2. Material used for bedding stone and/or fill should be non-terrigenous so as not pollute the sea during periods of high wave action.

3. In accordance with State Administrative Rules, Title 11, Chapter 11-58, "Solid Waste Management Control," the property owner/developer shall be responsible for ensuring that grub material, demolition waste and construction waste generated by the project are disposed of in a manner or at a site approved by the State Department of Health. Disposal of any of these wastes by burning is prohibited.

Due to the general nature of the application submitted, we reserve the right to implement future environmental health restrictions when more detailed information is submitted.

Based on the applicant adhering to the above conditions, as stated in the Clean Water and Kauai Environmental Health Service Office Sections, we have no objections to the seawall construction.

If you should have any questions on this matter, please contact Mr. Edward Chen, Engineering Section of the Clean Water Branch, at 586-4309 or Mr. Clyde Takekuma, Chief Sanitarian, Kauai District Health Office at 241-3328.

c: Kauai District Health Office
Clean Water Branch

JOANN A. YUKIMURA
MAYOR

COUNTY ENGINEER
TELEPHONE 241-6600

EDMOND P.K. RENAUD
DEP. COUNTY ENGINEER
TELEPHONE 241-6600
FAX 241-6604

PW6.048

AN EQUAL OPPORTUNITY EMPLOYER
COUNTY OF KAUAI
DEPARTMENT OF PUBLIC WORKS
3021 UMI STREET
LIHUE, KAUAI, HAWAII 96766

June 14, 1993

State of Hawaii
Dept. of Land & Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809

ATTENTION: MR. ROY SHAEFER

Gentlemen:

SUBJECT: CONSERVATION DISTRICT USE APPLICATION
FOR A SLOPING ROCK SEAWALL, TMK: 5-9-2:35
#KA-2646

We have completed our review for the subject conservation district use application and offer the following comments:

1) We believe your improvement will need to be approved by the Army Corps of Engineers.

2) We will approve a building permit upon receiving written approval from the Army Corps of Engineer.

We would like to thank-you for allowing us to provide our comments. Should you have any questions, please feel free to contact Mr. Wallace Kudo of my staff at 241-6616.

Very truly yours,

KIYOJI MASAKI
Chief, Division of Engineering

WK/cu

cc: Building Division

August 5, 1993

MEMORANDUM

LOG NO: 8582
DOC NO: 9307NM12

TO: Roger Evans, OCEA

FROM: Don Hibbard, Administrator
State Historic Preservation Division

SUBJECT: **CDUA KA-2646 Sloping Sea Wall (Murio-Toro, Inc.)**
TMK: 5-9-2: 35
Haena, Hanalei, Kauai

We reviewed our files on this project and the single family dwelling under CDUA 2086. Under that CDUA, we had two conditions relative to historic preservation concerns (#8 and #9). Condition #9 has yet to be completed and complied with.

For your background information, an archaeological inventory survey was conducted on the property by Dr. Hallett Hammatt (Cultural Surveys Hawaii) in 1989. We found the survey report acceptable, fulfilling Condition #8 (December 18, 1989, memo to Roger Evans). Since a significant historic site was present (a subsurface habitation deposit), Condition 9 came into play, calling for the development of a mitigation plan. The consulting archaeologist recommended that an archaeologist be present during the subsurface activity associated with the sea wall construction, particularly to cover the concern that human remains might be found. We agreed with this mitigation plan.

Chapter 6E, HRS, has been changed since 1989, to better deal with the handling of Hawaiian burials. Burials were found and some enforcement problems have occured place on the adjacent properties (Zimmerman and Anawalt). We believe that this project area also likely has subsurface Hawaiian burials, so mitigation plans need some revision.

We disagree with the application (page 3), Section III, 6, which states that the previous archaeological work was sufficient. This is incorrect, since the mitigation work has yet to occur.

Several members of the community have expressed their concerns over this project to our office.

Given the above history, we recommend the following conditions become the mitigation plan for this permit if it is approved, in order to ensure "no adverse effect" to significant historic sites and burials:

1. Further archaeological subsurface testing shall be conducted in the location of the sea wall, to determine if burials are still present -- either intact or fragmentary. The subsurface testing shall either be conducted by backhoe or hand excavation. Findings shall be submitted to the State Historic Preservation Division in a report format for adequacy review.

2. If burials are found during this testing, under Chapter 6E, the Kaua'i Island Burial will need to vote on the applicant's proposal to preserve or disinter these remains. After the vote, a burial mitigation plan shall be submitted to our Division for approval. Prior to the start of construction, our Division must verify in writing that the burial mitigation plan has been successfully carried out.

3. The applicant shall hire a professional archaeologist to monitor the sea wall construction, in case further burial remains are uncovered. Our Division shall be contacted immediately upon the discovery of human remains in order to determine appropriate mitigation.

If you have any questions, please call Nancy McMahon 587-0006.

NM:amk

c: Jeff Lacy, County of Kauai
Kauai Island Burial Council
OEQC
Walton Hong
Murcia-Toro, Inc.

JOHN WAIHEE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF LAND MANAGEMENT
3060 Eiwa Street, Rm. #306
Lihue, HI 96766-1875

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

June 18, 1993

KA-5/20/93-2646

MEMORANDUM

To: Edward E. Henry

From: Sam Lee

Subject: Request for Comments, File No. KA-5/20/93-2646, Tax Map Key 5-9-2: 35, Hanalei, Kauai

The applicant Walton D. Y. Hong, for property owner Murcia-Toro, Inc., proposes to construct a rock seawall revetment immediately mauka of and along the certified shoreline for the above referenced property. A CDUP and County SMA permit had been previously approved for a similar project on the property, but the permits have since lapsed.

We offer the following comments:

1. Since the shoreline certification is good for one-year, and in anticipation of the length of time it will take to secure the necessary approvals and permits from the State and County, it is recommended that the applicant resubmit a shoreline re-certification request at least 3 months prior to the expiration of the existing certification.

2. Beach sand located makai of the certified shoreline shall not be utilized or removed for the construction of the seawall.

3. The certified shoreline shall be staked, and such stakes properly maintained by the owner or contractor during all phases of construction, to insure that any and all improvements related to the seawall do not encroach on State land.

Such metal stakes shall be a minimum of 5 ft. tall, painted orange and flagged. Applicant shall notify the State Land Office of the commencement date of construction so that the stake line be inspected.

Provided the applicant satisfy the requirements and conditions of the Special Management Area Use Permit as may again be approved by the County of Kauai Planning Commission, we would have no objections to the proposal.

Thank you for this opportunity to comment.

cc: Mason Young
Herbert Apaka, Jr.
ML:vr

JOHN WAIHEE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF LAND MANAGEMENT
3060 Eiwa Street, Rm. #306
Lihue, HI 96766-1875

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

July 23, 1993

KA-5/20/93-2646
KA-93:1318

MEMORANDUM

To: Edward E. Henry

From: Sam Lee

Subject: Request for Comments, File No. KA-5/20/93-2646; Tax Map Key 5-9-2: 35, Hanalei, Kauai

The applicant Walton D. Y. Hong, for property owner Murcia-Toro, Inc., proposes to construct a rock seawall revetment immediately mauka of and along the certified shoreline for the above referenced property. A CDUP and County SMA permit had been previously approved for a similar project on the property, but the permits have since lapsed.

We offer the following revised comments:

1. Beach sand located makai of the certified shoreline shall not be utilized or removed for the construction of the seawall.

2. The certified shoreline shall be staked, and such stakes properly maintained by the owner or contractor during all phases of construction, to insure that any and all improvements related to the seawall do not encroach on State land.

   Such metal stakes shall be a minimum of 5 ft. tall, painted orange and flagged. Applicant shall notify the State Land Office of the commencement date of construction so that the stake line be inspected.

Provided the applicant satisfies the requirements and conditions of the Special Management Area Use Permit, as may again be approved by the County of Kauai Planning Commission, we would have no objections to the proposal.

Thank you for this opportunity to comment.

cc: Mason Young
Herbert Apaka, Jr.
ML:vr

JAGER ENTERPRISES
1951 HUKU PL.
KOLOA, HI. 96756
PHONE/FAX
(808) 742-6600

TO. ROY SCHAEFER-DLR-FAX-587-0390
JEFF LACEY-KAUAI PLANNING DIRECTOR-FAX-245-5753
WALTON HONG-CONSULTANT-FAX-245-5175

RE: CDUA & SMA APPLICATION FOR SEAWALL-TMK 5-9-02 35

TOTAL NUMBER OF PAGES 3 INCLUDING TRANSMITTAL

WE ARE TRANSMITTING FROM: (808)-742-6600

IF YOU DO NOT RECEIVE ALL PAGES, PLEASE CALL BACK AS SOON AS POSSIBLE AT (808)-742-6600

MESSAGE: ON ATTACHED

CDUA # KA-2646

1000 Friends of Kaua'i
PO Box 99
Hanalei, Hawai'i
96714

July 15, 1993

Mr. Walton D. Y. Hong, Consultant
3135-A Akahi St.
Lihue, Hawaii 96766

Subject: CDUA and SMA Application to Construct a Seawall in Ha'ena, Kaua'i. TMK 5-9-02:35.

Dear Mr. Hong:

The Board of 1000 Friends of Kauai is very concerned about the proposed revetment/seawall that your client wishes to construct

...in Ha'ena, Kaua'i. As you know, Ha'ena is a very special area that deserves the highest level of protection. Ha'ena's scenic beauty and marine resources are unmatched anywhere in the world. Additionally, it's importance in ancient Hawai'i is well documented in legends, songs, and hula.

We are worried that the proposed seawall could unintentionally create an adverse impact on all of the important characteristics of this unique area. While we realize that the existing seawall adjacent to your client's property may be accelerating the natural erosional process that are normally, and continually, occurring in that area, we don't feel that creating another seawall will solve the overall problem. Although the proposed seawall may reduce future erosion of your client's property, it could lead to an increase in the erosion on adjacent properties that do not have seawalls. Approval of seawalls for this reason is a dangerous precedent that could lead to a chain reaction of seawall applications, which if approved, would change forever the picturesque nature of Ha'ena beach.

Additionally, as you well know, your clients property is located in an area renown for archaeological remains, and especially ancient burials. Included in your applications is an archaeological report that clearly indicates that the subject property was indeed used in ancient times. Although, the proposed seawall will be constructed on the makai section of your clients property, close to the vegetation line currently used by surveyors to demark the "shoreline", you should be aware that in the past the shoreline in that area extended significantly out to the north. Evidence of this can still be seen in the remains of the large ironwood trees which once lived on top of the sand dunes well inland of the highwater line. Today, nearly all of these trees have been undermined and either out up or washed away in high surf. Considering this, and the fact that skeletal remains have been exposed in the area of your clients property by high surf in recent years, it appears highly probable to us that the excavation needed to construct the seawall could disturb ancient burials at that site.

POI POI
Preserve Our Islands

We strongly urge your client to reconsider their application. The ancient Hawaiians chose to make only temporary dwellings close to the sea in this famous area. They respected the power of the sea and chose not to challenge or tempt it. While today's technology and machinery will allow your client to build a seawall with boulders weighing 1-4 tons, your application does not fully address the ultimate consequences of this action! How will it effect the natural erosional processes of the areas adjacent to the proposed seawall? Will it create a chain reaction of seawall construction? What is the impact to the exquisite marine environment in Ha'ena from the change in the natural erosional process? Will it result in lost revenue to the island and the State from future movie producers who are looking for a "natural" shoreline scene?

We feel that it is entirely possible that the proposed seawall, and the construction of future seawalls, could cause sand to migrate into new areas covering living coral reefs and changing the habitat for the many reef dwelling organisms. This in turn could change fish feeding and schooling patterns and thus the fishing practices of our local community which are not as wealthy as your client and often depend upon the marine resources to feed their families. If this were to happen it would be a shame. We hope that your client will have concern for the preservation of the existing natural shoreline in Ha'ena, the historic bones and artifacts buried in the dunes, and the lifestyle of our local residents.

We feel that the most appropriate action would be for your client to urge the owners of the existing seawall to dismantle

client to urge the owners of the existing seawall [illegible] it and [illegible] nature to shape and move the sand of Ha'ena as it wishes. Interestingly, seawalls built on the north shore of Oahu to stop erosion from high winter surf have been ordered torn down for lack of permits and to avoid setting a precedent. We agree with that opinion.

Rather than trying to dominate nature we should try to harmonize with it. As we all learned during the few hours of Iniki's wrath, nature's power is overwhelming. Even the strongest building or seawall can be destroyed by mother nature. We should be content with what we have and not strive to stop the natural erosion that has been occurring for millions of years.

Sincerely,

Mr. Fred Jager, President

bc: State of Hawaii Department of Land and Natural Resources
Kaua'i County Planning Department

Carol Wilcox
P.O.Box 10558
Honolulu, HI 96816

July 26, 1993

Department of Land and Natural Resources
P.O. Box 621
Honolulu, HI 96819

Attn: Roy Schaefer

RE: Proposed Haena Seawall, CDUA 2646
Applicant: Murcia-Toro, Inc (Charo)

Dear Mr. Schaefer,

Based on the requirements of HRS Chapter 343, it appears that the Environmental Assessment for the above proposed seawall may be a deficient disclosure document in the following areas:

Certain pertinent references should be cited and their concerns addressed. In particular, relevant sections should be cited from the:

- Coastal Zone Management Act (HRS 205A), especially those which relate to shoreline setback requirements. Language in 205A that deals with visual and access issues should also be cited, as it is applicable in this case.

(When citing the CZM, the applicant should reference 205A 1.9.B.9 as amended in 1993 by the Legislature, which has new language that requires that new structures be located inland from the shoreline setback, and prohibiting construction of private erosion protection structures seaward of the shore line.)

- County of Kauai Shoreline Setback Rules and Regulations.

Other relevant studies and efforts should also be cited and their salient points addressed. Some such work produced in the last few years that are directly relevant to shoreline hardening are:

Shoreline Erosion Management in Hawaii: A call for a New Paradigm. Michael Parke. 1992.

Recommendations for Improving the Hawaii Coastal Zone Management Program, OSP, 1992,

Hawaii Beach Erosion study by Fletcher, et.al. U.H. 1992.

Beach and Ocean Recreation Study, Ha'ena, Kauai, Division of State Parks, DLNR 1992.

Jerry Rothstein, Public Access Shoreline Hawaii (PASH).

Orrin H. Piilkey Jr's The Beaches Are Moving: The Drowning of America's Shoreline.

The Environmental Assessment fails to address or disclose the following:

Location description: The EA fails to adequately describe the area or acknowledge its great natural beauty and coastal reprove value. It fails to note the proximity of vast areas of conservation land and state and county parks, and the recreational values of these areas. A plot plan with all structure's identified is needed, along with a map which places this property in context with the surrounding area.

Demonstrate need: Has a need for a seawall been demonstrated? For instance, is there actually erosion, or is there a naturally migrating vegetation line? Have different methods of surveying shoreline been used to suggest erosion on paper when none actually exists in reality? What structures are currently on the property, are they permitted structures, where are they in relations to the property lines, and are they being threatened? What evidence is there that the adjoining seawall will negativity affect this properly?

Visual impact: The adjoining seawall has a negative visual impact, particularly in that it is the only such intrusion on what was previously a natural beachfront. This issue should be addressed, and pictures should be provided.

Public Safety and Recreation: the issue of lateral access has not been addressed.

Archeology: Surely the applicant is aware of the extensive burials found in the adjoining property during construction of that seawall, and generally in the sand dunes of Haena. This is a strong indication of the need for an archaeology study at the specific site proposed for the seawall. This study should be included in full in the EA.

Alternatives: The law specifically calls for alternatives to be fully developed. In this case, three alternatives that should be explored are a) removal of adjacent seawall, b) revetment behind shoreline setback, c) no action.

Technical Descriptions: When proposing shoreline hardening, the applicant is obligated to provide complete technical descriptions of all alternatives. Justification must be more than a statement that erosion is taking place; such events must be documented. The applicant must demonstrate that the proposed construction is the best alternative of several investigated, and that the proposed construction will not cause any adverse effect or significant changes to the shoreline. The impact of removal of sand dunes to beach erosion should be examined.

Cumulative Impact: The applicant relies heavily on the construction of one recently built beach wall as justification for hardening this property. It can be anticipated that if this seawall is granted based on this justification that all adjacent landowners will make the same argument for hardening all the beach front properties. The implications of this for management of conservation zoned land, both mauka and makai of the shoreline, should be examined. The potential cumulative impact of hardening Haena Beach should be explored in the light of its present natural state.

In conclusion, until additional information is presented, it appears that the Department cannot make a determination as to the potential impact of the proposal.

I wish to be considered a consulted party in this application. I would appreciate a copy of the amended EA and any related correspondence sent to me at the above address.

Yours truly,

Carol Wilcox

cc OEQC
Murcia-Toro

June 28, 1993

Roy Schaefer
Department of Land and Natural Resources
1151 Punchbowl Street
Honolulu, HI 96813

Dear Sir:

I am writing to express my extreme concern and objection to a possible determination of no significant impact for a proposed seawall in the Haena District of Kauai, by Murcia-Toro, Inc., TMK 5-9-02:35. This is the latest of several attempts by these well-heeled owners of this conservation-zoned property to build a seawall on one of the most pristine beaches in the entire Hawaiian chain. So far, these people have been unsuccessful in their attempts to fortify the shoreline, but they keep trying, despite the lack of any demonstrated need for a seawall and the potentially devastating long-term consequences for the natural and cultural resources of the area, and public beach users.

The applicant claims as the only justification for his proposed wall that he has lost over 12,000 square feet of property to erosion. He bases this loss claim on a comparison of a December 1, 1992, shoreline survey with tax map boundaries that were originally drawn prior to 1960. Both the State surveyor and the County tax assessors have told me that these outdated tax map lines were generally drawn to the mean tidal water mark of the seat The Hawaii Supreme Court has since ruled that the property boundary should be delineated by the upper reaches of the wash of the waves, or the debris line. Any supposed property loss by Murcia-Toro is probably due to such a paper loss, that is, a change in the definition of the property line, not a substantial physical change. In fact, if you will compare the certified shorelines from 1987 to 1992 that have been submitted by the applicant, you will see that accretion has taken place on the northwest corner of the property. Unless the applicant supplies various certified shoreline surveys to document the claims of lost property, why should such a loss be considered as either real or threatening to his house. Likewise, if no imminent danger to his house can be demonstrated, conservation district rules and regulations are relatively unambiguous that a seawall should not be allowed in conservation-zoned land.

Additionally, even if such erosion were real and demonstrable, it would supply a stronger argument against the proposed seawall and for the need for an EIS for the proposed project. Since the original application for this wall in 1987, according to surveys on record at OCEA, Charo's property has accreted seaward, not landward, approximately 5 to 8 feet. Given this evidence, and the evidence from a Hawaii Coastal Zone Management Program report, "Kauai Shoreline Erosion Management Study," that identifies this property as part of a dynamic shoreline, subject to periodic episodes of accretion and erosion, a seawall, even if

constructed of huge boulders instead of solid concrete, would probably disrupt beach processes in the area, and lead to beach erosion, as opposed to shoreline erosion. This 1990 report also states that beach width in the area has shown a long-term tendency to narrow over the last 30 years, while the shoreline has shown evidence of long-term accretion. The conclusion to be drawn from this study is that the beaches in Haena are threatened by erosion while private property shorelines are actually extending seaward. The study recommends that non-structural measures are the most appropriate management responses to shoreline erosion in the area, because beach preservation should be the priority for this unique area of unsurpassed natural beauty. The study explicitely states that because beachfront parcels in the area are all quite large, restrictions could and should be imposed on development in the area. These restrictions include locating residential development further away from the shoreline than currently required by County setback laws. The report concludes that if any form of erosion intervention is absolutely necessary, beach nourishment should be used. Structural responses such as seawalls and revetments are particularly inappropriate in areas that have dynamic shorelines such as Haena, because such structures interfere with the littoral processes that maintain beach and shoreline equilibrium, and ultimately lead to degradation of the beach resources. I would not want Haena to become another Lanikai or Kahala. Given this evidence of natural accretion, given the state law that prohibits shoreline protection structures on accreted land, and given the problems associated with the finding of Hawaiian burial remains on the adjacent property, I believe that you should require a full scale EIS for this project.[7]

In case you are not familiar with the cultural features of the area, and the adjacent property upon which was built the only seawall on the entire North Shore of Kauai, I will supply you with a short background for your reference. You may be aware of the desecration of ancient Hawaiian burial sites by the builders of a "residential" dwelling on the adjacent property owned by Stuart Zimmermann. This violation ultimately resulted in a nominal fine against the property owner by the Board of Land and Natural Resources, even though your Office of Conservation and Environmental Affairs, in particularly, Don Horiuchi, demonstrated little concern or effort to deal with these violations, even after being made aware of them. The archeologists who were assigned to sift through the disturbed sites have told me that many of the disturbed remains were found in the sand that was excavated to allow the placement of the Zimmermann revetment. These same archeologists expect similar remains would be found along the entire Haena shoreline. In fact, it is the richness of cultural remains in the sand dunes that has held up the development of Haena State Park for more than two decades. There is no reson to believe that the Murcia-Toro property would be substantially different than the Zimmermann property, despite the report by a privately-paid consultant to the contrary.

You are probably not aware that this violation was merely one of a series of continuing violations that accompanied the development of the Zimmermann property from the beginning. None of the other violations were ever investigated or prosecuted. These include major deviations from the conditionally-approved design for a seawall that was constructed.

The revetment is illegal because it violates the conditions upon which the CDUA permit is based. It has a steeper aspect than 1.5 feet horizontal to 1 foot vertical that is required. Boulders were used in the seawall that are in excess of 5 feet in diameter, when the marine-engineering design that was submitted for approval by the BLNR called for boulders with diameters of 2 to 2.5 feet. Third, the wall may be located seaward of the certified shoreline, and may have been built on accreted lands. All of these violations have been buried under the sand that was trucked in to cover the revetment, so it is impossible to document them at this time.

There is not much more to be done about the Zimmermann case, which was a major mistake by your office. I am more concerned with trying to ensure that the same violations and mistakes are not made in the Murcia Toro case. I am sure that you are aware of the dearth of enforcement resources in your department. If the Murcia-Toro revetment is approved, I foresee the same problems that surfaced after the Zimmermann wall was already in place. The Murcia-Toro seawall that is proposed is to be erected primarily as a retaining wall, to prevent the natural variation of the shoreline that has been demonstrated for this area through the aforementioned study. I contend that another massive seawall in the dynamic and pristine Haena coastal area should never be allowed in the conservation district if subjected to the proper critical rigor during this environmental assessment process. The North Shore Development Plan Update for Kauai specifies that "maintenance of the natural beauty, and ecological systems that characterize the North Shore must take priority over any new development." The beaches in Haena have a "high statewide significance," according to a DLNR inventory.

Given the social and environmental characteristics of the area, another seawall would merely exacerbate the mistake made in the Zimmermann case, is completely out of place, and should never be permitted. If the dominant geophysical and oceanographic characteristics of the coastal zone in Haena are also considered, this seawall (and any others proposed in Haena), presents a particularly grave threat to both the beach resources, historic/cultural resources, and community lifestyle. Even the engineering evaluation that accompanied the original conservation district use application for this seawall states that vertical structures are inappropriate on beach areas, because they lead to increased beach erosion, as well as erosion of adjacent unprotected properties. There is already some evidence that the Zimmermann seawall is causing beach degradation, and disrupting the beach-forming processes in the area. This beach degradation should have been a consequence anticipated by the planners at OCEA responsible for evaluating the Zimmermann and other seawall proposals. Please do not continue this shortsightedness and continuing disregard for the public beach resources. Instead of facilitating development which is strictly in the interests of the wealthy landowners, consider and give more weight to the potential negative impacts on the beaches and surrounding reef and ocean environment. Please recommend that the environmental assessment is inadequate for this particular proposal, and require a full blown EIS. This would allow a full investigation of both the physical, biological, and cultural impacts of this proposed seawall.

This is not an isolated case. Another seawall has been proposed on the Ellis property adjacent to the existing seawall. If this one is approved, I foresee a whole series of walls that are designed primarily as privacy control retaining walls under the guise of erosion control structures, being built along the entire Haena coastline. Such a series of walls would undoubtedly lead to a loss of both the beach and reef resources in Haena, which would be an inestimable and irreversible loss to all the people of Hawaii.

Your prompt attention and response to this letter would be greatly appreciated, in order to allow me to pursue whatever action is necessary to stop this proposed seawall before it has a chance to be built.

Sincerly,

Michael Parke
1777 East West Rd.
Box 1210
Honolulu, HI 96848

cc. OEQC
Keith Ahue
Sharon Himeno
Christopher Yuen