

1990-11-23-HA-FA

FILE COPY

ENVIRONMENTAL ASSESSMENT

for

AWAKE'E/MANINIOWALI LAND EXCHANGE*

A Land Exchange Involving State Lands

Submitted to:

Department of Land and Natural Resources
State of Hawaii

Applicant:

North Kona Development Group

Agent for Applicant:

Takeyama and Sullivan
Attorneys at Law

October 12, 1990



Group 70 Limited • Architects • Planners • Interior Designers • 924 Bethel Street • Honolulu, HI 96813 • Phone (808) 523-5868 • FAX (808) 523-5874

ENVIRONMENTAL ASSESSMENT
for
AWAKE'E/MANINIOWALI LAND EXCHANGE
A Land Exchange Involving State Lands

Lands Situated at:

AWAKE'E and MANINIOWALI, NORTH KONA, HAWAII
TMK: 7-2-04: por. 17 and 3

Submitted to:
Department of Land and Natural Resources
State of Hawaii

Applicant:
North Kona Development Group

Agent for Applicant
Takeyama and Sullivan
Attorneys at Law
1188 Bishop Street, Suite 1411
Honolulu, HI 96813

Prepared by:
Group 70 Limited
Architects • Planners • Interior Designers
924 Bethel Street
Honolulu, Hawaii 96813

October 12, 1990

February 1983

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

DEPARTMENT MASTER APPLICATION FORM

FOR DLNR USE ONLY

Reviewed by _____
Date _____
Accepted by _____
Date _____
Docket/File No. _____
180-Day Exp. _____
EIS Required _____
PH Required _____
Board Approved _____
Disapproved _____
Well No. _____

(Print or Type)

I. LANDOWNER/WATER SOURCE OWNER
(If State land, to be filled
in by Government Agency in
control of property)

Name North Kona Development Co.
Address 1600 Ala Moana Blvd. #2306
Honolulu, HI 96815

Telephone No. 947-4402

SIGNATURE [Signature]

Date 12 October 1990

II. APPLICANT (Water Use, omit if applicant
is landowner)

Name Takeyama & Sullivan
Address Jan Sullivan, Esq.
1188 Bishop Street, Suite 141
Honolulu, HI 96813

Telephone No. 526-2416

Interest in Property Agent for Applicant

[Signature]
(Indicate interest in property; submit
written evidence of this interest)

*SIGNATURE _____

Date 12 October 1990

*If for a Corporation, Partnership,
Agency or Organization, must be signed
by an authorized officer.

III. TYPE OF PERMIT(S) APPLYING FOR

- (x) A. State Lands
- () B. Conservation District Use
- () C. Withdraw Water From A Ground
Water Control Area
- () D. Supply Water From A Ground
Water Control Area
- () E. Well Drilling/Modification

IV. WELL OR LAND PARCEL LOCATION REQUESTED

District North Kona
Island Hawaii
County Hawaii

Tax Map Key 7-2-04: por. 17 and 3

Area of Parcel Private land: 334.33 acre;
State land: 485 (approx.
(Indicate in acres or
sq. ft.)

Term (if lease) ---

V. Environmental Requirements

Pursuant to Chapter 343, Hawaii Revised Statutes, and in accordance with Title 11; Chapter 200, Environmental Impact Statement Rules for applicant actions, an Environmental assessment of the proposed use must be attached. The Environmental assessment shall include, but not be limited to the following:

- (1) Identification of applicant or proposing agency;
- (2) Identification of approving agency, if applicable;
- (3) Identification of agencies consulted in making assessment;
- (4) General description of the action's technical, economic, social, and environmental characteristics;
- (5) Summary description of the affected environment, including suitable and adequate location and site maps;
- (6) Identification and summary of major impacts and alternatives considered, if any;
- (7) Proposed mitigation measures, if any;
- (8) Determination;
- (9) Findings and reasons supporting determination; and
- (10) Agencies to be consulted in the preparation of the EIS, if applicable.

VI. Summary of Proposed Use (what is proposed)

Note: For Items V and VI, please refer to Environmental Assessment.

INFORMATION REQUIRED FOR ALL USES

I. Description of Parcel

- A. Existing structures/Use. (Attach description or map).
- B. Existing utilities. (If available, indicate size and location on map. Include electricity, water, telephone, drainage, and sewerage).
- C. Existing access. (Provide map showing roadways, trails, if any. Give street name. Indicate width, type of paving and ownership).
- D. Vegetation. (Describe or provide map showing location and types of vegetation. Indicate if rare native plants are present).
- E. Topography; if ocean area, give depths. (Submit contour maps for ocean areas and areas where slopes are 40% or more. Contour maps will also be required for uses involving tall structures, gravity flow and other special cases).
- F. If shoreline area, describe shoreline. (Indicate if shoreline is sandy, muddy, rocky, etc. Indicate cliffs, reefs, or other features such as access to shoreline).
- G. Existing covenants, easements, restrictions. (If State lands, indicate present encumbrances.)
- H. Historic sites affected. (If applicable, attach map and descriptions).

II. Description: Describe the activity proposed, its purpose and all operations to be conducted. (Use additional sheets as necessary).

III. Commencement Date: Filing for Land Exchange: 12 October 1990

Completion Date: BLNR Action on Land Exchange: 7 December 1990

IV. TYPE OF USE REQUESTED (Mark where appropriate) (Please refer to Title 13, Chapter 2)

- 1. Permitted Use (exception occasional use);
DLNR Title 13, Chapter 2, Section _____; Subzone _____.
- 2. Accessory Use (accessory to a permitted use);
DLNR Title 13, Chapter 2, Section _____; Subzone _____.
- 3. Occasional Use: Subzone _____.
- 4. Temporary Variance: Subzone _____.
- 5. Conditional Use: Subzone _____.

OTHER: Exchange of private land for State Land - Resource and General Subzones

Area of Proposed Use Awake'e 334.33 acres
Maniniowali 485 acres (approximately)
(Indicate in acres or sq. ft.)

Name & Distance of Nearest Town or Landmark
Keahole Airport is four miles to south

Boundary Interpretation (If the area is within 40 feet of the boundary of the Conservation District, include map showing interpretation of the boundary by the State Land Use Commission).

Conservation District Subzone both sites included in Conservation District
County General Plan Designation _____

V. FILING FEE NONE APPLICABLE.

1. Enclose \$50.00. All fees shall be in the form of cash, certified or cashier's check, and payable to the State of Hawaii.
2. If use is commercial, as defined, submit additional public hearing fee of \$50.00.

INFORMATION REQUIRED FOR CONDITIONAL USE ONLY

I. Plans: (All plans should include north arrow and graphic scale).

- A. Area Plan: Area plan should include but not be limited to relationship of proposed uses to existing and future uses in abutting parcels; identification of major existing facilities; names and addresses of adjacent property owners.
- B. Site Plan: Site plan (maps) should include, but not be limited to, dimensions and shape of lot; metes and bounds, including easements and their use; existing features, including vegetation, water area, roads, and utilities.
- C. Construction Plan: Construction plans should include, but not be limited to, existing and proposed changes in contours; all buildings and structures with indicated use and critical dimensions (including floor plans); open space and recreation areas; landscaping, including buffers; roadways, including widths; offstreet parking area; existing and proposed drainage; proposed utilities and other improvements; revegetation plans; drainage plans including erosion sedimentation controls; and grading, trenching, filling, dredging or soil disposal.
- D. Maintenance Plans: For all uses involving power transmission, fuel lines, drainage systems, unmanned communication facilities and roadways not maintained by a public agency, plans for maintenance shall be included.
- E. Management Plans: For any appropriate use of animal, plant, or mineral resources, management plans are required.
- F. Historic or Archaeological Site Plan: Where there exists historic or archaeological sites on the State or Federal Register, a plan must be submitted including a survey of the site(s); significant features; protection, salvage, or restoration plans.

II. Subzone Objective: Demonstrate that the intended use is consistent with the objective of the subject Conservation District Subzone (as stated in Title 13, Chapter 2).

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D: Archaeological Reconnaissance Survey - Maniniowali B.P. Bishop Museum, October 1990	
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SECTION I

ESSENTIAL INFORMATION

A. Project Team

APPLICANT/OWNER: North Kona Development Group
1600 Ala Moana Blvd., Suite 2306
Honolulu, HI 96815
Contact: Michael J. Hands
Telephone: 947-4402

AGENT: Takeyama & Sullivan
Attorneys at Law
1188 Bishop Street, Suite 1411
Honolulu, HI 96813
Contact: Jan N. Sullivan
Telephone: 526-2416

PLANNING CONSULTANTS: Group 70 Limited
924 Bethel Street
Honolulu, HI 96813
Contact: Jeff Overton or Yukie Ohashi
Telephone: 523-5866

B. General Data

REQUEST: Land Exchange Between Private Lands at Awake'e and State
Lands at Maniniowali

LOCATION: Awake'e: North Kona District, Hawaii
Maniniowali: North Kona District, Hawaii

TAX MAP KEY: Awake'e: 7-2-04: por. 17
Maniniowali: 7-2-04: 3

LAND AREA: Awake'e: 334.33 Acres
Maniniowali: 485 Acres (approx.)

STATE LAND USE DISTRICT: Awake'e: Conservation, Resource & General Subzones
Maniniowali: Conservation, Resource & General Subzones

COUNTY GENERAL PLAN: Awake'e: Intermediate Resort Area/
Medium Density Urban Area
Maniniowali: Conservation

COUNTY ZONING: Awake'e: Open
Maniniowali: Open

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**I. IDENTIFICATION OF APPLICANT AND APPROVING AUTHORITY,
AND AGENCIES CONSULTED IN MAKING ASSESSMENT**

A. Applicant

The applicant for the proposed land exchange is North Kona Development Group, a Hawaii limited partnership, who is the landowner of the 334.33-acre parcel makai of Queen Ka'ahumanu Highway in the Awake'e *ahupua'a*.

B. Identification of Approving Agency

The approving agency for a determination of significance on this Environmental Assessment is the State of Hawaii Department of Land and Natural Resources.

C. Reason for This Environmental Assessment

The proposed request of a land exchange involves the use of State lands; it is therefore, subject to the requirements of Chapter 343, Hawaii Revised Statutes (HRS). This Environmental Assessment is intended to comply with Chapter 343, HRS of Title 200, Department of Health.

D. Identification of Agencies Consulted in Making Assessment

The following list includes agencies who have been contacted as part of the analysis of existing environmental conditions on the exchange parcels; the history of the land exchange; and individual, community and governmental positions regarding the exchange.

State of Hawaii

Department of Land and Natural Resources
Division of Land Management
Division of State Parks / Historic Sites Section
Division of Forestry and Wildlife - Na Ala Hele Program
Office of State Planning
Office of Hawaiian Affairs

County of Hawaii

Department of Planning

Organizations and Individuals

Kona Hawaiian Civic Club
Chris Yuen
Hannah K. Springer
Bobby Camara

SECTION II

II. DESCRIPTION OF THE PROPOSED ACTION AND STATEMENT OF OBJECTIVES

A. Description of Proposed Action

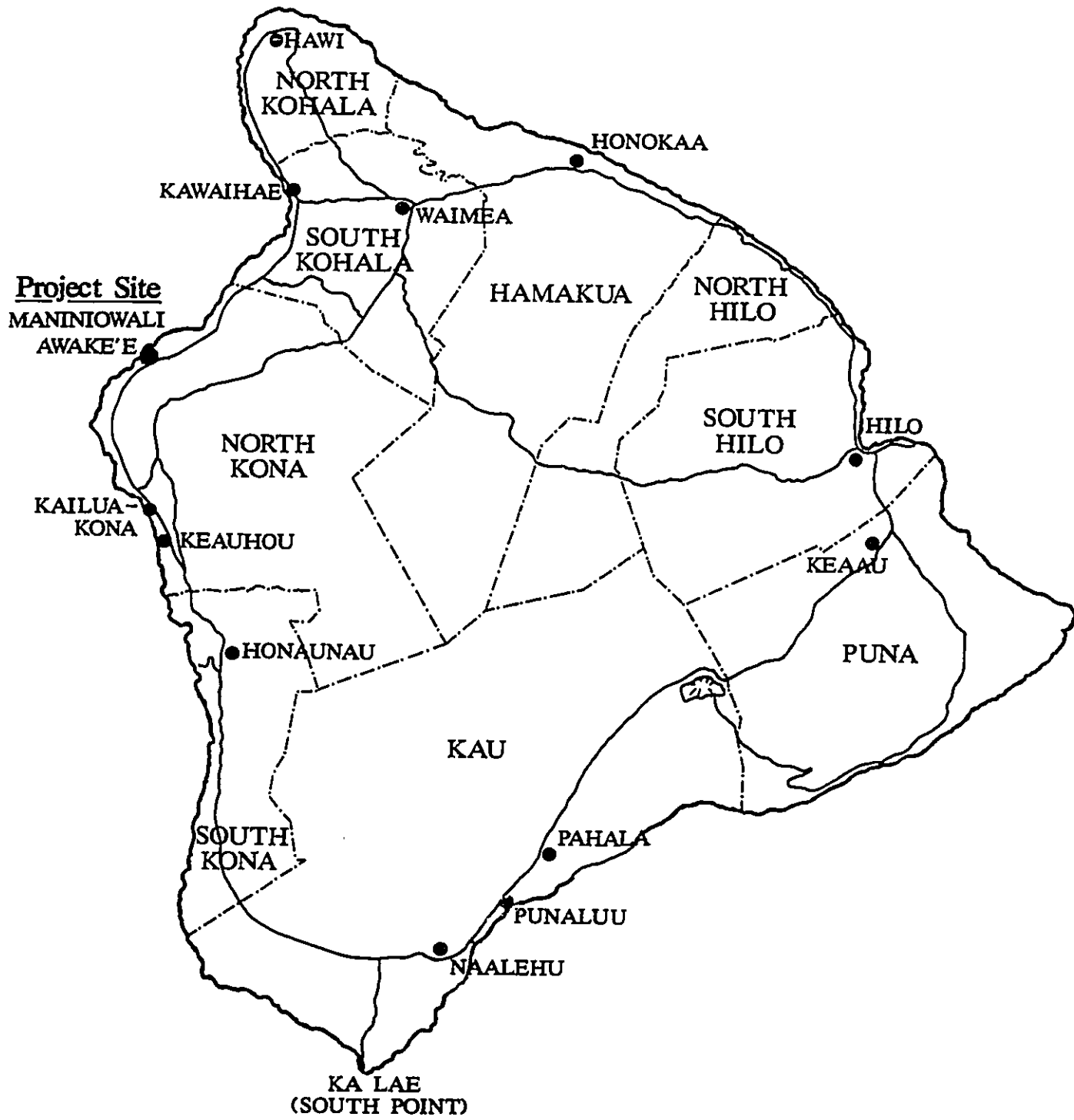
North Kona Development Group (NKDG or Applicant) requests that the State of Hawaii Board of Land and Natural Resources approve the exchange of lands in North Kona District, County of Hawaii, between the Applicant and the State of Hawaii. The exchange involves the following lands:

- **Awake'e** - 334.33 acres makai of the Queen Kaahumanu Highway in the Awake'e *ahupua'a*, owned by North Kona Development Group.
- **Maniniowali** - approximately 485 acres of land makai of the Queen Kaahumanu Highway in Maniniowali *ahupua'a*, owned by the State of Hawaii.

Figure 1 identifies the location of the two exchange parcels on the island of Hawaii. Figure 2 presents the regional location of these parcels in West Hawaii. Both parcels are located within the North Kona Judicial District, one of nine judicial districts in Hawaii County. The North Kona District lies on the western coast of the island of Hawaii, within a larger region known as West Hawaii. The district's northern boundary is located at Anaeho'omalua Bay, and the district extends south to Kealahou Bay. The inland boundaries are defined by the land masses of Mauna Loa and Hualalai. The North Kona Judicial District includes Census Tracts 215 (Kailua-Kona) and 216 (the remainder). Kailua-Kona, the second largest town on the island of Hawaii, is the primary commercial center of the region. Secondary urban centers are found in the communities of Holualoa, Honalo, Kainaliu, Keauhou and Kalaloa.

The boundaries of the proposed exchange parcels are shown in Figure 3. The Awake'e parcel, owned by NKDC, is bounded by the State's Maniniowali parcel to the north, State lands leased to Huehue Ranch to the east and south, and the sea to the west. Also located to the south is a portion of the Makalawena *ahupua'a* owned by Bishop Estate.

The Maniniowali parcel, owned by the State of Hawaii is bounded by a portion of the Kukio *ahupua'a* to the north, the Queen Ka'ahumanu Highway to the east, a portion of the Awake'e *ahupua'a* to the west, and the sea to the west. The State's Maniniowali parcel includes a portion of land which is a part of the Kukio *ahupua'a* known as Kukio 2. For the purposes of this document, these lands will be referred to as Awake'e and Maniniowali. Upon completion of the exchange, portions of Maniniowali would be owned by North Kona Development Group, and all of Awake'e would be owned by the State of Hawaii. Figure 4 identifies the land ownership of the subject parcels and the adjoining parcels.



Hawaii Location Map
 MANINIOWALI/AWAKE'E LAND EXCHANGE

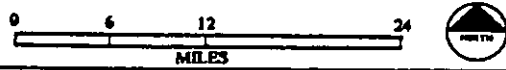
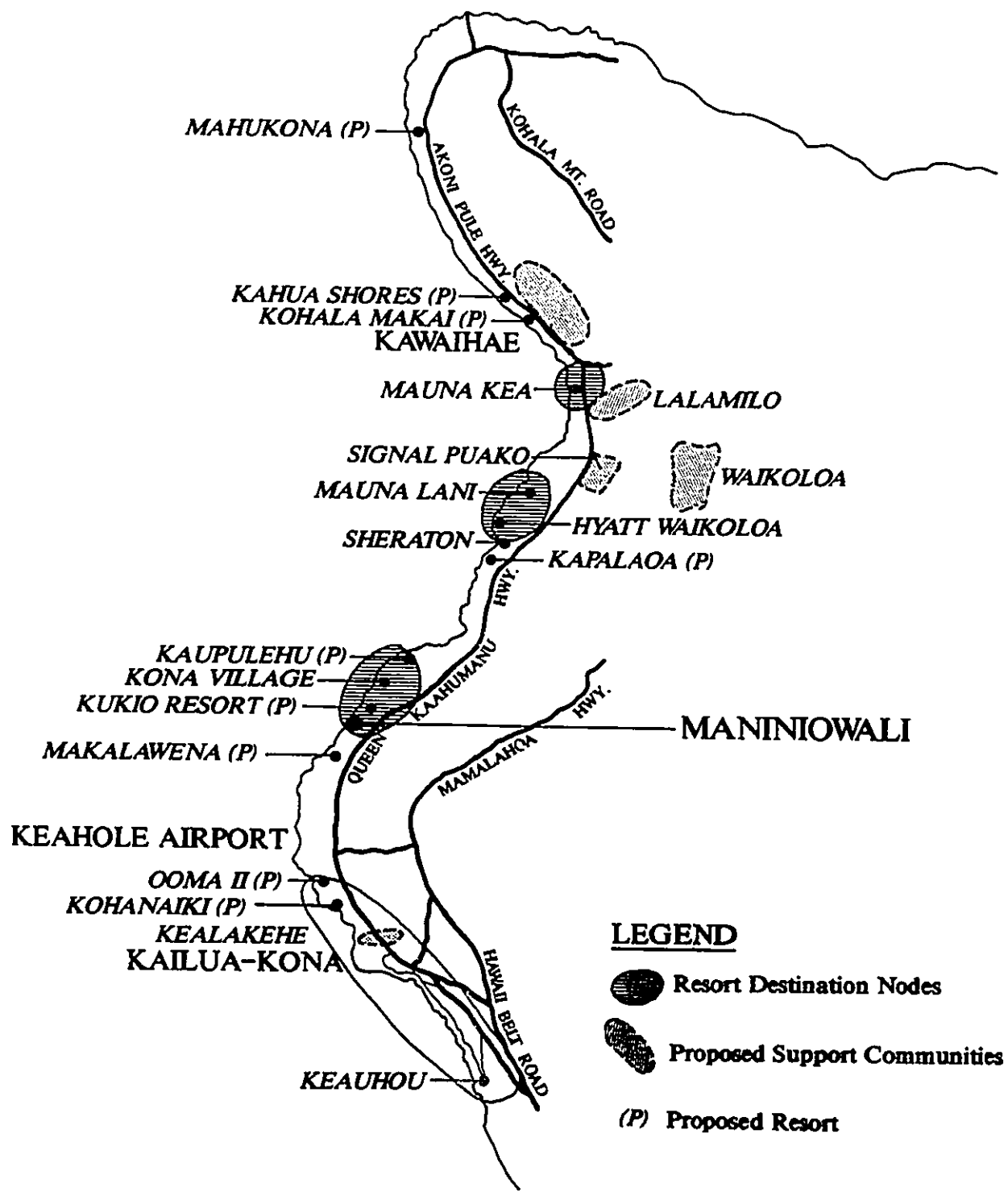


FIGURE 1

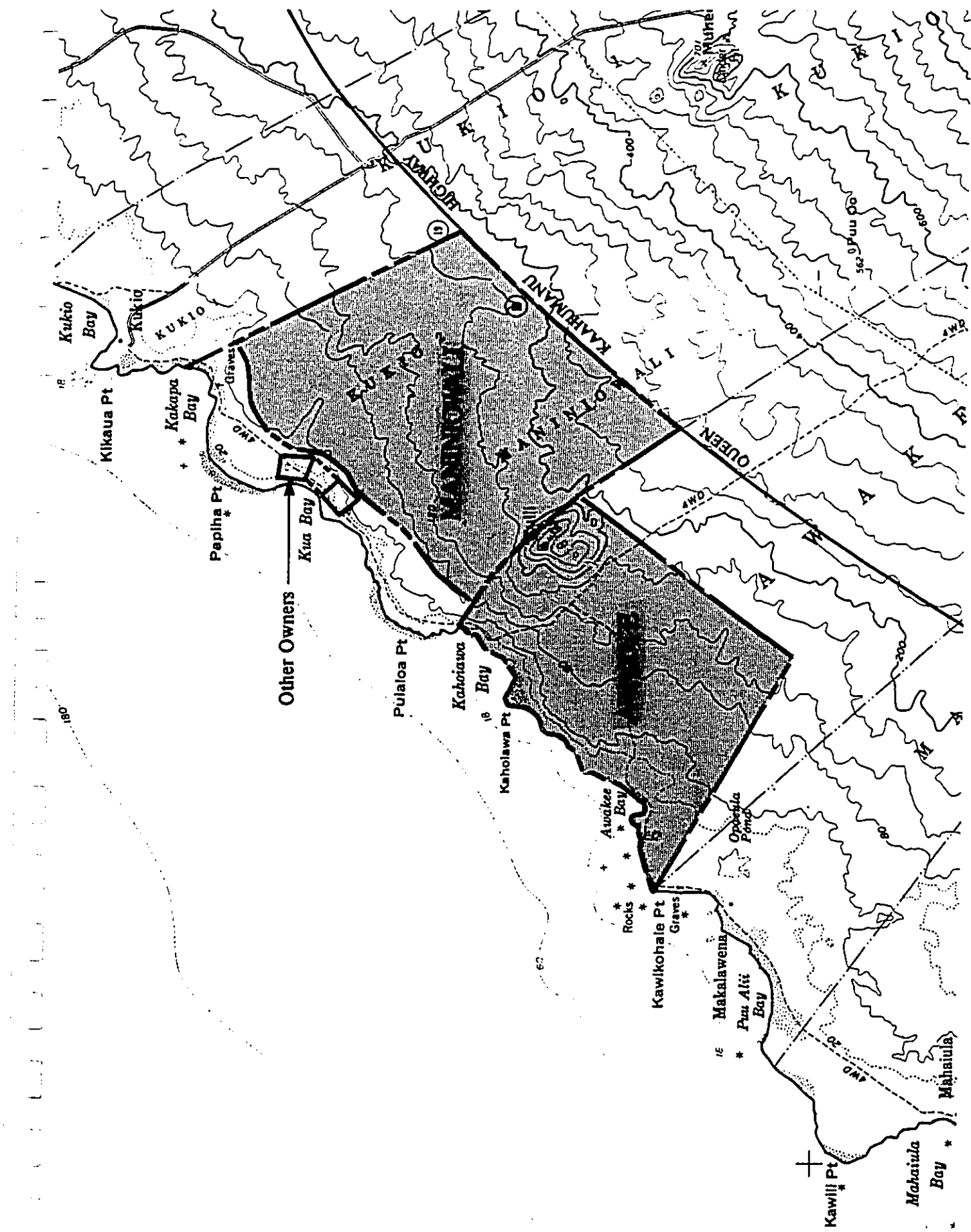


Regional Location Map
 West Hawaii Resort
 Destination Nodes and Support Communities

MANINIOWALI/AWAKE'E LAND EXCHANGE

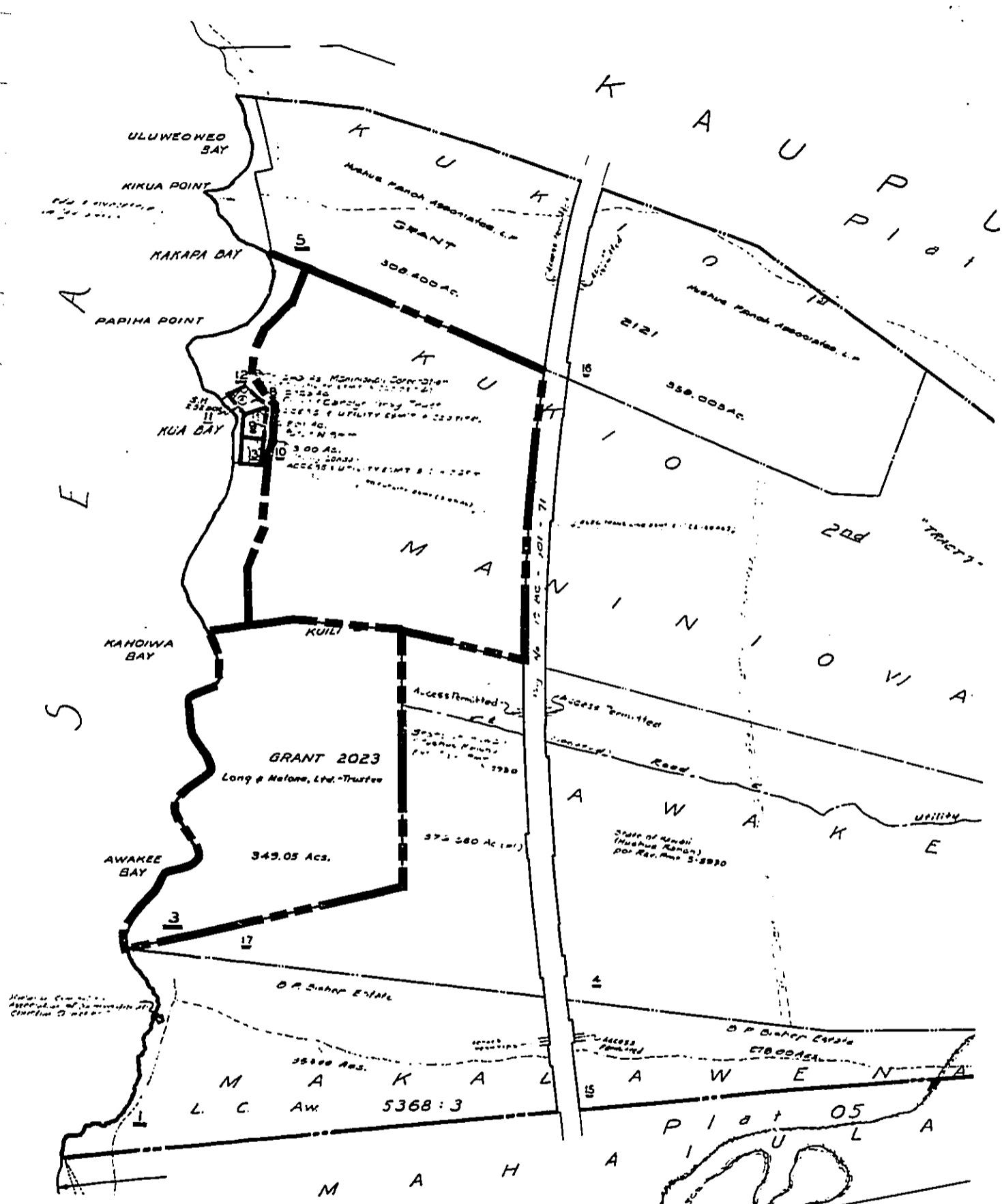


FIGURE 2



Exchange Parcels Boundaries
 MANINIOWALI/AWAKEE LAND EXCHANGE

FIGURE 3



Land Ownership
MANINIOWALI/AWAKE'E LAND EXCHANGE

FIGURE 4

B. History of Previous Application for Land Exchange

Awake'e has previously been proposed for resort development. Implementation of the resort development was always contingent upon obtaining the required government approvals for the specific resort land use. In December 1987, the County of Hawaii adopted a General Plan amendment which allows for a 600 hotel and 900 residential-unit resort development at Awake'e. As part of the General Plan amendment application process, an Environmental Impact Statement (EIS), prepared pursuant to Chapter 343, HRS, was accepted by the County of Hawaii.

A petition for State Land Use redistricting was withdrawn by Kahala Capital Corporation, the former development manager, in 1988. The primary basis for the withdrawal were several concerns raised by the Department of Business and Economic Development (DBED). These concerns included: 1) An unwarranted increase in lands for resort use outside of the designated resort destination nodes; (2) the appropriateness of retaining the Conservation District designation of the petition area; and (3) the potential impact for the resort development to cause significant adverse impacts on the adjacent Makalawena parcel and on coastal resources.

The proposed location of the resort on the Awake'e parcel appeared to be the primary issue of concern. Therefore, an alternative was proposed whereby the applicant would seek an exchange of land, and then a relocation of the resort proposal to mitigate DBED's concerns. Application for the exchange of the two subject parcels was submitted to the State Board of Land and Natural Resources in late 1989. An Environmental Assessment was prepared for the land exchange (Helber, Hastert & Kimura Planners, December 1989). The proposal was approved by the Board of Land and Natural Resources in December 1989. However, community concerns over treatment of archaeological resources, the absence of shoreline access provisions, the likelihood that approval of a resort and resort development would be sought subsequent to the exchange had not been resolved. Because of these unresolved concerns, the proposal was withdrawn by the BLNR, during the course of its consideration by the 1989 State Legislature, and the land exchange was not finalized.

C. Statement of Objectives and Rationale for Action

Objective

The adjoining parcels of Awake'e and Maniniowali are of similar value. Both are within the State Conservation District. The objective of the proposed land exchange is two-fold:

- (1) The Applicant would gain a portion of Maniniowali, a State of Hawaii owned parcel, but excluding the shoreline area and proceed with planning for a low density residential subdivision and golf course. Maniniowali is at the periphery of an Office of State Planning designated resort node.

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- (2) The State of Hawaii would gain the entire parcel of Awake'e owned by the Applicant (including approximately 5,800 feet of shoreline); in addition, the State would retain approximately 105 acres and the entire shoreline (approximately 6,800 feet) which fronts Maniniowali. The length of shoreline under State ownership would nearly double.

Public Purpose of a Land Exchange

Section 171-50, *Hawaii Revised Statutes* states, "No exchange of public land for private land shall be made except for public purposes ..." The acquisition of Awake'e through a land exchange would be advantageous to visitors and residents of the State and of the island of Hawaii and serve a public purpose for the following reasons:

- The State of Hawaii would gain the Awake'e land with intrinsic value of the natural resources, including Pu'u Kuili, a complex of anchialine ponds and approximately 5,800 feet of coastal shoreline.
- Public acquisition of Awake'e, while at the same time retaining the shoreline area at Maniniowali, would allow the State to achieve its goal of creating a Wilderness Heritage Park. The shoreline under State ownership would be nearly doubled, and both configuration and natural resource value of the mauka wilderness area would be improved.
- Acquisition of this significant shoreline parcel by exchange rather than purchase would mean that the limited amount of public funds available for the purchase of State park lands could be used to acquire other important sites for park purposes. Substantial public benefits would be provided at no cost to the public.

The rationale for a land exchange is described below:

- Although the Big Island is physically large with many miles of coastline, its physical configuration limits the amount of shoreline suitable for recreational purposes. Usable and accessible pocket beaches are located in Hilo, Kalapana in the Puna District, at Punalu'u in the Ka'u District, but primarily along the West Hawaii coastline. The only stretches of white sand beaches are located along the Kona-Kohala coast. Consequently, residents and visitors from throughout the island will travel long distances to recreate at beaches in West Hawaii. In that regard, "ownership" is claimed not only by Kona residents, but by all members of the Big Island community.
- Recognizing this, the Office of State Planning in its *West Hawaii Regional Plan*, has identified shoreline areas on the Kona-Kohala coast for new public parks. These include Maniniowali Beach (Kua Bay) and Mahaiula Bay at Makalawena. Awake'e is situated between these two target beaches. The *West Hawaii Regional Plan* also identifies Awake'e and Makalawena as a Heritage Area. Awake'e would become an integral part of the State's planned Wilderness Heritage Park, which would extend along the coast from the State owned Keahole parcel to Kua

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Bay. This park could provide improved public access to the shoreline and beach areas for swimming, fishing and diving, and could potentially include the creation of a hiking trail along the coast, and interpretive archaeological sites.

- The Makalawena parcel owned by Bishop Estate is targeted for acquisition by the State. The special natural features of the Makalawena lands include: Mahaiula Beach, a prime swimming beach of statewide significance; Opaepa (Kapoikai) Pond, a major nesting area and habitat for endangered Hawaiian waterbirds; and anchialine ponds which are considered among the best remaining ponds in West Hawaii.
- The unique natural resources of the Awake'e coastal lands include: Anchialine ponds located at the southwestern corner of the property. The 18 Awake'e ponds are a part of the Makalawena pond complex. Pu'u Kuili, a 342 feet high cinder cone located in the northwestern portion of the property is a land mark along the flat and barren lava fields characteristic of the general landscape. Awake'e is attractive for State ownership because of its proximity to the Makalawena coastal lands. By acquiring this parcel, the State will be able to consolidate and substantially buffer the Makalawena coastal lands from future urban development to the north.
- A further objective of a land exchange, as articulated in the State's *West Hawaii Regional Plan*, is the clustering of resorts into four Resort Destination Nodes and develop them as employment centers. This would also confine the need for public services and facilities and infrastructure development. Achievement of a land exchange would then provide the Applicant with a parcel adjacent to the Kaupulehu/Kona Village/Kukio Resort node. The proposed land use of a golf course and low density residential development would be an independent but ancillary development to the resorts on the periphery of the Kaupulehu/Kona Village/Kukio Resort node. This action would be consistent with the objectives of the Office of State Planning.
- The exchange parcel, Maniniowali, will be contiguous to existing Urban District lands (Kukio 1) and allow a large continuous section of Conservation District lands to remain intact. Should further urbanization of the private lands be allowed in the area, it would be preferable at Maniniowali, as it is at the periphery of the Office of State Planning's Kaupulehu/Kona Village/ Kukio Resort node.

This would be consistent with the State's policy, as articulated in the *West Hawaii Regional Plan*, of clustering developments into nodes. Achievement of a land exchange would provide the Applicant with a parcel on the periphery of the Kaupulehu/Kona Village/ Kukio Resort node. The Applicant's proposed land use of a golf course and low density residential development for the Maniniowali lands would be an independent but ancillary development to the resorts within the central portions of the node.

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- Once secured by the State, the pressure to urbanize would no longer be upon the most sensitive lands, the shoreline will be preserved in perpetuity, and a public purpose would be served.

SECTION III

III. GENERAL DESCRIPTION OF THE PROPOSED ACTION'S TECHNICAL, ECONOMIC, SOCIAL AND ENVIRONMENTAL CHARACTERISTICS

A. Technical Characteristics

The proposed land exchange involves the total parcel of approximately 334.33 acres of land at Awake'e which is owned by the Applicant, North Kona Development Group; and approximately 485 acres of a portion of land situated in the Maniniowali *ahupua'a* which is owned by the State of Hawaii. The exact land area at Maniniowali to be exchanged is subject to the completion of a registered survey. The entire shoreline area at Maniniowali would be retained by the State and not be a part of the exchange. Further, the land exchange would be subject to the conditions set forth in the approval of the Board of Land and Natural Resources. The boundaries of the land area constituting Maniniowali and Awake'e are shown in Figure 3. Upon completion of the exchange the Applicant will own a portion of Maniniowali situated makai of the Queen Ka'ahumanu Highway and the State of Hawaii will own Awake'e makai of the Highway and the shoreline portion of Maniniowali.

The proposed exchange of Conservation District lands, if approved, would not involve the granting of permission for any form of development on the Applicant's newly acquired Maniniowali parcel. Both parcels would remain in the State Conservation District. It is the Applicant's desire, however, to eventually develop Maniniowali with a low density residential and golf course project.

B. Economic Characteristics

The land exchange will not involve the use of State funds.

C. Social Considerations

The land exchange previously proposed by Kahala Capital in 1989-1990 provided an opportunity for public testimony on State Resolution 24 before the House of Representatives on March 19, 1990. Individuals and representatives of various organizations and interest groups provided testimony on the proposed exchange. Several issues were raised, most of which related not to the land exchange itself, but to the potential future uses of Maniniowali if the exchange was finalized by the State Legislature. The main points raised by those expressing concerns are listed below:

- Future development of Maniniowali may disturb burial sites and other sensitive archaeological and cultural resources on the land.
- Future development could affect the historic trails on the site.
- Infrastructure of the region is already stressed, and additional development would create additional stresses.

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- Public access to the shoreline across Maniniowali was not addressed in the evaluation of the exchange.
- The State owned Maniniowali should be developed as a public park.
- There was a lack of communication with the community prior to the exchange application and during the review process.
- * The Office of Hawaiian Affairs was not consulted.
- * The Ceded Lands issue was not addressed.

D. Environmental Characteristics

A discussion of the existing environmental characteristics of the exchange parcels is included in Section IV. The proposed land exchange will not create any adverse environmental impacts.

SECTION IV

IV. SUMMARY DESCRIPTION OF THE AFFECTED ENVIRONMENT

Awake'e and Maniniowali are adjacent parcels with similar physical attributes. This section presents a description of the existing physical, natural and human environmental conditions at the two exchange parcels and the surrounding area. Technical studies have been prepared by expert consultants to address existing site conditions for archaeological resources, botanical and faunal resources, and coastal water quality and biological conditions. Information from these reports has been included in the following discussion, and copies of these reports are appended.

No impacts to the environment are expected to occur in the land exchange; therefore no mitigation measures are addressed in this section.

A. Climate

The exchange parcels are located in the coastal area of North Kona, which has a semi-tropical, semi-arid climate. Average annual precipitation in this area is 10 to 15 inches. Average annual temperature is 78 degrees F, with an average high temperature of 83 degrees F and an average low of 67 degrees F. Rainfall increases with elevation from the coastal area, with a high rainfall belt located between the 1,200- and 3,000-foot elevation on the leeward slopes of Hualalai and Mauna Loa.

The large land masses of Mauna Loa, Mauna Kea and Hualalai generally shelter the north Kona coast from the predominant northeasterly trade wind system affecting the Hawaiian Islands. Winds follow a typical pattern of on-shore winds (westerly and southwesterly) in the morning and early afternoon. Cloud banks often form along the higher elevation slopes during the day, and off-shore breezes occur in the late afternoon and evening. Typical wind velocities range from 3 to 14 knots. Relative humidity generally ranges between 71 to 77 percent year-round.

B. Existing Land Use and Access

Both of the exchange parcels are vacant, however, they are regularly utilized by fishermen, beachgoers, hikers and some campers. There are no amenities for the public at either site. Recent surveys indicate that archaeological sites have been greatly disturbed.

Access to Maniniowali is available via a rough road across the lava field (four-wheel drive vehicle required) which originates from Queen Ka'ahumanu Highway. The State Department of Land and Natural Resources (DLNR) officially established a legal access point from Queen Ka'ahumanu Highway at Maniniowali (Sta. 504+00).

Currently, there is no legal access to Awake'e from Queen Ka'ahumanu Highway. The parcel can be accessed by four-wheel drive vehicles over a rough trail which extends across State-owned land fronting the highway.

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Awake'e/Maniniowali Land Exchange

C. Natural Hazards

The parcels of Awake'e and Maniniowali are subject to natural hazards, as are similar lands along this stretch of Kona coastline. These include the possibility of seismic activity, lava flow and tsunami inundation.

Seismicity: The two exchange parcels, like the entire island of Hawaii, are susceptible to earthquakes originating in fault zones under and adjacent to the island. Within the Kona region, two fault zones have been identified. The Kealakekua and Kaloho faults are both located in South Kona, which is distant from the subject parcels. For the purposes of structural building design, the island of Hawaii has been classified as having the highest potential for seismic occurrence and danger. The Hawaii County Building Code requires that all new structures be designed to resist these forces.

Volcanic Activity: The U. S. Geological Survey (USGS) has identified "zones of overall relative risk" associated with volcanic activity on the island of Hawaii. These zones take into account both direct volcanic activity hazards (lava flow inundation, rock fragments and gases) and indirect volcanic hazards (subsidence, surface rupture, earthquake and tsunami). Six zones (A - F) are classified in this system, ranging from low risk (A) to high risk (F). Both Awake'e and Maniniowali, which lie downslope from Mt. Hualalai, are located in zone "DE", indicating a relative degree of risk from volcanic action.

Awake'e and Maniniowali are both susceptible to potential lava flows from Hualalai, one of the five volcanoes on the island of Hawaii. Hualalai has been active in historic times, with the last active period of eruption occurring about 1800. The northwest volcanic rift zone at an elevation of approximately 1,600 feet above msl (makai of Mamalahoa Highway), produced a lava flow which extended to the shoreline between Keahole Point and Mahaiula to the south of the exchange parcels. The flow also extended to the Ka'upulehu area to the north, and surrounded the exchange parcels.

Tsunami Hazard: Within historic times, the Hawaiian Islands have been subjected to at least 50 tsunami occurrences. The highest tsunami run-up wave heights ever recorded in the Kona region resulted from the 1960 tsunami, which caused extensive damage throughout the State. Coastal high hazard areas at risk from tsunami inundation have been identified in the Flood Insurance Rate Maps prepared by the Federal Emergency Management Agency. The 100-year flood hazard boundary closely follows the coastline except near Kakapa Bay (at Kukio) and Kawikohale Point (at the Makalawena/Awake'e boundary), where the boundary extends mauka for approximately 750 feet.

D. Geology and Topography

The two exchange parcels are located on the western slope of Hualalai, a dormant shield-type volcano (elevation 8,271 feet). The Keahole Point area was formed by progressive layering of prehistoric lava flows from Hualalai. The lavas are primarily pahoehoe with thicknesses varying from six inches to 100 feet. Lava layers are very

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porous and contain numerous lava tubes, cracks and fissures. Anchialine ponds are found near the southern coastal border of Awake'e, and one pond is located adjacent to Kua Bay at Maniniowali.

The topography of the two exchange sites is gently to moderately sloping. The significant topographic features of the two parcels include the shoreline and the Pu'u Kuili cinder cone. Maniniowali has average slopes of five to seven percent, with elevations ranging from sea level to 280 feet above msl at the southern mauka corner. A small cinder cone exists at Maniniowali near its mauka boundary. Awake'e ranges in elevation from sea level to approximately 200 feet above msl at the northern-mauka boundary. The Pu'u Kuili cinder cone is almost entirely located on Awake'e, which reaches an elevation of 342 feet above msl. The average slope from the peak of Pu'u Kuili to the shoreline is approximately 17 percent.

E. Soil Types and Agricultural Capability

Soil types of the two exchange parcels have been mapped as part of the U.S. Department of Agriculture, Soil Conservation Service (1972) soil survey for the State of Hawaii (Figure 5). Four soil types occur on the exchange parcels, as shown in Figure 5, including: Pahoehoe lava flows (rLW), Cinder land (rCL), Rock land (rRO) and 'A'a lava flows (rLV). The predominant soil types of the land are 'A'a lava flows and Rock land.

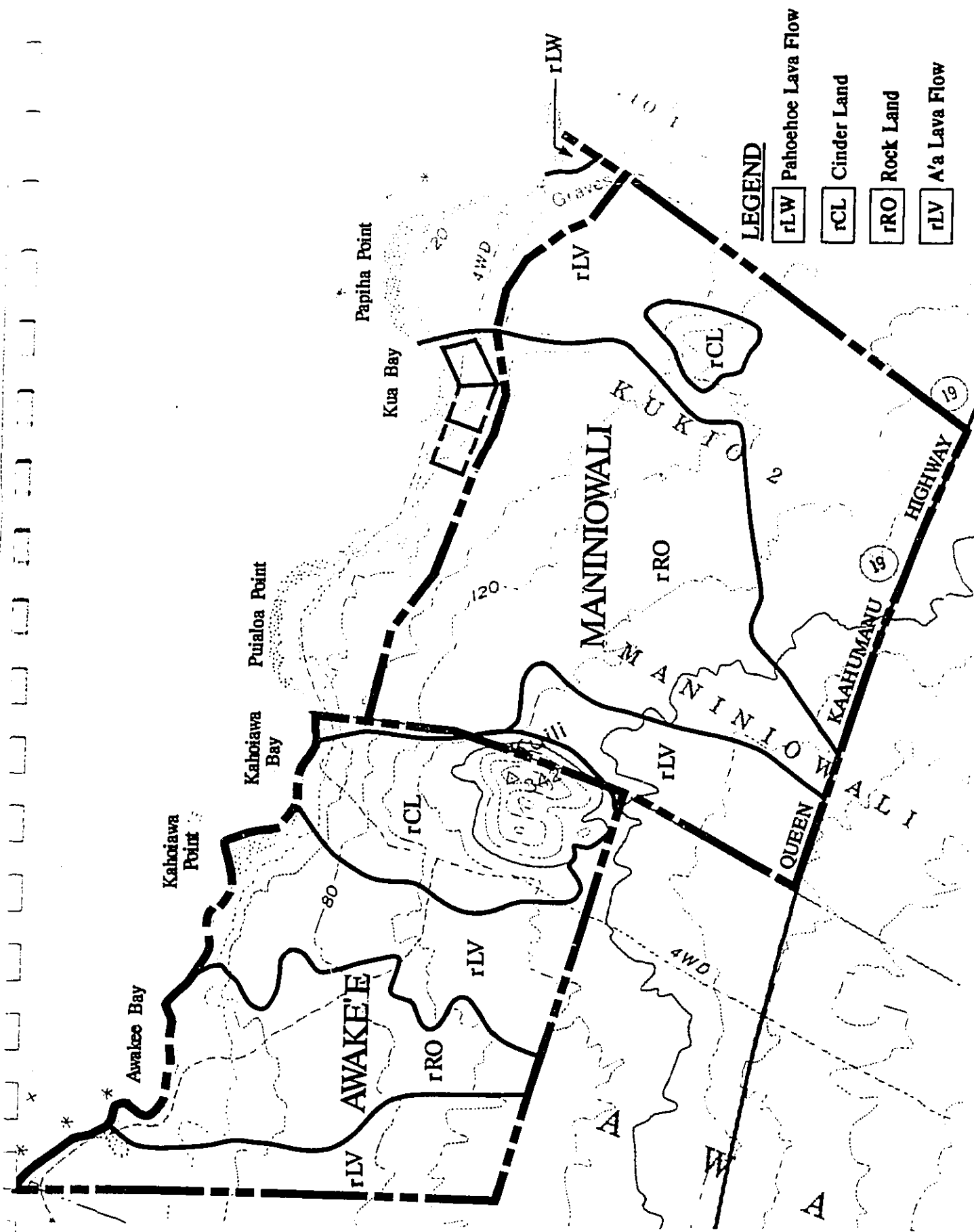
According to the U.S. Department of Agriculture (1972), soils at Awake'e and Maniniowali are not suited for agricultural use. Pahoehoe lava flows, Cinder land and 'A'a lava flows have an agricultural capability class rating of VIII, defined as soils and land forms whose limitations preclude the cultivation of commercial plants. These soil types have very severe limitations that restrict their use for wildlife habitat and recreation. Rock land is given a capability class rating of VII, which includes soils which have very severe limitations that make them unsuited to cultivation, and restrict their use largely to pasture or range, woodland or wildlife.

Two other land classification systems are used to rate the agricultural potential of soils in Hawaii on a scale ranging from A (best) to E (poorest). The University of Hawaii Land Survey Bureau (1972) classifies the soils of the two exchange parcels within their category E, which indicates they are not suited for agricultural uses. The State of Hawaii Department of Agriculture has also mapped Agricultural Lands of Importance to the State of Hawaii (ALISH). The site does not contain soils rated as "prime", "unique" or "other important" agricultural lands.

F. Shoreline and Nearshore Environments

Baseline studies of the marine environment off Awake'e and coastal anchialine ponds were conducted by Steven Dollar, Ph.D., in 1986 and again on September 15-16, 1990. The 1990 survey report is attached as Appendix A. In the 1986 and 1990 studies pond conditions and inventory of composition were found to be identical.

Shoreline Area: The physical structure of the shoreline fronting Awake'e consists predominantly of low basaltic boulder slopes interspersed with crescent-shaped



Soil Series Map
MANINIOWALI/AWAKE'E LAND EXCHANGE
 FIGURE 5

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Awake'e/Maniniowali Land Exchange

pocket beaches. The beaches are composed of rounded cobbles and coarse sands which extend into the intertidal area. The southern extreme of the property is somewhat anomalous in that a berm of coral rock separates the ocean from a low-lying back-beach area containing a complex of anchialine ponds. The coral rocks have apparently been thrown up on the shoreline after being broken loose by storm action. The most prominent beach of this type occurs along the margin of Awake'e Bay. At the southern end of Awake'e (south of Awake'e Bay), an intertidal platform of calcium carbonate beach rock lies between the reef bench and the shoreline. North of Awake'e Bay the shoreline is somewhat elevated, preventing the formation of tidepools and anchialine ponds.

Coastal Water Quality: A long-term data base for surface water chemical parameters has been collected at the Natural Energy Laboratory of Hawaii (NELH) at Keahole Point located approximately four miles south of Awake'e and Maniniowali. Because of the homogeneity of the coastline and the lack of shoreline development between Keahole Point and the subject parcels, it is likely that water chemistry off the subject parcels is similar.

Descriptively, the nearshore waters off both parcels are classed by the State Department of Health as AA, and can be considered pristine. Lack of suspended material results in extreme water clarity. There are no streams entering the sea along Awake'e, but there is evidence of high volumes of ground water extrusion. According to Dollar, Awake'e Bay showed definite effects of groundwater discharge in the form of a visible surface lens of low salinity water and increased nutrient concentrations.

Benthic Community Structure-Corals and Invertebrates: In general, the geologically young age of the island of Hawaii limits the development of true "coral reefs". Rather, the majority of the off-shore benthic (i.e. bottom) environment is a "coral community". The distinction is that, for the most part, corals are growing on substrata composed of basement rock, rather than on calcareous rock of organic (reef) origin. The distribution pattern of corals are relative to the harshness of physical conditions in the nearshore area, primarily in response to wave stress. The major group of benthic organisms occurring on the reefs offshore both of the parcels, other than corals, are sea urchins and sea cucumbers.

Reef Fish Community: The reef fish community off Awake'e and Maniniowali is typical of that found along most of the Kona Coast and can be grouped into six general categories: juveniles, planktivorous damselfishes, herbivores, rubble-dwelling fishes, swarming tetrodons and surge-zone fishes.

Overall, the fish community structure offshore both parcels is fairly typical of the assemblages found in undisturbed Hawaiian reef environments. The presence of large schools of some food fishes indicates that the area has been subjected to only light to moderate amounts of fishing pressure, both by aquarium fish collectors and fishermen. The apparent low levels of fishing are undoubtedly a function of the remote location of the site with respect to shoreline access and the distance from the nearest harbor or boat launching facility.

ENVIRONMENTAL ASSESSMENT
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Threatened or Endangered Species: Three species of marine animals that occur in Hawaiian waters have been declared threatened or endangered by Federal jurisdiction. The threatened green sea turtle occurs commonly along the Kona Coast, and is known to feed on selected species of macroalgae. The endangered hawksbill turtle is known infrequently from waters off the Kona Coast. No turtles were observed at Awake'e during the course of the 1986 and 1990 surveys. George Balazs, zoologist with the National Marine Fisheries Service, who specializes in the study of Hawaiian sea turtles, has indicated that while he had not personally visited Awake'e, the area is not identified as a turtle nesting, breeding, or aggregating site.

Populations of endangered humpback whale are known to winter in the Hawaiian Islands from December to April. In general, however, it is not common for whales to occupy the shallow reef areas.

G. Anchialine Ponds

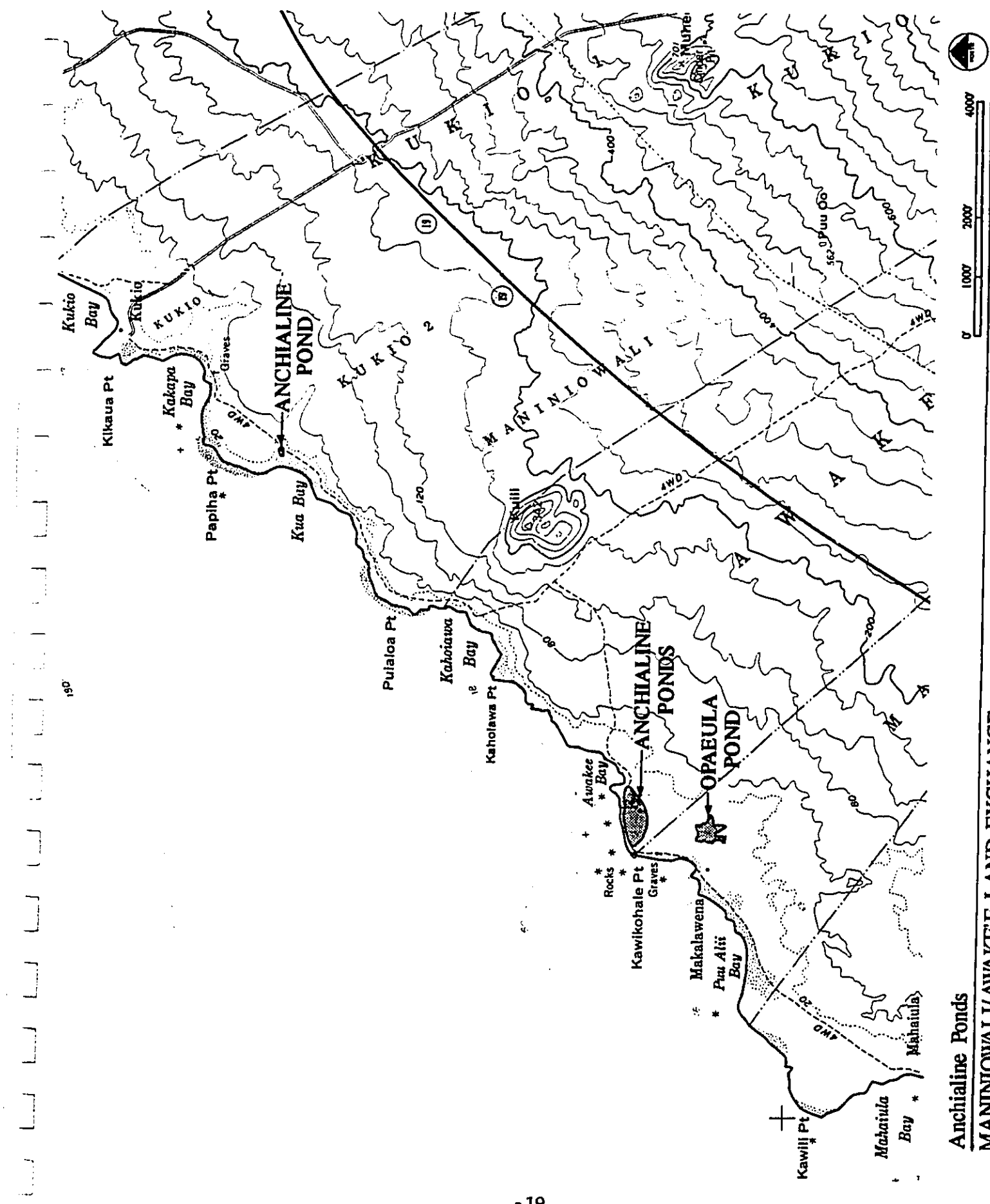
Anchialine ponds are shoreline pools without surface connections to the sea. These unique ponds that contain water of measurable salinity which oscillate with tidal rhythm owing to inland extension of the oceanic water table.

At Awake'e, a series of ponds occur at the southwestern corner of the property, between Awake'e Bay and Kawikohale Point (Figure 6). The pond system continues farther south on the adjacent Makalawena property. They lie in an area of low topography behind a coastal berm composed mainly of coral rock. The lack of ponds on the northern portion of Awake'e is probably due to the relatively steep coastal topography. The most obvious characteristic of the Awake'e pond biota is the relative lack of shrimp and native fish species, and the overwhelming domination by introduced fish.

Eighteen ponds were numbered and surveyed within Awake'e. The ponds are concentrated in a small geographical area. They are diverse in size and type. Twelve of the 18 ponds are depressions in the lava rock with no benthic macro-algae, and no sediment accumulation. "A'a" ponds are the most abundant type. Pond depth range from shallow (<20 in.) to moderate (20-60 in.). None are classified as deep (>60 in.). Pond bottoms are found to be of different types.

A common characteristic of all pond types is evidence of cultural modification. Many of the A'a ponds contained walls that divided the ponds into sub-sectors, or modified pond boundaries. Water columns in all ponds appeared clear and transparent, with no suspended solids. Even ponds with thick sediment layers and surface algal mats had clear water columns. Turbid water columns are usually caused by dense populations of phytoplankton.

Anchialine pond biotic communities are characterized by a unique assemblage of organisms of relatively low species diversity. In the Awake'e ponds, the most ubiquitous plant groups are the orange algal crusts (Schizothrix). Ponds with substantial sediments contained the vascular plant Ruppia maritima, commonly known as widgeon grass.



ANCHIALINE PONDS
MANIOWALI/AWAKE'E LAND EXCHANGE

FIGURE 6

ENVIRONMENTAL ASSESSMENT
Awake'e/Maniniowali Land Exchange

Typically, the most abundant fauna of anchialine ponds are snails and shrimp. Three representative snails, Assiminea sp., Melania sp., and Theodoxus cariosa, were typically found in the Awake'e ponds. No typically representative pond fishes, Eleotris sandvicensis and Kuhlia sandvicensis, were observed in the Awake'e ponds. However, introduced fish species (topminnows (Poecilia spp.) and guppies) were abundant throughout the pond system.

Two shrimp species, Halocaridina rubra (opae'ula) and Metabeteus lohena are considered rare and found only in anchialine ponds. The other two shrimp species, Palaemon debilis and Macrobrachium grandimanus, are found in estuaries and streams in addition to anchialine ponds.

Shrimp were extremely scarce in the Awake'e ponds compared to other West Hawaii ponds. During daylight hours, shrimp were not observed on the exposed surfaces of pond bottoms, and the few individuals that were observed were hiding within the fronds of benthic plants. The most obvious characteristic of the Awake'e pond biota is the relative lack of shrimp and native fish species, and the overwhelming domination by introduced fish. Inverse relationships between fish and shrimp have been found.

H. Flora

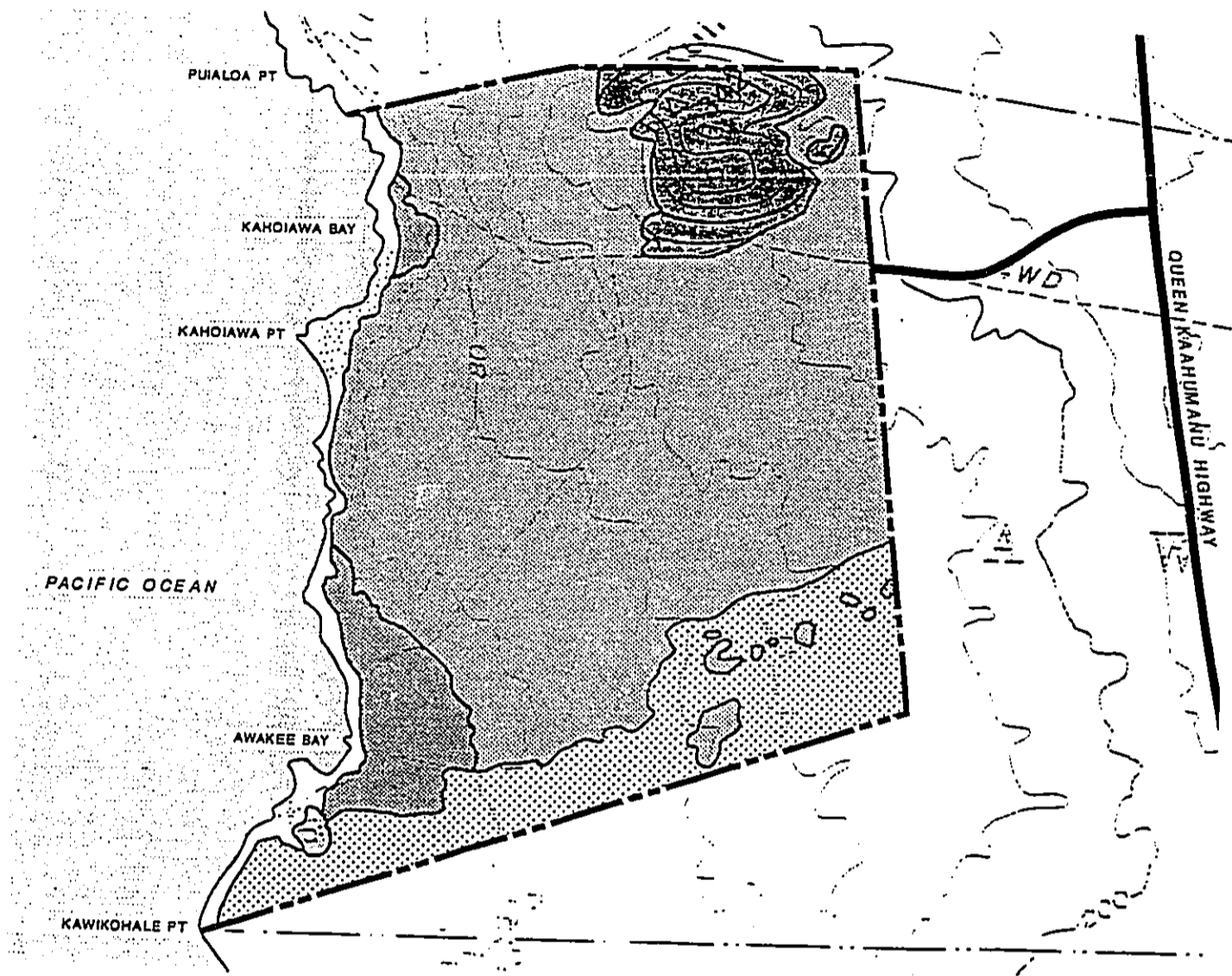
This section identifies the existing vegetation at the subject parcels. Botanical assessments of the Awake'e and Maniniowali parcels were conducted by Char and Associates in 1986 and 1989. A report (1990) which combines their findings is attached to this report as Appendix C.

Awake'e







A botanical survey conducted in September 1986 inventoried a total of 45 plant species (Char & Associates, 1986). Of those 45 species, 26 (58%) are introduced, and 17 (38%) are native (14 are found in the Hawaiian Islands and elsewhere, three are restricted to the Hawaiian Islands) and two (4%) are of Polynesian origin. No endangered plant species were observed at Awake'e. None of the native species on the project area are listed as rare, threatened, or endangered by the U. S. Fish and Wildlife Service.

The distribution of vegetation types at Awake'e is strongly influenced by the substrate type. The older, weathered pahoehoe and 'a'a lava flows support a more or less dense cover of fountaingrass and kiawe trees. The younger 'a'a flow which lies on the southern boundary is almost devoid of vegetation. The loose cinder-pumice-ash substrate of Pu'u Kuili supports a grassland with scattered trees. The five major vegetation types which are found on Awake'e are shown in Figure 7 and are described below.

Strand - The coastal portion of Awake'e is predominantly rocky with large basalt boulders. Vegetation is sparse on the rocky shoreline with only a few scattered plants such as fountain grass (Pennisetum settagum), Sagina sp., nettle-leaved goosefoot (Chenopodium murale), pa'u-o-Hi'i-'aka (Jacquemontia sandwicensis),



LEGEND

- | | |
|--|---|
|  Grass Land |  Lava Flow - A'a |
|  Closed Prosopis (Kiawe) Forest |  Anchialine Ponds |
|  Open Prosopis (Kiawe) Forest |  Strand |

Vegetation Zone - Awake'e Map
MANINIOWALI/AWAKE'E LAND EXCHANGE

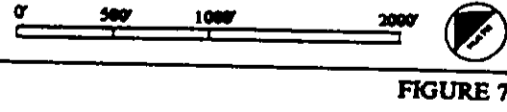


FIGURE 7

ENVIRONMENTAL ASSESSMENT
Awake'e/Maniniowall Land Exchange

and low, windswept pluchea shrubs (Pluchea odorata) and kiawe trees (Prosopis pallida).

Scattered along the rocky shoreline are areas where high storm-waves have thrown up coral rubble. The rubble is composed of rounded to irregularly shaped pieces of coral 8 to 10 inches in diameter. Small patches of the silver-leaved hinahina-kakahakai (Heliotropium anomalum var. argenteum) are occasionally found.

Along Kahoiawa Bay is a small beach with very coarse sand. A small grove of tree heliotrope (Messerschmidia argentea), up to 18 feet tall, is found here. Mats of pohuehue or beach morning-glory (Ipomoea brasiliensis) and 'aki'aki or beach dropseed grass (Sporobolus virginicus) are scattered here and there on the coarse sand.

By Awake'e Bay, near the largest anchialine pond, beach morning glory forms scattered patches. A grove of milo (Thespia populnea) and coconut (Cocos nucifera) is found between the strand and pond areas.

Anchialine Pond - A number of anchialine ponds are found behind the beach by Awake'e Bay. The ponds found on the A'a lava flow generally have sparse or no vegetation around their edges. Larger ponds, located by a grove of milo and coconut trees, support a growth of makaloa or 'chu'awa (Cyperus lacvigatus), water hyssop (Bacopa monniera), 'ohelo-kai (Lycium sandwicense), phuehue or beach morning glory, and a few kiawe trees. However, the vegetation occurs as scattered patches and bare 'a'a predominates. Milo seedlings are abundant on the edge of the pond abutting the grove of milo and coconut trees.

The larger sediment-laden ponds support orange-colored algae crusts (Schizothrix sp.) and floating mats of filamentous algae. Widgeon grass (Ruppia maritima var. pacifica), an aquatic flowering plant, was observed in only one of these ponds.

Closed Prosopis Forest - This vegetation type is found on the lower portion of Awake'e, behind the coast. The Closed Prosopis forest occurs on pahoehoe bedrock covered by a thin layer of reddish-brown soil material, six to eight inches deep.

Kiawe trees form a closed canopy forest with the crowns of the trees touching and interlocking. The trees are from 18 to 25 feet tall. There are only a few, smaller kiawe saplings present and no sub-canopy layer or dense ground cover because of the heavy shade from the tree canopy.

A few scattered plants found in this forest include false mallow (Malvastrum coromandelianum), hoary abutilon (Abutilon incanum), lantana (Lantana camara), fountain grass, and 'uhaloa (Walterhia indica var. americana). In areas where the canopy is thinner, hoary abutilon and 'ilima (Sida aff. fallas) may form small, localized clumps.

Open Prosopis Forest - This vegetation type occurs on the pahoehoe and smaller areas of very weathered 'a'a lava flows found at Awake'e. There is very little soil in

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Awake'e/Maniniowali Land Exchange

these areas. The surface of the pahoehoe flows is often rough and broken with numerous hummocks and domes.

Kiawe trees form an open canopy forest with the trees scattered and the crowns not touching. The canopy cover varies from 30 to 40 to as much as 50 percent in some places. Ground cover is very dense and dominated by the introduced fountain grass.

Other grasses found in this vegetation type include buffelgrass (Cenchrus ciliaris), love grass (Eragrostis tenella), and pili grass (Heteropogon contortus), which is locally common in the upper portions of the project area. Other species found occasionally in the open kiawe forest include 'ihi (Portulaca cyanosperma), 'uhaloa (Waltheria indica var. americana), garden spurge (Euphorbia hirta), indigo (Indigofera suffruticosa), and hairy abutilon (Abutilon grandifolium). 'Ilima is quite common throughout this vegetation type. Goat (Capra hircus) droppings and signs of browsing were observed in this vegetation type.

Grassland - The grassland vegetation type is restricted to the loose, reddish-brown colored, bedded cinder-ash-pumice material of Pu'u Kuili. Fountain grass is the dominant species, forming a 90 to 95 percent cover in most places. Locally common are patches of 'ilima shrubs. Near the top of the cinder cone, the grass cover is reduced and more surface rock and cinder are present. In these areas 'ihi (Portulaca cyanosperma), 'ihaloa, and pa'u-o-Hi'i-aka become more numerous.

The 3- to 12-foot tall kiawe trees (Prosopis pallida) found in the grassland occur as very scattered individuals. However, very large depressions or pits on the cinder cone may support a small kiawe forest (up to 25 feet tall) on their bottoms.

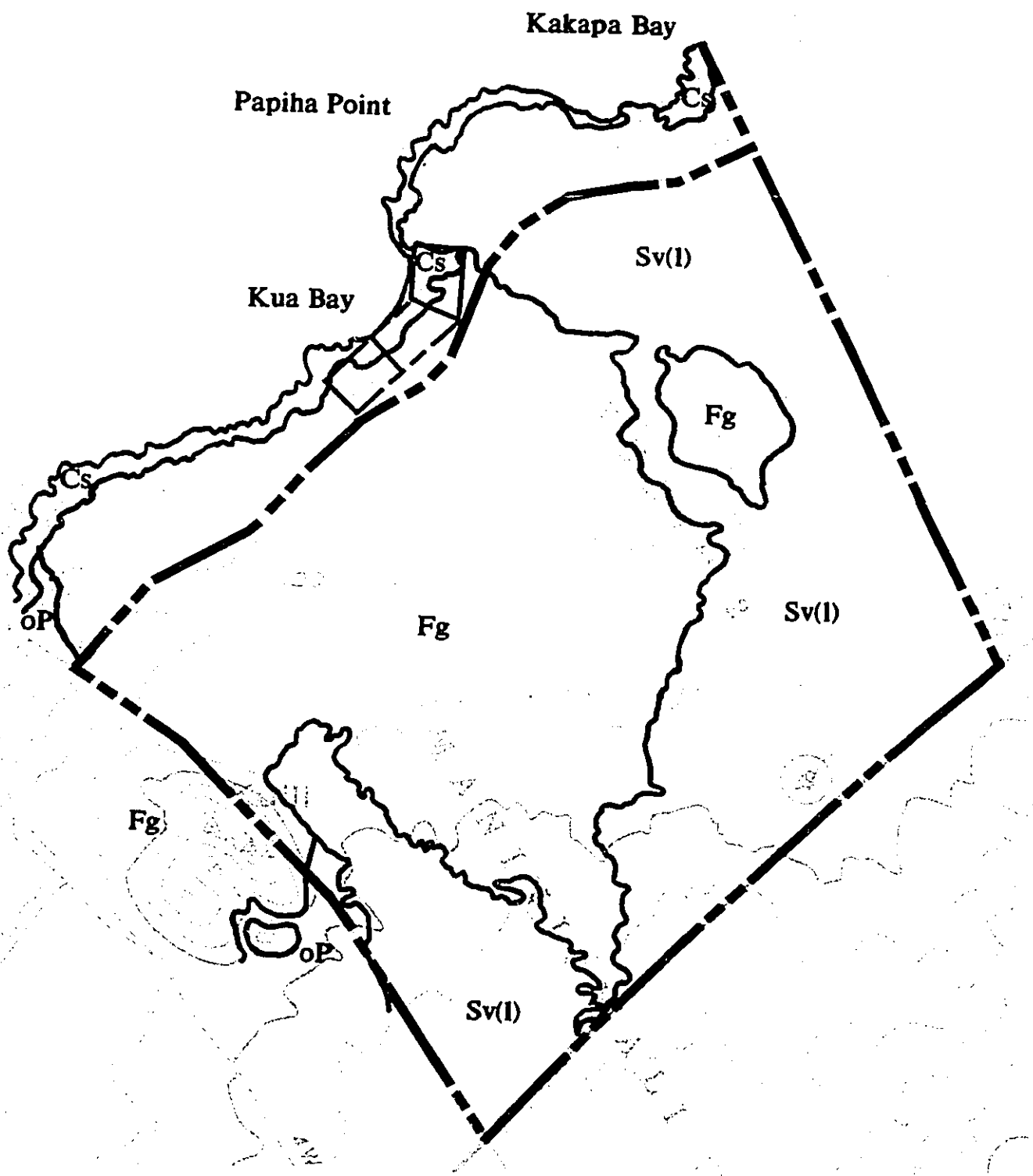
A few koa-haole shrubs (Leucaena leucocephala) are found alongside the jeep trail which goes to the top of the pu'u and to a U.S.G.S. marker. The koa-haole plants are heavily browsed, and fresh goat droppings are occasionally found on the cinder cone.

Maniniowali

In September 1989, Char & Associates surveyed Maniniowali to assess general vegetation types. The majority of the area surveyed is covered by a grassland composed of fountain grass with scattered kiawe trees. The mauka portion is largely barren 'a'a and pahoehoe lava flows.

Three major vegetation types are found on the area surveyed (Figure 8) and are described as follows.

Strand - A narrow, sandy beach is found along Kua Bay, however, most of the coastline consists of a rocky lava coast with waterworn boulders and coralline rubble. The coastal strand is poorly developed. On the sandy beach or areas of sand amongst boulders, a few native species can be found; these include 'aki'aki or seashore rushgrass (Sporobolus virginicus), pa'u-o-Hi'i-aka (Jacquemontia ovalifolia), pohuehue or beach morning-glory (Ipomoea pes-caprae), and kipukai (Heliotropium curassavicum). Low, windswept kiawe trees (Prosopis pallida) are found back of the shoreline.



LEGEND

Cs Coastal strand

Fg Fountain grass grassland

Sv(l) Scrub vegetation on lava

oP Open Prosopis

Vegetation Zone - Maniniowali

MANINIOWALI/AWAKE'E LAND EXCHANGE

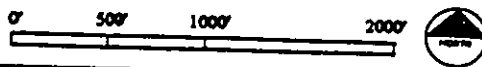


FIGURE 8

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Awake'e/Maniniowali Land Exchange

Grassland - This vegetation type is found primarily on Maniniowali. The grassland occurs on prehistoric, very weathered pahoehoe lava flows. Fountain grass (Pennisetum setaceum) cover is very dense, varying from 70 to 90 percent cover. Scattered through the grassland are trees of kiawe, from 6 to 12 feet tall. Shrubs and subshrubs include 'ilima (Sida fallax), 'uhaloa (Waltheria indica), and a'ali'i (Dodonaea viscosa).

A cinder cone composed of reddish-brown, cinder-ash-pumice material is found near the large 'a'a lava flow along the Kuki'o boundary. It supports all those species previously mentioned plus pili grass (Heteropogon contortus), 'ihi (Portulaca pilosa), threadstem carpetweed (Molluga cerviana), goosefoot (Chenopodium murale), sixweeks threeawn (Aristida adscensionis), bitter herb (Centaurium erythraea), and buffel grass (Cenchrus ciliaris). Around the base of the cinder cone, the kiawe forms a dense ring of trees from 15 to 18 feet tall. 'Ilima, threadstem carpetweed, and 'ihi are locally abundant in places.

Scrub on 'A'a - Vegetation is sparse on the 'a'a lava flows on the mauka half of the area surveyed and on the large flow on the northern boundary. Scattered patches of fountain grass, kiawe, pluchea (Pluchea symphytifolia), 'uhaloa, and 'ilima can usually be found in depressions or on the pahoehoe outcrops among the 'a'a flow. Two natives found only in this vegetation type during our survey were nehe (Lipochae lavarum) and pua-kala (Argemone glauca).

No officially listed threatened and endangered plants have been recorded from the area surveyed. Char & Associates did not find any threatened or endangered plant species during the field survey. Two candidate endangered species, the pololei fern (Ophioglossum concinnum) and tree 'ohai (Sesbania arborea) have recently been collected from nearby areas. Although neither the pololei fern nor the tree 'ohai were found by Char & Associates, these plants, especially the pololei fern could possibly occur on Maniniowali. At a time when the proposed land exchange is achieved, and new uses are proposed, it is the intention of the Applicant to mount a more intensive field survey of Maniniowali during the wetter months when the pololei fern may be more visible.

I Avifauna and Feral Mammals

Field surveys for the presence of avifaunal and feral mammals at the subject parcels were conducted in 1986, 1989 and 1990. In September 1989 and September 1990, Phillip Bruner surveyed Awake'e and Maniniowali and the area mauka, up to Queen Ka'ahumanu Highway. In September 1986 a survey of Awake'e was conducted by Char & Associates. The 1990 report by Bruner is attached to this report as Appendix C.

Resident Endemic Land and Water Birds: No Short-eared Owl or Pueo (Asio flammeus sandwichensis) were observed but this bird could potentially occur on occasion on this property. Pueo are relatively common on the island of Hawaii particularly at higher elevations.

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During the 1989 survey, four Black-necked Stilt or Ae'o (Himantopus mexicanus knudseni) were seen flying along shore towards Opaepa Pond (south of Parcel B). This endemic and endangered species is not as numerous on Hawaii as it is on some of the other islands in the State. Suitable habitat such as shallow ponds with small islands free of mammalian predators are scarce on Hawaii especially along the Kona coast. Opaepa Pond at the adjacent Makalawena parcel represents a vital resource for this species as well as for other native and migratory waterbirds.

Migratory Indigenous Birds: Of all the shorebirds species which winter in Hawaii, the Pacific Golden Plover (Pluvialis fulva) are the most abundant. The Pacific Golden Plover arrive in Hawaii in early August and depart to their arctic breeding grounds during the last week of April. The plover are extremely site-faithful on their wintering grounds and many establish foraging territories which they defend vigorously. Such behavior makes it possible to acquire a fairly good estimate of the abundance of plover in any one area. These populations likewise remain relatively stable over many years. A total of three Pacific Golden Plover were recorded during this field survey. These birds were observed along the shoreline. Most of the area surveyed is too brushy or the grass too tall to provide suitable habitat for plover. A total of two Wandering Tattler (Heteroseclus incanus) were also recorded along the rocky shoreline. This species is usually solitary. Other possible shorebirds which should be expected although not found during Bruner's survey (1989) are: Ruddy Turnstone (Arenaria interpres) and Sanderling (Calidris alba).

Resident Indigenous Birds: No seabirds were observed. Some seabirds nest and roost on barren lava flows in Hawaii but at much higher elevation.

Exotic Birds: The property supports the normal array of introduced bird species commonly found in this type of environment in Hawaii. A total of only 11 species of exotic birds were recorded during the 1989 survey: Gray Francolin (Francolinus pondicerianus), Spotted Dove (Streptopelia chinensis), Zebra Dove (Geopelia striata), Common Myna (Acridotheres tristis), Yellow-billed Cardinal (Paroaria capitata), Northern Cardinal (Cardinalis cardinalis), Japanese White-eye (Zosterops japonicus), Nutmeg Mannikin (Lonchura punctualata), Warbling Silverbill (Lonchura malabarica), House Finch (Carpodacus mexicanus), and Yellow-fronted Canary (Scrinus mozambicus). Other exotic bird species that might also be expected to occur on or near both Maniniowali and Awake'e include: Barn Owl (Tyto alba), Ring-necked Pheasant (Phasianus colchicus), Erckel's Francolin (Francoinus erkelii), Black Francolin (Francolinus francolinus), California Quail (Callipepla californica), Japanese Quail (Coturnix japonica), Northern Mockingbird (Mimus polyglottos), Saffron Finch (Sicalis flaveola) and Lavender Waxbill (Estrilda caerulea).

Feral Mammals: Small Indian Mongoose (Herpestes auropunctatus), feral cats and goats were all recorded on the survey. Not sighted were feral donkeys or the Hawaiian Hoary Bat (Lasiurus cinereus semotus); however, they have been recorded on nearby properties.

The following are some general conclusions related to bird and mammal activity on the property (Bruner 1990). All representative types of habitat found on the property were censused. The more densely forested coastal sections of the property support

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Awake'e/Maniniowali Land Exchange

the greatest number of birds. The more open lands were virtually devoid of avifauna, except the Warbling Silverbill (Lonchura malabarica).

The Awake'e site, particularly the makai section with its anchialine ponds, is more valuable habitat for wildlife than property located to the north. Native birds such as the Black-crowned Night Heron and the Black-necked Stilt rely on these wetlands for foraging and nesting. Exotic birds likewise depend on these ponds for drinking water and forage in the dense vegetation surrounding the ponds.

The property supports the normal array of exotic species of birds one would expect in this type of environment in Hawaii. However, some species typically found in this habitat were not recorded. This could have been due to the fact that the survey was too brief, or that they went undetected, or a combination of these and other factors. The low numbers of some species may be attributed to lack of specific food resources, such as flowering kiawe trees.

In order to obtain more definitive data on mammals, a trapping program would be required. However, the brief observations obtained on this survey did not find that the numbers of feral mammals differed dramatically from data gathered on other faunal surveys in similar habitats in West Hawaii.

J. Noise

Sources of noise at the adjacent parcels will be from coastal "surf" noise and vehicular traffic noise along the Queen Ka'ahumanu Highway.

Noise arising from flight aircraft originating from Keahole Airport, located approximately four miles to the south of the subject parcels, is not expected to adversely impact either Awake'e or Maniniowali.

The State Department of Transportation, Airports Division and the State Land Use Commission have set standards for developments situated nearby airports. The standards require a noise easement for areas where Ldn levels exceed 55. For areas where Ldn levels exceed 60, sound attenuation measures are required in residential and condominium developments. In areas exceeding 65 Ldn, residential and resort condominium units are prohibited. Maniniowale and Awake'e are not located within the areas projected to exceed noise levels of 55 Ldn by 1990.

K. Air Quality

There are no air quality monitoring stations in the West Hawaii region. The Department of Health maintains monitoring stations in Hilo and Honoka'a, about 60 miles east-south east of the site, but the data collected are specific to those localities and cannot be correlated to the subject properties. There are no large stationary sources or heavy vehicular traffic in the area. The County does not monitor key automobile pollutants, such as carbon monoxide (CO) and nitrogen oxide (NOx). At present the largest intermittent contributor to air pollution is eruptive activity at Kilauea volcano.

ENVIRONMENTAL ASSESSMENT
Awake'e/Maniniowali Land Exchange

L Visual Resources

The shoreline of Awake'e and Maniniowali are characterized by lava and rock outcrops and white cobble beaches. Besides the shoreline areas, the primary visual feature of either Awake'e and Maniniowali *ahupua'a* is the Pu'u Kuili cinder cone. It is prominently visible from the north and south approaches of the parcels along the Queen Ka'ahumanu Highway.

The total area of either parcel is not visible from the Queen Ka'ahumanu Highway because that section of the highway corridor and the adjoining land are relatively level. The slope from the mauka property line of both parcels is moderate down to the ocean, allowing excellent ocean views from most portions of the parcels, and especially from the slopes of Pu'u Kuili.

M Archaeological and Historical Resources

Previous Archaeology of Awake'e and Maniniowali

Awake'e *ahupua'a*, located south of Maniniowali *ahupua'a*, was surveyed by Donham in 1987. Eighty-four archaeological sites, consisting of 239 features, were recorded. Seventy-five percent of the sites were located within 300 meters from the shoreline. Donham interpreted nine of the coastal sites as permanent habitation sites. Twenty-four inland sites, including overhang shelters, depressions, and agricultural-type features, were interpreted as temporary habitation sites.

Makalawena *ahupua'a*, located south of Awake'e *ahupua'a* was surveyed by Donham in 1986. Forty-nine archaeological sites, consisting of 121 features, were recorded. Coastal habitation sites were identified as historic. Due to storm wave destruction and historic influence, there is a lack of permanent habitation prehistoric sites along the coast. Evidence of prehistoric sites is best indicated by temporary habitation and shelter sites located inland (Donham 1986).

Previous archaeological surveys within the project area in Maniniowali were conducted by Soehren (1982), Cordy (1986), and Athens (1989). A total of 131 archaeological sites were identified, consisting of 2,703 features. While Soehren and Cordy concentrated in the coastal areas, Athens conducted a survey from the coast inland to Queen Ka'ahumanu highway. Results from these surveys indicated that the majority of sites were concentrated in the coastal zone. These sites were defined as permanent habitation complexes and ceremonial features. Further inland, the density of sites decreased. Sites within the inland zone included overhang shelters, C-shapes, and pits. These sites were interpreted as temporary habitation. Trails linked the coastal sites with the inland sites.

Kuki'o *ahupua'a*, located north of Maniniowali *ahupua'a*, was surveyed by Walker in 1985. Sixty-nine archaeological sites, consisting of 178 features, were recorded. Forty-seven percent of these sites were located near the shoreline. Inland sites, including overhang shelters, were interpreted as temporary habitation sites.

ENVIRONMENTAL ASSESSMENT
Awake'e/Maniniowali Land Exchange

Based on Archaeological, ethnological, and ethnohistorical information, the general settlement pattern for North Kona is characterized by three major zones (Rosendahl 1973:60-61): a narrow, arid coastal habitation zone associated with exploitation of various marine resources; a sloping, barren middle zone characterized by exposed A'a and pahoehoe, and devoid of soil and vegetation other than grasses; and an upland habitation zone associated with agricultural exploitation.

Archaeological information from the subject parcel and adjoining *ahupua'a* supports the above generalized settlement pattern. Each *ahupua'a* exhibited permanent coastal habitation sites and temporary inland habitation sites. Differences between each *ahupua'a* was feature specific. Makalawena sites indicated a historic influence and a lack of prehistoric component on the coast, but inland sites continued to contain temporary habitation sites. Maniniowali contained long, narrow enclosures along the coast, interpreted as habitation and canoe houses. Awake'e had an increase in C-shapes and U-shapes, but a decrease in enclosures compared to Maniniowali.

Awake'e

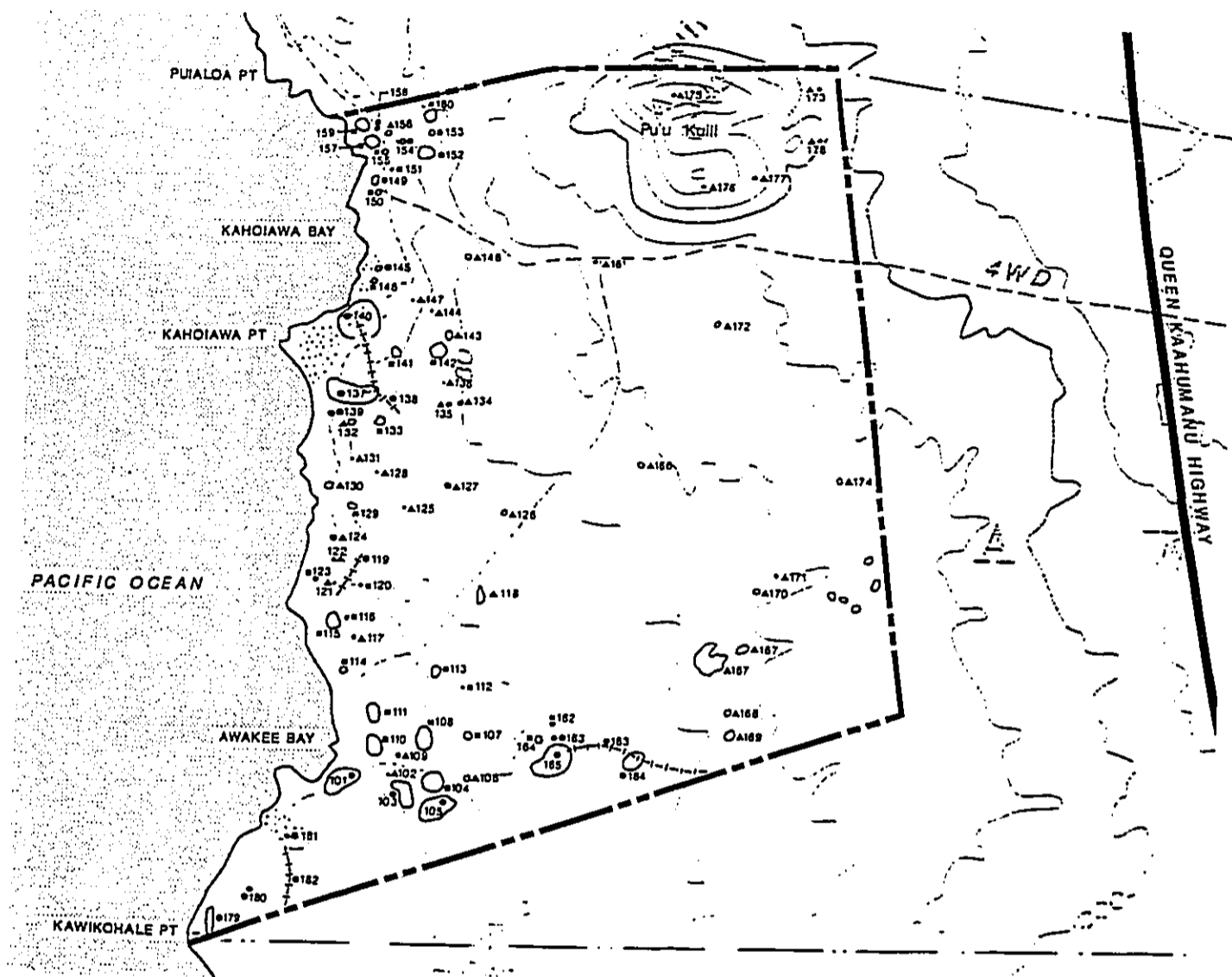
A total of 84 archaeological sites with 239 component features were identified in Awake'e (Rosendahl, 1986). These sites are shown on Figure 9.. Sixty-three sites (153+ component features) were located within the immediate coastal zone extending to approximately 1,000 feet inland, an area of about 125 acres. Tentative functional site types included habitation features, possible agricultural features, possible burials, religious, transportation, aquacultural, recreation, and sites of indeterminate function.

Twenty-one sites (86+ component features) were found to be located within the inland portion of Awake'e, an area of approximately 225 acres. Tentative functional site types included possible agricultural features, a recent jeep road marker, ceremonial, habitation, transportation, survey markers, and sites of indeterminate function.

A total of 28 formal types are represented among the 239 features recorded. Over half of these features are accounted for in seven formal categories: cairns, C-shaped wall shelters, wall shelters, cave shelters, terraces, platforms, and enclosures.

Most of the sites and features are concentrated near the shoreline, in the immediate coastal zone (extending to approximately 1,000 feet inland). Within this coastal zone, multiple component habitation site complexes and features appear concentrated in the vicinity of Kahioawa Point, Kahioawa Bay, and Awake'e Bay. The inland portions of Awake'e have a distinct paucity of sites and features, with the exception of multiple component site complexes and features situated along or near Site T-183, a coastal-inland oriented foot trail.

This distribution of sites conforms to the general pattern of early Hawaiian settlement that has been reconstructed on the basis of archaeological, ethnohistoric, and ethnographic sources for the portion of North Kona to the north of Kailua.



LEGEND

- To Be Retained
- ▲ Further Data Collection Necessary
- No Further Work Necessary

Archaeological Sites - Awake'e
MANINOWALI/AWAKE'E LAND EXCHANGE

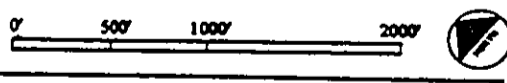


FIGURE 9

ENVIRONMENTAL ASSESSMENT
Awake'e/Maniniowali Land Exchange

The total environmental setting is characterized by three major zones: a narrow, arid coastal habitation zone associated principally with the exploitation of various marine resources; a sloping, barren middle zone characterized by exposed A'a and pahoehoe lava rocklands and largely devoid of soil or vegetation other than grasses; and an upland habitation zone associated with agricultural exploitation. A forest zone, still further inland, was also exploited but not inhabited. The sites and features identified within Awake'e evidence the occupation of the narrow coastal zone, and the movement of people and produce along the foot trails through the barren intermediate zone that connected the coastal and further inland areas of habitation and exploitation.

The significance of archaeological remains can be defined in terms of potential research, interpretive, and/or cultural values. Based on the findings of the full reconnaissance survey, the archaeological remains found within Awake'e appear to be, for the most part, of limited to moderate significance in terms of potential scientific research, interpretive, and cultural values. Specific exceptions to this general evaluation are the following sites:

- T-101 Complex--high research and interpretive values for habitation complexes with cultural deposit, unique architectural features and nearby associates structural features.
- T-103 Complex--high research and interpretive values for habitation complex, due to unique architectural feature (possible small holua slide) and nearby associated structural features;
- T-104 Complex--high research, interpretive and cultural values for habitation complex due to cultural deposit, unique architectural features, and nearby associated structural features;
- T-105 Complex--high research and cultural values, due to possible burial features and numerous associated structural features.
- T-137 Complex--high research, interpretive, and cultural values for habitation complex, due to presence of cultural deposits, possible shrine feature, and nearby associated foot trails;
- T-139 Complex--potentially high research, interpretive, and cultural values, due to possible shrine features;
- T-140 Complex--high research and interpretive values for habitation complex, due to presence of cultural deposits, associated T-138 foot trail, and numerous associated structural features;
- T-145 Modified terrace/outcrop--potentially high research, interpretive, and cultural values, due to possible shrine feature;
- T-152 Complex--potentially high research and cultural values for cairns, due to possible human remains;

ENVIRONMENTAL ASSESSMENT
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- T-163 Collapsed platform--potentially high research and cultural values, due to possible human burial;
- T-165 Complex--high research, interpretive, and possibly cultural values for habitation complex, due to numerous associated structural features, association to Site T-183 foot trail, and numerous associated structural features;
- T-184 Complex--high research, interpretive, and possibly cultural values for habitation complex, due to numerous associated structural features, association to Site T-183 foot trail and possible human burials;

Various foot trails (T-119, -138, -182, and -183)--potentially high interpretive value, as well as cultural value (in terms of traditional access rights).

Anchialine pond complex (T-179, -180 and -181)--potentially high research (T-179, -181), interpretive, and cultural values, especially in association with the nearby T-101 complex.

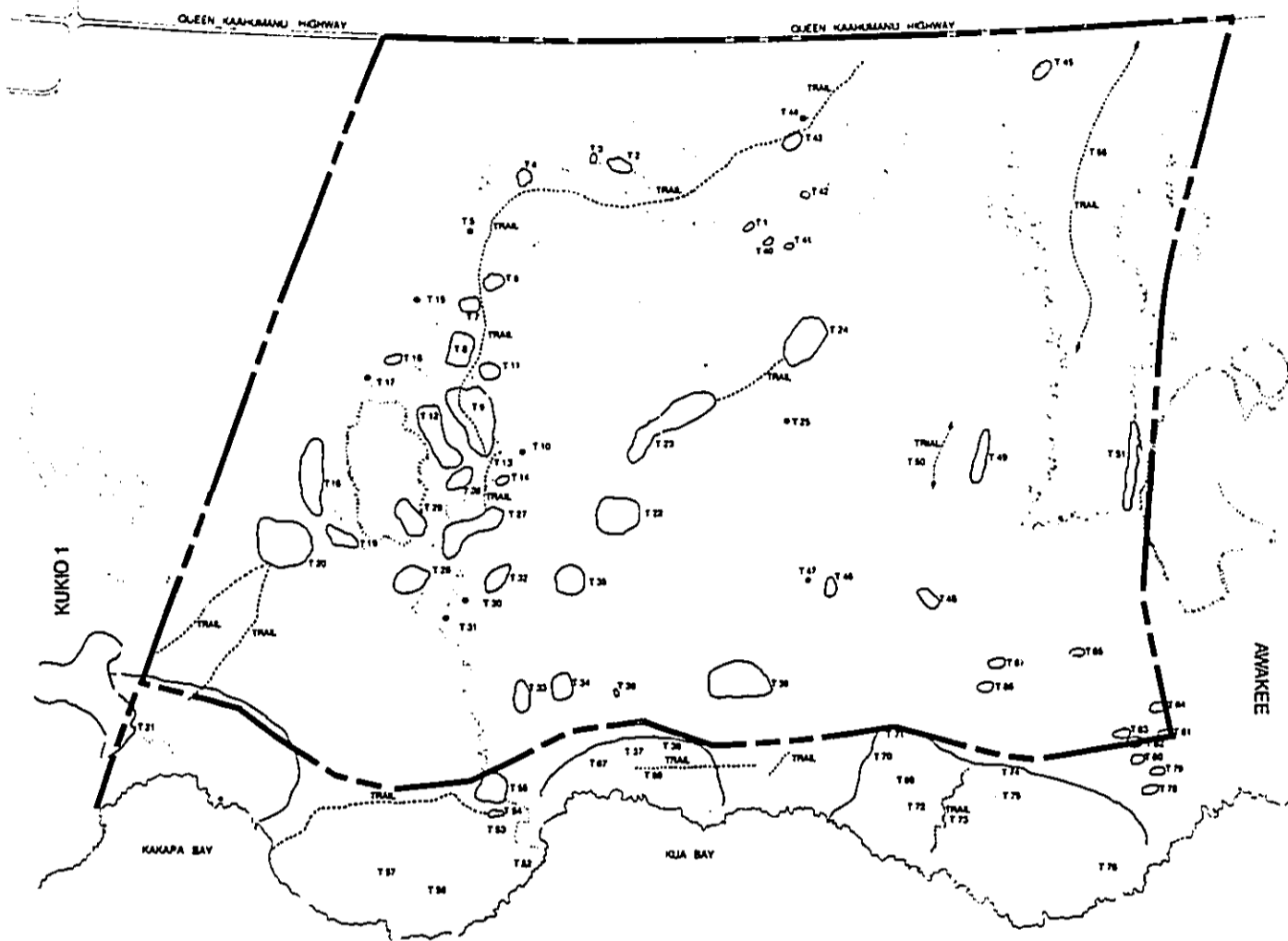
Maniniowali

The Applied Research Group, Bishop Museum, conducted a field assessment (September 26-28, 1990) within the project area in order to evaluate previously recorded archaeological sites. Bishop Museum relocated and evaluated sites recorded by Athens (1989), and identified previously unrecorded sites and features. Once a site was identified, each feature was examined and its significance was assessed. Site areas were redefined and plotted using new temporary numbers (T-1 through 86).

Several sites recorded by Athens (1989) were redefined and grouped together into single, larger complexes. This process allowed the identification of preliminary preservation precincts and coastal site clusters. The field assessment identified enclosures, overhang shelters, habitation features, agricultural features, pavements, pits, mounds, alignments, cairns, C-shapes, lava tubes, burials, petroglyphs, trails and a possible ceremonial structure.





During the field survey, it was noted that extensive looting occurred at several sites, especially areas along the coast. Lava tube shelters were vandalized, evidenced by backdirt piles located outside the shelter entrances. Since large amounts of midden and artifacts were mixed in the backdirt piles, they will need to be further examined.

Table 1 (included in Appendix D) lists the significance evaluations for each archaeological site within the project area. All sites are shown in Figure 10. All of the recorded sites meet Criterion D of the National Register Criteria for Evaluating Significance of Historic Properties. Other applicable significance criteria are listed to sites with specific features which include burials or ceremonial structures. A brief description of each major archaeological site and complex is included below.



Source: Bishop Museum

LEGEND

-  A'a Flow
-  Pu'u
-  Trail
-  Site Boundary

Archaeological Sites - Maniniowali
 MANINIOWALI/AWAKE'E LAND EXCHANGE

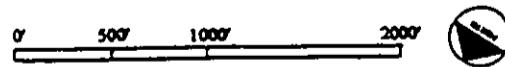


FIGURE 10

ENVIRONMENTAL ASSESSMENT
Awake'e/Maniniowall Land Exchange

Site T-21 Coastal Habitation Complex

This complex located in the area surrounding Kakapa Bay, consists of over 300 features including enclosures, overhang shelters, C-shapes, cairns, trails, pavements, pits, mounds, alignments, petroglyphs, possible burials and a possible ceremonial structure. According to Hannah Springer (personal communication), burials are located in this site complex. While surveying the northwest area of this complex, petroglyphs were discovered on a pahoehoe outcrop. Two human figures holding spears over their heads were recorded. Along this pahoehoe flow were numerous lava tubes that may contain burials.

Located approximately 20 meters inland from the coral beach at Kakapa Bay and at the base of an a'a lava flow is a large rectangular enclosure. This feature is approximately 10 meters long and 8 meters wide. Rectangular pahoehoe slabs, that may have been artificially shaped, define the base of the west wall. The structure is constructed of a'a cobbles and boulders, and the walls are core-filled. In plain view, the structure is notched (northeast corner), which is uncommon, if not unique to Hawai'i Island. This feature probably served as a ceremonial function. An excavated depression was observed inside the structure probably caused by looters.

Sites T-52, 53, 54 55, 67, 37, 38 Anchialine Pond and Associated Features

This complex is located along Kua Bay and consists of numerous features including an anchialine pond, a canoe house, trails, enclosures, platforms, and other habitation features. Due to previous grading disturbance, numerous features were destroyed or impacted including the anchialine pond. The pond has been partially covered by A'a lava while associated features nearby have also been impacted.

Several overhang shelters along the coast have been looted as indicated by backdirt piles outside the overhang entrances. These piles are mixed with abundant midden and artifacts, and will need to be examined.

Site Complex T-69, 70, 71, 72 73, 74, 75 Coastal Habitation Complex

Seven sites, located along Puialoa Point, were grouped together into one site complex. Archaeological features within this complex include a canoe house, enclosures, overhang shelters, trails, pits, alignments, pavements, lava tubes, mounds, and cairns. Numerous shelters contained midden and artifacts. Several of the mounds and lava tubes may contain burials, as indicated by scattered coral and upright slabs.

Site T-20 Temporary Habitation and Trails

This complex is located in the north end of the subject parcel at the northwest base of a cinder cone. It consists of overhang shelters, mounds, pits, and two parallel trails marked by crushed as and coral markers. These trails extend west to Site T-21 where they intersect with the "King's Trail."

ENVIRONMENTAL ASSESSMENT
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Sites T-23 and T-24 Temporary Habitation and Burials

This complex, located in the central area of the subject parcel on a pahoehoe outcrop, consists of lava tube shelters, walls, C-shapes, quarries, mounds, a trail, and burials. Site T-23, a complex of temporary habitation features, connects to Site T-24 by a trail. While investigating a lava tube at Site T-24, burials were discovered down a long tube extension. The tube opened into a large cavern where ten burials were identified. One of the burials was placed in a canoe, and two other burials were bundled. Other burials were seen in tubes extending away from the cavern. Some of the burials date to the historic era evidenced by a mirror and wood pipe associated with one of the burials. There is a probability of additional burials in the area indicated by the numerous lava tubes.

Maniniowali Archaeological Sites Recommended for Preservation

Sites recommended for permanent in-situ preservation include both the coastal habitation complexes and the inland burial sites and trails. Due to the density of sites located along the coastal zone, preservation of site complexes is necessary for future research, education, and interpretation. The recommended preservation coastal habitation complexes include Sites T-21, T-37, T-38, T-52, T-53, T-54, T-55, T-67, T-69, T-70, T-71, T-72, T-73, T-74, and T-75. In addition to these sites, the "King's Trail" is recommended for preservation. The location of the proposed exchange boundary on the makai portion of the Maniniowali site has generally been placed along the mauka boundary of the various coastal habitation complexes identified by Bishop Museum (September 1990).

Sites recommended for permanent in-situ preservation in inland areas include Sites T-20, T-23, and T-24. Site T-20 includes the cinder cone and mauka-makai trails, and Sites T-23 and T-24 contain burials. Each of these sites would remain within the privately owned segment of the Maniniowali lands, and their preservation should be accommodated under any future use of the land.

N. Infrastructure and Services

The existing conditions of the public infrastructure and services are identified in this section. Portions of this section have been extracted or summarized from the following reports: *West Hawaii Regional Plan* (Office of State Planning, November 1989), and the Preliminary Engineering Report for the Proposed Awake'e Resort Development (Wilson Okamoto & Associates, Inc.; November 1986) prepared for the Environmental Impact Statement (1986).

Roadways: The major roadway providing access to both Awake'e and Maniniowali is Queen Ka'ahumanu Highway. Queen Ka'ahumanu Highway is a two-lane, Class I, State Highway, designed for a 70-mile per hour vehicle speed. It is a limited access highway within a 300-foot right-of-way. Dedicated in 1975, the highway extends 38 miles along the North Kona and South Kohala coast from Kawaihae to Kailua-Kona. Of the two parcels, only Maniniowali has legal access from Queen Ka'ahumanu Highway.

ENVIRONMENTAL ASSESSMENT
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Potable Water: The closest developed water source south of the subject parcels is the North Kona system which consists of four wells, a well at Holualoa and a shaft at Kahaluu. The capacity of this system is 11.4 million gallons per day (gpd), with a current usage at about 50 percent of this capacity.

Wastewater: Presently, there are no wastewater collection, treatment and disposal facilities in the Awake'e area. The closest public sewerage system is a small 0.04 mgd package treatment plant maintained by the State of Hawaii at the Keahole Airport to serve airport operations.

A new wastewater treatment facility with a design capacity of 2.8 mgd is currently being designed for a site near the Honokohau Harbor. This plant is intended to replace the Kailua-Kona Treatment Plant, servicing the Kailua-Kona area and limited sections of Alii Drive. The distance between Awake'e and Maniniowali and the future sewage treatment facility is approximately 10 miles.

Stormwater Drainage: The geologic formation in the subject area generally comprised of highly permeable rocks of the Hualalai volcanic series, the last active flow of which occurred in 1800-1801. This highly permeable formation lacks definitive drainage ways, indicating that surface runoff is virtually non-existent.

Drainage areas mauka of the highway and immediately above the subject parcels were designated in a 1971 drainage study for the planning and design of the Queen Ka'ahumanu Highway as Drainage Basins 2E, 2F and 2G with runoff volumes of 60 cfs, 10 cfs, and 110 cfs respectively. Based on this analysis, three pipe culverts were installed under the highway mauka of Awake'e to accommodate storm runoff.

Solid Waste Disposal: It is estimated in the *West Hawaii Regional Plan* that for the next three to four years, the requirements for solid waste disposal can be met by the County sanitary landfill at Kealakehe in Kailua. When this municipal landfill reaches its capacity, a new landfill site proposed for Puuanahulu will be opened. The Puuanahulu landfill is expected to serve the needs of the area for many years.

Electrical Power: Existing electrical service in the surrounding area is provided by Hawaii Electric Light Company (HELCO) via a 69-KV overhead transmission line located approximately 3,000 feet mauka of Queen Ka'ahumanu Highway.

Communications:

i. **Telephone:** Existing telephone service to the surrounding area is provided by Hawaiian Telephone Company. They share the same utility corridor with HELCO facilities. Telephone service can be supplied to the project utilizing HELCO poles or by sharing direct burial trenches and concrete encased ducts for electric lines.

ii. **Postal Service:** A total of 33 post offices and stations are located around the island. The federal post office nearest to the project area is located in Kailua-Kona.

ENVIRONMENTAL ASSESSMENT
Awake'e/Maniniowali Land Exchange

Police: Police protection for North Kona is provided by the Hawaii County Police Department from its new regional headquarters in Kealakehe, about seven miles south of Awake'e and Maniniowali.

Fire: The Hawaii County Fire Department would provide fire protection services to Awake'e and Maniniowali out of the Kailua-Kona station, with an approximate response time of 10 to 15 minutes. The Kailua-Kona Station is located on Palani Road above the Queen Ka'ahumanu intersection approximately 11 miles from the subject parcels. It is presently composed of one engine company, one ladder company, one tanker, a medical unit and a rescue boat. The current staff is 16 firefighters. A crash/rescue unit is maintained by the State Airports Division at the Keahole Airport; however, the equipment and personnel are restricted to airport emergencies.

Health Care Services: Emergency ambulance service is provided by the State Department of Health. Advanced life support ambulance units are located at the Lucy-Henriques Medical Center in Waimea (two holding beds, X-ray), the Kailua-Kona Fire Station, and at the Captain Cook Fire Station. The Kona Hospital houses a basic life support ambulance unit. The Kailua-Kona Fire Station is equipped for off-shore emergencies.

The State Department of Health administers the Kona Hospital located in Kealakekua. Built in 1975, the 83-bed skilled nursing facility provides both acute and intermediate level care to Kona residents. The hospital is reaching its capacity and funding to expand the number of available beds has been requested.

Schools: The North Kona District is serviced by three public schools and two private schools. The major public high school for the region, Konawaena, is located in Captain Cook, south of Kailua-Kona. Awake'e and Maniniowali would be serviced by Kealakehe Elementary (K-5), Kealakehe Intermediate (6-8), and Konawaena High School (9-12).

Recreational Facilities: Recreational facilities in North Kona are extensive, including: a golf course, beaches, small boat harbors, historic sites, hunting areas and other amenities and attractions. The district has three County beach parks (Kahaluu, Pahoehe and White Sands), the Old Kona Airport State Park, and the Hulihee Palace State Monument. Throughout the district are numerous historic sites, including fishponds, trails, heiaus and buildings. The U. S. Army Corps of Engineers has established wetlands at Honokahau and Kiholo Bay. Several hiking trails are also available in the North Kona District. Bikeways are proposed throughout most of the district.

SECTION V

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**V. IDENTIFICATION AND SUMMARY OF MAJOR IMPACTS
AND ALTERNATIVES CONSIDERED**

A. Identification of Major Impacts

The proposed action represents the exchange of two parcels of land of similar value; this action is not expected to create any adverse environmental impacts. Any impacts which may result from the applicant's future use of the acquired land at Maniniowali, or the State's future use of Awake'e, should this land exchange be finalized, will be subject to the requirements of Chapter 343, HRS.

B. Alternatives to the Proposed Action

Two alternatives to the proposed land exchange are presented in this section. These include the no action alternative and an exchange for lands at an unspecified mauka site. A brief discussion of each alternative is included below.

i) No Action Alternative

If the land exchange is denied, or the Applicant decides to withdraw the request, the existing situation of ownership at Awake'e and Maniniowali would continue to the present. The undeveloped coastal lands would continue to be generally unutilized, except for access by some recreational users. No further expenditure of resources by the Applicant or the State of Hawaii would be required, under this alternative.

The substantial public benefits of the proposed land exchange would not be realized under the No Action Alternative. There would continue to be a large privately owned section of land at Awake'e adjacent to the sensitive coastal lands of Makalawena. The creation of a Wilderness Heritage Park along this section of the coast, including the establishment of a continuous coastal trail, would be interrupted by the private land. The significant natural features of the Awake'e site, including Pu'u Kuili and the 18 anchialine ponds, would remain under private ownership and control. Access to the shoreline at Awake'e would also be limited by the private landowner due to potential liability concerns. The potential benefits of private participation in funding environmental protection programs and developing public facilities for this area would not occur under this alternative.

ii) Exchange for Mauka Land

An exchange of land at an unspecified mauka site is the second alternative. The Applicant's intent is to provide a modest sized residential project which would include an 18 hole golf course and clubhouse, tennis courts and a low density residential subdivision. The commercial and other ancillary services and facilities generally required of a stand-alone development would not be provided. Rather, the facilities and amenities of an adjoining commercial center such as a resort would be utilized. Thus, the concept envisioned by the Applicant requires a location near an economic center with a variety of retail, recreational and social opportunities.

ENVIRONMENTAL ASSESSMENT
Awake'e/Maninowali Land Exchange

Marketing of the residential units will target upper-class buyers who will likely be second home purchasers who would be attracted to an area with the amenities offered by the destination resorts such as are planned for the Kaupulehu/Kona Village/ Kukio Resort node. Therefore, a land exchange for mauka land inconvenient to amenities would not be economically feasible for the development.

SECTION VI

ENVIRONMENTAL ASSESSMENT
Awake'e/Maniniowali Land Exchange

VI. PROPOSED MITIGATIVE MEASURES

The proposed land exchange is not expected to create any adverse environmental impacts, therefore, no mitigative measures are required. The potential impacts of the future use of Maniniowali, should the exchange be completed, will be subject to the requirements of Chapter 343, HRS, as part of the application review process for any type of proposed project.

SECTION VII

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**VII. DETERMINATION, FINDINGS AND REASONS SUPPORTING
DETERMINATION**

Based on the information gathered and reviewed in the preparation of this Environmental Assessment, it has been demonstrated that the proposed action, an exchange of two parcels of land of similar value and characteristics, will not create any adverse environmental impacts. There is no justification to further evaluate the potential environmental impacts of the proposed land exchange through the preparation of a Draft Environmental Impact Statement. It is the position of the Applicant that issuance of a Negative Declaration by the State of Hawaii Board of Land and Natural Resources for this Environmental Assessment would be the appropriate decision on this matter.

APPENDIX A

**BASELINE ASSESSMENT OF THE MARINE AND ANCHIALINE
POND ENVIRONMENTS AT AWAKE'E, NORTH KONA, HAWAII**

Prepared for

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By

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October 2, 1990

INTRODUCTION

Planning is presently underway for a land swap of approximately 350 acres of privately owned open land (Awake'e Parcel B) for an adjacent parcel of State owned land (Awake'e Parcel A). These lands are situated on the west coast of the Island of Hawaii, approximately 11 miles north of Kailua-Kona (see Figure 1).

As one prerequisite of facilitating the land swap, it has been deemed necessary to conduct a baseline assessment of the marine and anchialine pond environments located on, and adjacent to, the Awake'e Parcel B property. The major objective of the environmental assessment is to establish qualitative and quantitative baseline information to accurately depict the community structure of the indigenous populations inhabiting the areas offshore of Awake'e, as well as the anchialine ponds. Marine community structure can be defined as the abundance, diversity, and distribution of stony and soft corals, other attached benthic fauna and flora such as benthic algae, motile benthos such as echinoderms, and pelagic species such as reef fish and sea turtles. Pond biota consists of fish, crustacea, mollusks, algae, and vascular plants. The marine and pond environments at Awake'e were assessed in a baseline survey conducted by Marine Research Consultants in 1986. Whenever possible, surveys were conducted in the same areas in the 1990 survey as in the 1986 survey.

METHODS

Marine Community Structure

All fieldwork was carried out on September 23, 1990, and was conducted from a 26-foot boat. Biotic structure of benthic (bottom dwelling) communities inhabiting the reef environment was evaluated by establishing a descriptive and quantitative baseline between the shoreline and the 20 m (~60 foot) depth contour. Initial qualitative reconnaissance surveys were conducted that covered the entire area off Awake'e property from the shoreline out to the limits of coral reef formation. These reconnaissance surveys were useful in making relative comparisons between areas, identifying any unique or unusual biotic resources, and providing a general picture of the physiographic structure and benthic assemblages occurring throughout the region of study.

Following the preliminary survey, three quantitative transect sites were selected offshore of the development area (see Figure 1). Station 1 was located just seaward of the land boundary separating the Awake'e "A" and "B" parcels; Station 2 was located just to the south of Kahoiawa Point; and Station 3 was located at Awake'e Bay.

At each station, three transect sites were selected, one in each of the dominant reef zones. Each transect was oriented parallel to depth contours so as to bisect a single reef zone. Care was taken to place transects in random locations that were not biased toward either peak or low coral cover. In total, nine transects were conducted in the 1990 baseline survey.

Quantitative benthic surveys were conducted by stretching a 50 meter long surveying tape in a straight line over the reef surface. An aluminum quadrat frame, with dimensions of 1 m by 0.66 m, was sequentially placed over 10 random marks on the transect tape so that the tape bisected the long axis of the frame. At each quadrat location a color photograph recorded the segment of reef area enclosed by the quadrat frame. In addition, a diver knowledgeable in the taxonomy of resident species visually estimated the percent cover and occurrence of organisms and substratum type within the quadrat frame. No attempt was made to disturb substrata to observe organisms, and no attempt was made to identify and enumerate cryptic species dwelling within the reef framework. Only macrofaunal species greater than approximately 2 centimeters were noted.

Following the period of fieldwork, quadrat photographs were projected onto a grid and units of bottom cover for each benthic faunal species and bottom type were recorded. Results of the photo-quadrats were combined with the in-situ cover estimates and community structure parameters (percent cover, species diversity) were calculated. The photo-quadrat transect method is a modification of the technique described in Kinzie and Snider (1978), and has been employed in numerous field studies of Hawaiian reef communities (e.g. Dollar 1979, Grigg and Maragos 1974), and has proven to be particularly useful for quantifying coverage of attached benthos such as corals and large epifauna (e.g., sea urchins, sea cucumbers).

Quantitative assessment of reef fish community structure was conducted in conjunction with the benthic surveys. As the transect tape was being laid along the bottom, all fish observed within a band approximately 2 meters wide along the transect path were identified by species name and enumerated. Care was taken to conduct the fish surveys so that the minimum disturbance was created by divers, ensuring the least possible dispersal of fish. Only readily visible individuals were included in the census. No attempt was made to seek out cryptic species or individuals sheltered within coral. This transect method is an adaptation of techniques described in Hobson (1974).

Anchialine Ponds

Location of all anchialine ponds was determined walking the shoreline and coastal zone as part of the 1986 survey. Each pond was numbered and classified into one of three pond types. The length and width of each pond was measured with a tape measure, and the area was calculated based on the closest geometric shape. Pond depth (to rocky bottom) was measured with a yardstick. In ponds with substantial sediment accumulation, depth of sediment was measured by inserting the yardstick into the sediment until solid substratum was reached.

Pond biota were assessed by inspecting each pond and noting conspicuous fauna and flora. Organisms inhabiting ponds were identified and qualitatively enumerated. Ponds were disturbed as little as possible during data collections; thus any organisms inhabiting the sediment column were not censused. There were, however, indications that the ponds with deep sediment layers were anoxic

(having the odor of reduced sulfides), thereby eliminating any macrofauna. All pond surveys were conducted during daylight hours, so organisms that are primarily visible only at night may have been underestimated.

RESULTS AND DISCUSSION

Physical Structure

The shoreline and intertidal area of the subject property consists predominantly of low basaltic boulder slopes interspersed with crescent-shaped pocket beaches. The beaches are composed of rounded cobbles and coarse sands which extend into the intertidal area. The southern extreme of the property (south of Awake'e Bay) is different than the area to the north in that a berm of white coral rock separates the ocean from a low-lying back-beach area containing a multitude of anchialine ponds. The berm is formed by shoreward transport of coral skeletons that are torn from the reef surface by storm surges. North of Awake'e Bay the shoreline is somewhat elevated, preventing the formation of tidepools and anchialine ponds.

The structure of the offshore environment at Awake'e conforms to the pattern that has been documented as characterizing much of the west coast of the Island of Hawaii (Dollar 1982). The zonation scheme consists of three predominant regions; at Awake'e the zonation scheme is compressed into a relatively narrow band (about 300 m wide) between the shoreline and the sand slope that extends to abyssal depths.

Beginning at the shoreline and moving seaward, the shallowest zone is comprised of a flat basaltic shelf that is the underwater continuation of the island landmass. In areas offshore of basaltic shoreline cliffs, the nearshore marine zone is often covered with large boulders that have entered the ocean after breaking off from the shoreline. In areas fronting shoreline beaches, boulder cover is not as prominent. This nearshore zone receives most of the force of breaking waves and surge, and as a result is inhabited only by organisms capable of withstanding these stresses on a regular basis. Depth of the nearshore boulder zone extends to approximately 15 feet.

Seaward of the nearshore boulder zone, bottom structure is composed predominantly of a gently sloping reef bench. In some areas, particularly in the southern regions of the property off Awake'e Bay, the bench is characterized by high relief in the form of pits, ledges and pinnacles. Water depth in this mid-reef zone ranges from about 20 to 40 feet. As wave stress in this region is substantially less than in the shallower areas, and suitable hard substrata abounds, the area provides an ideal locale for colonization by attached benthos, particularly reef corals.

The seaward edge of the reef platform (at a depth of about 50 feet) is marked by an increase in slope to an angle of approximately 20-30 degrees. In the deep slope zone, substratum type changes from

the solid continuation of the island mass to an aggregate of generally unconsolidated sand and rubble. Moving down the reef slope, coral settlement and growth ceases at a depth of approximately 80 feet; beyond this depth the bottom consists entirely of sand.

Water Chemistry

The scope of the present field survey did not include water chemistry analyses. Descriptively, the nearshore waters off Awake'e are classed by the State Department of Health as AA, and can be considered pristine. Lack of suspended material results in extreme water clarity. There are no streams entering the sea along the development frontage, but there is evidence of high volumes of ground water extrusion, as is typical of the west coast of Hawaii. Groundwater extrusion can cause variation in water quality parameters close to the shoreline in localized areas. Awake'e Bay showed definite effects of groundwater discharge in the form a visible surface lens of low salinity water. The long-term data base for the surface water collected at the Natural Energy Laboratory of Hawaii (NELH) could provide a baseline for water chemistry constituents that would be applicable for the Awake'e site.

Biotic Community Structure

Benthic Invertebrate Communities

Table 1 shows abundance estimates of invertebrates observed throughout the region of study. The predominant taxa of macrobenthos (bottom-dwellers) throughout the reef zones off the Awake'e property are Scleractinian (reef-building) corals. Results of quantitative line transects conducted at the 15, 30 and 60 foot depths at each of the three survey sites provide a data base characterizing coral community structure. Table 2 shows the quantitative summary of coral community structure, while Appendix A is comprised of individual transect results. Figure 2 depicts coral community structure in histograms that are useful in showing relationships with respect to depth zone and station location.

In total, 10 species of corals were encountered on transects, while species number on single transects ranged from 3 to 7. Only 2 species of corals (Cyphastrea ocellina and Fungia scutaria) were observed in the study area that did not occur on any transects (see Table 1).

Comparing the three reef zones, coral cover was generally lowest in the nearshore reef zone (15 feet), ranging from 27% to 39%. However, the number of species (5-7), and species diversity were higher in the shallow regions compared to the deeper areas (see Figure 2). Such a distribution pattern reflects the relative harshness of physical conditions in the nearshore area, primarily in response to wave stress. Under prevailing physical conditions, no single coral species is able to monopolize substrata.

The most abundant species in the shallow reef zones were Porites lobata and Pocillopora meandrina. Both of these species appear to have the adaptive advantage of being able to settle and survive in areas of extreme water motion. The nearshore region at Stations 1 and 2 differed somewhat from Station 3. While the dominant substratum at Stations 1 and 2 was basalt, the bottom cover was predominantly limestone at Station 3 (see Table 2). The limestone bench was characterized by high relief in the form of pits, ledges, and pinnacles.

Transects conducted across the mid-reef zone at depths of 30 feet typically contained higher percentages of coral cover than the shallower station (36% to 66%). Because of increased water depth and distance offshore, reduced wave scour results in greater proportions of coral cover on the reef bench. The predominant species were P. lobata and P. compressa, which are by far the most abundant corals across the reef, and are responsible for much of the true "reef" accumulation in the mid-reef zone. The former species predominantly takes the shape of short, thick lobed colonies, while the latter occurs as interconnected mats of "finger coral". The increased capacity for coral growth of these species appears to skew coral distribution away from other species, resulting in lower diversity in this region as compared to the shallower areas.

In the deep slope zones (60 feet), living coral cover is highest (63% to 69%), while diversity is lowest. At the seaward edge of the reef bench, the slope of the bottom increases, and substratum consists primarily of unconsolidated rubble and sand. On the deep slopes, the entire coral community is comprised of only two species, P. lobata and P. compressa. On the deep reef slope, P. compressa assumes a spreading growth form that extends laterally over areas of unconsolidated substratum in a manner that is not possible by other species. Owing to a fragile skeletal growth form, however, this species is especially susceptible to breakage by storm waves. Observations of the deep reef zones revealed substantial levels (about 20%) of bottom cover consisting of rubble fragments composed of broken P. compressa branches. Such levels of rubble cover suggest a relatively recent storm event that resulted in substantial damage to the P. compressa mats.

Off Awake'e, the slope of the deep reef is somewhat less than other parts of the Kona Coast. Submerged lava flows encountered along much of the deep reef zone caused the bottom to be relatively flat compared to the normal reef slope angle of about 40°. As a result, coral cover on the 60 foot transects was dominated less by finger coral than in areas with steeper slopes (see Dollar 1982). Total coral cover, however, was relatively similar on the Awake'e transects compared to the control as a result of high cover of Porites lobata.

The other dominant genera of macroinvertebrates are the sea urchins (Echinoidea). Table 3 summarizes the occurrence of sea urchins at all of the survey stations, while Appendix B shows urchin abundance on each transect. The most common urchins are Echinometra matheai, Tripneustes gratilla, and Heterocentrotus mammillatus. E. matheai are small urchins that are found within interstitial spaces bored into basaltic and limestone substrata. E. matheai were most abundant at the 15 foot transects where the number of individuals ranged from 52 to 86. This species was least

abundant on the 60' transects where solid substrata was not common. T. gratilla and H. mammillatus occur as larger individuals that are generally on the reef surface, rather than within interstitial spaces. The most common location for these urchins was on reef bench (30') zone; these animals were rare on both the shallow nearshore terrace and the deep reef slope.

Sea cucumbers observed during the survey consisted of three species, Holothuria atra, H. nobilis, and Actinopyga obesa. Individuals of these species were distributed sporadically across the mid-reef and deep reef zones (Table 1). The most common starfish (Asteroidea) observed on the reef surface was the crown-of-thorns starfish (Acanthaster planci). Several crown-of-thorns were observed feeding on colonies of Pocillopora meandrina.

Frustrated benthic algae are conspicuously rare on the reefs of West Hawaii. Several plants were observed, however, off Awake'e. These included the brown algae Turbinaria ornata, and Padina spp. Encrusting red calcareous algae (Porolithon spp., Peysoneilia rubra, Hydrolithon spp.) are abundant on bared limestone surfaces, and on the nonliving parts of coral colonies.

The design of the reef survey was such that no cryptic organisms or species living within interstitial spaces of the reef surface were enumerated. Since this is the habitat of the majority of mollusks and crustacea, detailed species counts were not included in the transecting scheme. No dominant communities of these classes of biota were observed during the reef surveys at any of the study stations.

Reef Fish Community Structure

Results of fish transects are presented in Table 4. Reef fish community structure was largely determined by the topography and composition of the benthos. On individual transects, the ranges for species diversity, numbers of species, and numbers of individuals were 2.30-2.66, 19-33, and 146-460, respectively. A total of 1734 individuals representing 66 species were noted.

The reef fish community off Awake'e is typical of that found along most of the Kona Coast (Hobson 1974, Walsh 1984), and can be grouped into six general categories: juveniles, planktivorous damselfishes, herbivores, rubble-dwelling fishes, swarming tetrodons, and surge zone fishes.

Juvenile fishes belonged mostly to the family Acanthuridae (surgeon fishes), with representatives from the families Labridae (wrasses), Mullidae (goat fishes) and Chaetodontidae (butterfly fishes). Juveniles were most abundant on the deepest transects of the reef slope zone (60 foot) in areas dominated by finger coral (Porites compressa). The complex habitat created by the growth form of P. compressa provides shelter for small fish. Apparent storm damage to the mats of finger coral in the deep slope zone in many areas appeared to substantially lower the percentage of living finger coral. Because the coral framework was not completely flattened, habitat complexity was partially maintained in the

aftermath of the storm event(s). It is apparent that fish abundance is not related directly to composition of intact living coral, but rather to the degree of shelter afforded by coralline structures, whether alive or dead.

Planktivorous damselfishes, principally of the genus Chromis were abundant in all areas surveyed, and often comprised more than a quarter of the total number of individuals encountered along a transect. Chromis agilis and C. verator predominated at the outer edge of the shelf and in deeper water, whereas C. vanderbliti was the primary shallow water species.

Herbivores, primarily the acanthurids Zebrasoma flavescens and Ctenochaetus strigosus were also abundant. On the shallower reef terrace, adult Acanthurus olivaceus, A. nigrofuscus and scarids (parrotfishes) were also common. In areas where coral rubble was abundant, common fishes included the angelfish Centropyge potteri, and several species of wrasses, notably Pseudochillinus tetrataenia and P. octotaenia.

Surge zone fishes were not quantitatively assessed because of the difficulty in working on the wave-swept basalt terraces that these fish inhabit. Visual observations, however, revealed that this biotope supported a large number of fish, principally herbivores of the genera Kyphosus, Acanthurus, and Naso. The wrasses Thalassoma trilobatum and T. purpuraceum were also abundant in the surge zone. Few juvenile fishes were seen inhabiting the nearshore boulder zone environment. Triggerfish of the species Melanichthys niger and M. vidua were also observed congregating in the water column over the reef platform.

Several species of "food fish" (taken by subsistence and/or commercial fishermen) were observed during the survey. A large milkfish (awa, Chanos chanos) was seen congregating on the surface. Schools of several hundred individuals of goatfish (weke, Mulloidichthys flavolineatus), opelu (Decapterus macarellus), and blue-lined snapper (taape, Lutjanus kasmira) were observed while diving. Rocky ledges and large coral heads sheltered fair numbers of squirrelfish (u'u, Myripristes berndti). Other food fish included parrotfish (uhu, Scarus spp.); goatfish (moana kea, Parupaneus cyclostomus), jacks (papiro, Caranx melampygus), grand-eyed porgys (mu, Monotaxis grandoculis), and grouper (Cephalopholis argus). None of these species were particularly abundant. Orange-eyed surgeonfish (kole, Ctenochaetus strigosus), while abundant, were generally not large enough to be considered suitable for "food fish".

Overall, fish community structure at Awake'e is fairly typical of the assemblages found in undisturbed Hawaiian reef environments. The presence of large schools of some food fishes indicates that the area has been subjected to only moderate amounts of fishing pressure, both by aquarium fish collectors and fishermen. The apparent low levels of fishing are undoubtedly a function of the remote

location of the site with respect to shore access and the distance from the nearest harbor or boat launching facility.

Endangered and Protected Species

Three species of marine animals that occur in Hawaiian waters have been declared threatened or endangered by Federal jurisdiction. The threatened green sea turtle (Chelonia mydas) occurs commonly along the Kona Coast, and is known to feed on selected species of macroalgae. The endangered hawksbill turtle (Eretmochelys imbricata) is known infrequently from waters off the Kona Coast. While turtles undoubtedly occur in the nearshore areas off Awake'e, no individuals were observed during the course of the present survey.

Populations of the endangered humpback whale (Megaptera novaeangliae) are known to winter in the Hawaiian Islands from December to April. The present survey was conducted in September, when whales are not present in Hawaiian waters.

Anchialine Ponds

Anchialine ponds are shoreline pools without surface connection to the sea that contain water of measurable salinity, and which oscillate with tidal rhythm owing to inland extension of the oceanic water table. In the Hawaiian Archipelago, anchialine ponds exist almost exclusively along the shorelines of Hawaii and southwest Maui.

At Awake'e, a series of ponds is located at the southwestern corner of the property, between Awake'e Bay and Kawikohale Point. The pond system continues farther south on the adjacent property (Makalawena). The area where the ponds occur lies in an area of low topography behind a coastal berm composed mainly of coral rock. The lack of ponds on the northern portion of Awake'e appears to be a result of the relatively steep coastal topography.

Overall, the Awake'e pond environments had not changed appreciably between the 1986 and 1990 surveys. Eighteen ponds were identified within the Awake'e property in the 1986 survey. In addition, several depressions smaller than 2 feet in diameter containing water were encountered. Low areas that appeared to be old ponds, evidenced by white calcareous precipitate on the rocks, were also not included in the inventory.

While the ponds are concentrated in a small geographical area, and can therefore be considered a single system that exchanges water above and below ground, they are surprisingly diverse in size and type. Using the same size and depth classifications as MacIolek and Brock (1974), 4 of the Awake'e ponds are large (>1000 sq. ft.), 11 ponds are medium (100-1000 sq. ft.), and 4 are small (<100 sq. ft.). Four of the Awake'e ponds have "apparent" bottoms (depth to rock bottom) classified as shallow (<20 in.), 14 are moderate in depth (20-60 in.), and none can be classified as deep (>60 in.).

Ponds are also classified according to composition of the bottom. "A'a" ponds are depressions in lava rock with no growth of benthic macro- algae, and no sediment accumulation. "A'a" ponds are the most abundant type at Awake'e (12 of 18). "Orange crust" ponds are similar to a'a ponds except that the bottom rock is covered, at least in part, by orange-brown mineralized crusts of the blue-green algae Schizothrix sp.. Four of the ponds were classified as the "orange crust" type.

"Sediment" ponds contain bottom layers of unconsolidated mushy sediment up to 2 feet deep. No compositional analyses were performed on Awake'e sediments, although the material appears to be mainly the calcareous and organic residue of Schizothrix and other forms of algae. Deep sediments appeared to be anoxic owing to the odor of reduced sulfides, and ebullition of bubbles, possibly of methane. Two of the ponds at Awake'e had deep sediment layers.

One pond contained a surface mat of slimy green algae that appears to be an alternate growth form of Schizothrix. A berm of dried algal mat ringed the pond, apparently from periodic cleaning of the water surface. The reason for this cleaning activity is not known, but may have been to keep the pond functional as a fish enclosure.

Another pond occurred within a grove of milo (Thespesia populnea), and palm trees and had the characteristics of a marsh environment. Water depth was very shallow (6 in.) and the pond bottom consists of a mat of tree leaves, branches and other decaying plant material.

One common characteristic of all pond types is evidence of cultural modification. Many of the a'a ponds contained walls that divided the ponds into subsectors, or modified pond boundaries. As mentioned above, the large pond with a surface mat appeared to be systematically cleaned.

The salinity of ponds measured in 1986 was between 6 and 10 ‰, with a mean of 8.3 ‰. Maciolek and Brock report that the average salinity for all Kona coast ponds is 7 ‰, close to the average for the Awake'e system. There was a slight horizontal gradient in salinity, with the ponds closest to the shoreline having the highest salinity, while the pond farthest from the coastline had the lowest salinity. None of the ponds appeared to have vertical profiles in salinity. Salinity can be expected to oscillate with the tidal cycle; at high tide salinity will be maximized owing to greatest inland excursion of seawater.

Pond temperatures measured in 1986 averaged 24.8° C. and ranged from 23.3° to 26.5°. All measurements were made on an overcast day, so solar heating of ponds was minimized. Generally ponds farthest from the coastline, and ponds with no sediment, were cooler, apparently owing to higher rates of groundwater turnover.

All a'a ponds were essentially saturated with dissolved oxygen. Sediment ponds were supersaturated with oxygen from 110 to 190% owing to photosynthetic activity of algae and vascular plants. The single marsh pond had oxygen concentrations well below saturation (31%); a result of oxidative

decomposition of the detrital mat, and lack of benthic algal mat photosynthesis. pH mirrored dissolved oxygen in that ponds with high rates of photosynthetic activity had higher alkaline values, while the pond with active decomposition was more acidic owing to higher levels of CO₂. The average pH of all ponds was 8.26

While turbidity was not measured, all ponds appeared clear and transparent, with no suspended particulate loads. Even ponds with thick sediment layers and surface algal mats had clear water columns. The extensive and frequent exchange of water in the ponds apparently prevents suspended phytoplankton communities from developing to the point of visibly altering water clarity.

Anchialine pond biotic communities are characterized by a rather unique assemblage of organisms of relatively low species diversity. In the Awake'e ponds, the most ubiquitous plant groups are the orange algal crusts (Schizothrix). Ponds with substantial sediments contained the vascular plant Ruppia maritima, commonly known as widgeon grass. Ruppia roots in the sediment, and forms clusters that may be exposed at low tide.

Typically, the most abundant fauna of anchialine ponds are snails and shrimp. Maciolek and Brock (1974) classify four shrimp, three snails, and two native fish as being "representative" pond organisms. The three representative snails, Assimineia sp., Melania sp., and Theodoxus carlosa, typically found in tide pools and anchialine ponds, especially on the undersides of rocks, were ubiquitous in the Awake'e system.

Representative pond fish, Eleotris sandwicensis and Kuhlia sandwicensis, were not observed in any of the Awake'e ponds. Introduced fish species (topminnows (Poecilia spp.) and guppies), however, were ubiquitous and abundant throughout the Awake'e pond system. No attempt was made to enumerate the exotic fish, but it is estimated that densities were on the order of hundreds to thousands of fish per pond in the sediment, marsh, and older a'a ponds, and tens of fish in the newer a'a ponds.

Two of the shrimp species, Halocaridina rubra (opae'ula) and Metabetaeus lohena are considered rare, found only in anchialine areas, but are normally the most common shrimp occurring in ponds. The other two shrimp species, Palaemon debilis and Macrobrachium grandimanus, are found in estuaries and streams as well as anchialine ponds.

Shrimp were extremely scarce at the Awake'e ponds compared to other west Hawaii ponds. During daylight hours, shrimp were not observed on the exposed surfaces of pond bottoms, and the few individuals that were observed were hiding within the fronds of benthic plants. The most obvious characteristic of the Awake'e pond biota is the relative lack of shrimp and native fish species, and the overwhelming domination by introduced fish. Maciolek and Brock (1974) found inverse relationships between fish and shrimp abundance, and native and exotic fish abundance, in anchialine ponds. Introduced species, which can complete their life cycle within the ponds, appear in much larger numbers compared to native fish which enter the ponds only as post-larval forms. As a result of the

high densities, introduced species appear to be much more effective predators of shrimp than native fish. The abundance of introduced fish and the paucity of shrimp observed at Awake'e fits the scheme of high predatory pressure on native shrimp species. It is possible that shrimp in the Awake'e ponds were in hiding during the day, and may be visible in the open at night. However, 24-hour surveys of ponds at Makalawena showed only a slight increase in shrimp abundance at night (OI Consultants 1986). In any event, it is apparent that shrimp populations appear to be severely depressed at Awake'e compared to areas without exotic fish.

The Awake'e pond system was also surveyed by Maciolek in 1987. Several substantial differences are apparent when comparing survey results of the present investigation and Maciolek's results. Most apparent was the difference in observation of fish species; Maciolek observed exotic fish in only 33% of the ponds he surveyed, compared to 100% occurrence observed in the present study. In addition, Maciolek observed marine fish in many of the ponds that were not evident in the 1990 survey. More ponds were observed to have shrimp in the Maciolek survey, although it is not clear if shrimp were observed during the day, or only at night when predation is probably reduced.

While there are discrepancies in the results of biotic pond inventories, an overall conclusion is that the natural community structure of the Awake'e pond biota is severely stressed by introduction of exotic predators. Observations of the ponds over the four year interval indicates that this situation has not changed.

Summary

Two main points emerge after conducting the recent survey of the Awake'e Parcel B offshore and pond area. First, the systems do not appear to be altered in any substantial way from the previous survey conducted in 1986. All major attributes of the marine environment are consistent within the four year interim. Likewise, pond appearance and biotic composition appear identical in 1990 and 1986. This is especially true of the observation of severely limited shrimp abundance, linked to large populations of predatory exotic fish species.

A second point is that the offshore area appears to fall within the typical zonation scheme documented for the West Hawaii coastline. The area does not possess any distinctive or unique characteristics in terms of resource value that distinguishes it from most of the west coast of Hawaii. It has been demonstrated by existing development on the West Hawaii coastline that shoreline development per se does not result in alteration of the nearshore environment. There is no indication that this overall pattern would change with development of the Awake'e property.

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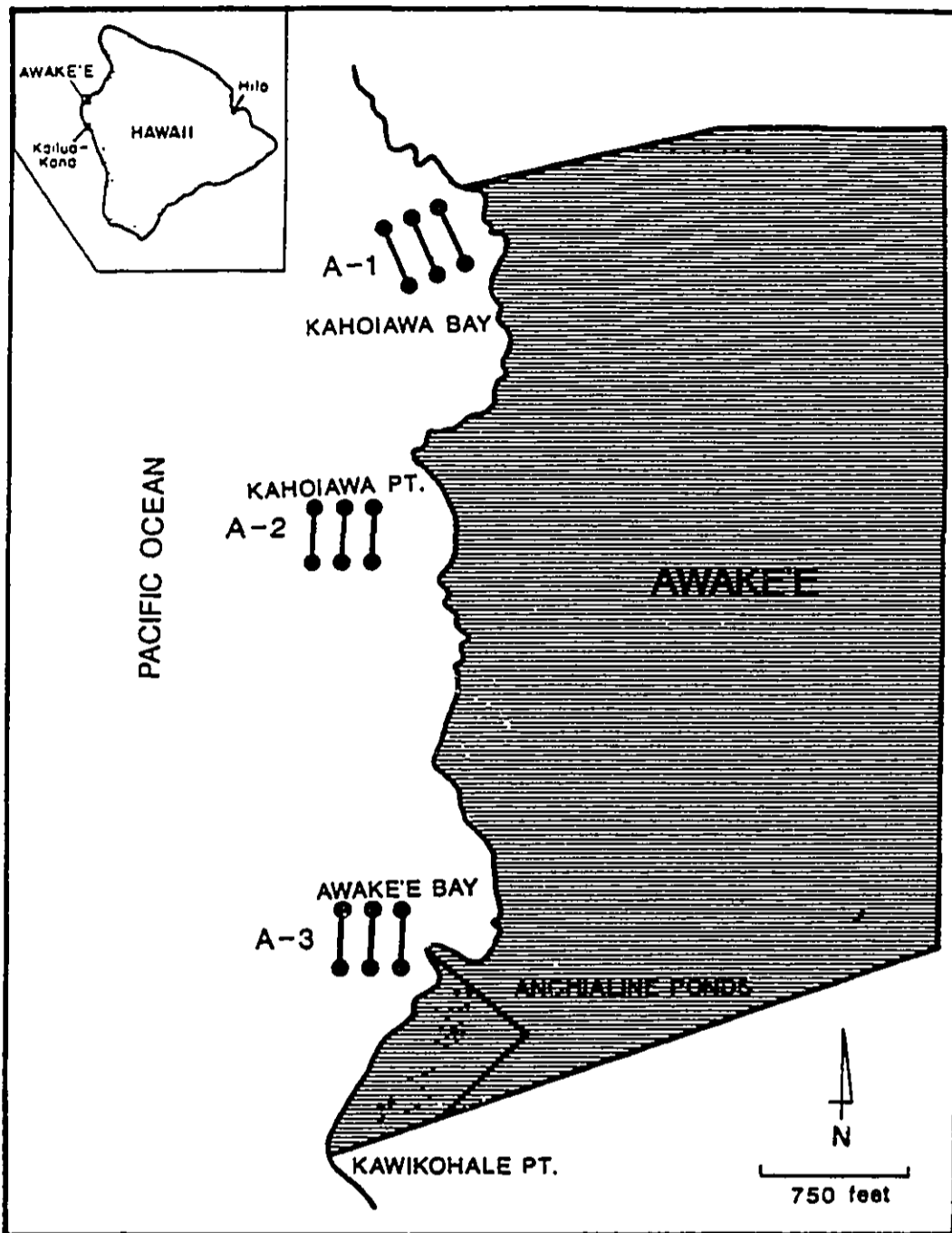


FIGURE 1. Map showing location of Awake'e parcel B on west coast of Island of Hawaii. Also shown are locations of benthic and reef fish transects conducted at three stations offshore of the property. Location of anchialine ponds in the southwestern corner of the property are also shown.

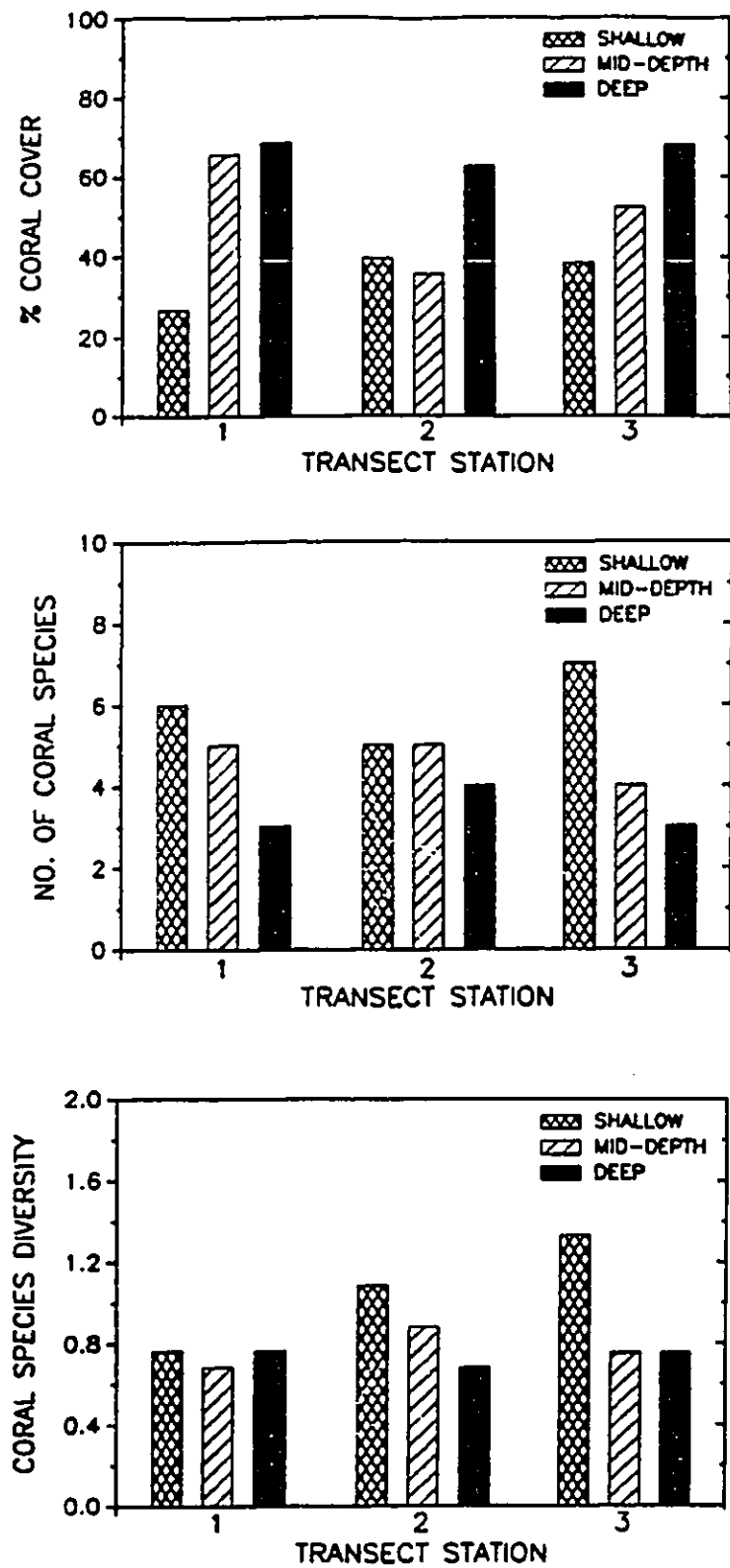


FIGURE 2. Histograms showing percent coral cover, number of coral species, and coral species diversity on transects off Awake'e. For transect station locations, see Figure 1.

TABLE 1. Marine invertebrate occurrence at Survey stations in the vicinity of Awake'e.

For station locations, see Figure 1.

Abundance code: "R" = rare (0 - 5 individuals or colonies sited on station)

"O" = occasional (5 - 20 individuals or colonies sited on station)

"C" = common (more than 20 individuals or colonies sited on station)

	TRANSECT								
	I 15'	I 30'	I 60'	II 15'	II 30'	II 60'	III 15'	III 30'	III 60'
SCLERACTINIA (Reef-Building Corals)									
<i>Porites lobata</i>	C	C	C	C	C	C	C	C	C
<i>Porites compressa</i>	R	C	C		C	C		C	C
<i>Pocillopora meandrina</i>	C	C	O	C	C	R	C	O	O
<i>Pocillopora eydouxi</i>		R			R				
<i>Montipora verrucosa</i>	O	O		O	O	O	C	O	
<i>Montipora patula</i>	R	R		R	R		R	R	
<i>Leptastrea purpurea</i>	O	R		O	R		C	O	
<i>Cyphastra ocellina</i>	R	R		R	R		R	R	
<i>Pavona varians</i>	C	C		C	C		C	C	
<i>Pavona duerdeni</i>		R			R		R		
<i>Cyphastrea ocellina</i>							R		
<i>Fungia scutaria</i>							R		
ZOANTHINARIA (Colonial "soft" corals)									
<i>Palythoa tuberculosa</i>	R	R		R	R		R	R	
HOLOTHUROIDEA (Sea Cucumbers)									
<i>Actinopyga obesa</i>		O			O			O	R
<i>Holothuria atra</i>		O			O	R		O	R
<i>Holothuria nobilis</i>		O	R		O	R		O	R
ECHINOIDEA (Sea Urchins)									
<i>Diadema paucispinum</i>		R	R		R			R	
<i>Echinothrix diadema</i>		R	R		R	R		R	R
<i>Echinothrix calamaris</i>		R							
<i>Tripneustes gratilla</i>	C	C	C	C	C	C	C	C	C
<i>Echinometra mathaei</i>	C	C	R	C	C	R	C	C	R
<i>Echinometra oblonga</i>	R	R		R	R		R	R	
<i>Echinostrephus aciculatus</i>	C	O		C	O		C	O	
<i>Heterocentrotus mammilla</i>	R	C	C	R	C	C	R	C	C
ASTEROIDEA (Starfish)									
<i>Linckia diplax</i>		R							
<i>Acanthaster planci</i>		R			R			R	
CEPHALAPODA									
<i>Octopus spp.</i>		R							
GASTROPODA									
<i>Conus spp.</i>		R			R			R	

TABLE 2. Coral species percent cover, non-coral substrata cover, and coral community statistics for transects off Awake'a. For transect station locations, see Figure 1.

CORAL SPECIES	TRANSECT								
	I 15'	I 30'	I 60'	II 15'	II 30'	II 60'	III 15'	III 30'	III 60'
<i>Porites lobata</i>	21.0	45.8	33.7	15.4	24.1	38.8	20.4	32.4	37.3
<i>Porites compressa</i>	0.4	19.0	33.9		8.9	23.8		18.9	29.6
<i>Porites brighami</i>									
<i>Pocillopora meandrina</i>	3.7	0.1	1.0	19.5	1.5	0.1	9.4		1.0
<i>Pocillopora eydouxi</i>		0.1							
<i>Montipora patula</i>				0.6			1.5		
<i>Montipora verrucosa</i>	0.8	0.3		1.5	0.9	0.1	2.3	0.7	
<i>Pavona varians</i>	0.5	0.5			0.3		3.7		
<i>Leptastrea purpurea</i>	0.3			2.6			0.3	0.3	
<i>Pavona duerdeni</i>							1.0		
TOTAL CORAL COVER	26.7	65.8	68.6	39.6	35.7	62.8	38.6	52.3	67.9
NUMBER OF SPECIES	6	6	3	5	5	4	7	4	3
CORAL COVER DIVERSITY	0.76	0.68	0.76	1.08	0.88	0.68	1.33	0.75	0.75
NON-CORAL SUBSTRATA									
Limestone	5.3	18.9		21.4	23.1		32.2	24.3	3.4
Sand		1.0	3.2		17.3	7.6	2.6	4.3	7.4
Basalt	68.0	8.4		39.0	3.2	6.4	25.3	3.5	1.3
Rubble		6	28.2		20.7	23.2	1.3	15.6	20

TABLE 3. Sea urchin abundance on benthic transects off Awake'e. For transect station locations, see Figure 1.

SEA URCHIN SPECIES	TRANSECT								
	I 15'	I 30'	I 60'	II 15'	II 30'	II 60'	III 15'	III 30'	III 60'
<i>Echinometra matheai</i>	67	59	6	86	20		52	45	
<i>Echinometra oblonga</i>	1								
<i>Echinostrephus aciculatus</i>	1								
<i>Heterocentrotus mammillatus</i>	6	2		2	14	2	16	2	3
<i>Tripneustes gratilla</i>	9	3	3	8	6	2	9	34	3
TOTAL URCHIN COUNT	84	64	9	96	40	4	77	81	6

TABLE 4. Reef fish community abundance on transects off the Awake'e (Parcel B) property. For transect locations, see Figure 1.

FAMILY Species	TRANSECT								
	A-1 15'	A-1 30'	A-1 60'	A-2 15'	A-2 30'	A-2 60'	A-3 15'	A-3 30'	A-3 60'
MURAENIDAE									
<i>Gymnothorax flavimarginatus</i>				1					
AULOSTOMIDAE									
<i>Aulostomus chinensis</i>			2						
FISTULARIDAE									
<i>Fistularia petimba</i>								2	
HOLOCENTRIDAE									
<i>Myripristes amaena</i>						12			10
KYPHOSIDAE									
<i>Kyphosus bigibbus</i>					4				
CIRRHITIDAE									
<i>Cirrhitops fasciatus</i>		1		1	1		2		
<i>Cirrhitus pinnulatus</i>				3					
<i>Paracirrhites arcatus</i>	1		2		2		2	2	1
MULLIDAE									
<i>Mulloides flavolineatus</i>			15			30			18
<i>Parupeneus pleurostigma</i>			1						
<i>P. multifasciatus</i>	7	6	7	4	4	6	8	12	6
<i>P. bifasciatus</i>						6			
<i>P. cyclostomus</i>				1			2		
SERRANIDAE									
<i>Cephalopholis argus</i>						2	2		1
LUTJANIDAE									
<i>Lutjanus kasmira</i>						150			32
<i>Aprion virescens</i>						2			1
LETHRINIDAE									
<i>Monotaxis grandoculis</i>		14					3		

Table 4. continued

FAMILY Species	TRANSECT								
	A-1 15'	A-1 30'	A-1 60'	A-2 15'	A-2 30'	A-2 60'	A-3 15'	A-3 30'	A-3 60'
CHAETODONTIDAE									
<i>Chaetodon lunula</i>	3	2				4	1		2
<i>C. quadrimaculatus</i>	3								
<i>C. miliaris</i>			6			40			29
<i>C. ornatissimus</i>	2	1	2			1	2		
<i>C. multinctus</i>	5	5	7	4	7	4	14	6	5
<i>C. lineolatus</i>				2					
<i>Forcipiger flavissimus</i>		1	6		2	4	2	3	3
POMACANTHIDAE									
<i>Centropyge potteri</i>			2						
POMACENTRIDAE									
<i>Plectro. johnstonianus</i>		2	1						1
<i>P. imparipennis</i>				2			2	2	
<i>Stegastes fasciolatus</i>		1		3					
<i>Dascyllus albisella</i>			12			6			5
<i>Chromis agilis</i>			13			16		13	12
<i>C. hanui</i>			4			4		2	1
<i>C. vanderbilti</i>	30	25		35	27		25		
LABRIDAE									
<i>Cheilinus unifasciatus</i>			1						
<i>C. bimaculatus</i>			1			1		1	1
<i>Pseudocheilinus octotaenia</i>			2		1	2		1	1
<i>P. tetrataenia</i>						1			1
<i>Bodianus bilunulatus</i>				1					
<i>Coris gaimard</i>			1				1	1	
<i>Thalassoma duperrey</i>	16	27	9	28	12	6	21	12	8
<i>Gomphosus varius</i>								3	
<i>Labroides phthiophagus</i>			1					2	
<i>Stethojulis balteata</i>	2	1			6				
<i>Halichoeres ornatissimus</i>		2			1			1	
SCARIDAE									
<i>Scarus perspicillatus</i>						2		2	
<i>S. psittacus</i>	2		2			2			1
<i>S. rubroviolaceus</i>		6							
juvenile <i>Scarus</i>	23						3		

Table 4. continued

FAMILY Species	TRANSECT								
	A-1 15'	A-1 30'	A-1 60'	A-2 15'	A-2 30'	A-2 60'	A-3 15'	A-3 30'	A-3 60'
ACANTHURIDAE									
<i>Zebrasoma flavescens</i>	21	8	33			32		18	38
<i>Acanthurus achilles</i>						2			1
<i>A. triostegus</i>				5					
<i>A. leucopareius</i>		2							
<i>A. olivaceus</i>		6		4		3			1
<i>A. dussumieri</i>		12				2			2
<i>A. blochii</i>		7		8					
<i>A. nigrofuscus</i>	58	38	3	31	38	9	45	27	15
<i>Ctenochaetus strigosus</i>		42	48	12	23	48	28	47	51
<i>C. hawaliensis</i>						33			32
<i>Naso lituratus</i>	17	2	6		4	5	7	4	9
ZANCLIDAE									
<i>Zanclus cornutus</i>	2		6		1			2	
MONOCANTHIDAE									
<i>Pervagor aspricaudus</i>	1				1				
BALISTIDAE									
<i>Sufflamen bursa</i>	1	2	2	2	5	4	3	3	3
<i>Melichthys vidula</i>	2		2		1	7			
<i>M. niger</i>	7	12		11	6	11		3	9
OSTRACIONTIDAE									
<i>Ostracion meleagris</i>							1		
TETRADONTIDAE									
<i>Arothron hispidus</i>	1								
<i>Canthigaster jactator</i>	1						1	1	
NUMBER SPECIES	21	24	28	19	19	33	21	24	30
NUMBER INDIVIDUALS	205	225	197	158	146	460	173	170	300
SPECIES DIVERSITY	2.32	2.57	2.66	2.32	2.30	2.56	2.30	2.46	2.58

APPENDIX A. Coral transect data at Awake'e.

REEF CORAL TRANSECT DATA SHEET (PERCENT COVER)											
TRANSECT SITE:	AWAKEE					MEAN CORAL COVER	26.7 %				
TRANSECT ID #:	i-15'					STD. DEV.	9.7				
DATE:	08/20/90					SPECIES COUNT	6				
						SPECIES DIVERSITY	0.755				
SPECIES	QUADRAT										SPECIES TOTAL
	1	2	3	4	5	6	7	8	9	10	
Porites lobata	18.0	22.0	23.0	21.0	21.0	16.0	14.0	28.0	6.0	41.0	210.0
Porites compressa									2.0	2.0	4.0
Pocillopora meandrina	18.0	1.0			8.0		7.0		1.0	2.0	37.0
Montipora verrucosa		1.0						1.0	4.0	2.0	8.0
Montipora patula	2.0				2.0				1.0		5.0
Leptastra purpurea		1.0						2.0			3.0
QUADRAT TOTAL	38.0	25.0	23.0	21.0	31.0	16.0	21.0	31.0	14.0	47.0	267.0

REEF CORAL TRANSECT DATA SHEET (PERCENT COVER)											
TRANSECT SITE:	AWAKEE					MEAN CORAL COVER	65.7 %				
TRANSECT ID #:	i-30'					STD. DEV.	20.3				
DATE:	08/20/90					SPECIES COUNT	5				
						SPECIES DIVERSITY	0.681				
SPECIES	QUADRAT										SPECIES TOTAL
	1	2	3	4	5	6	7	8	9	10	
Porites lobata	78.0	31.0	80.0	43.0	51.0	32.0	54.0	39.0	21.0	29.0	458.0
Porites compressa	18.0	61.0	4.0	6.0		26.0	3.0	42.0	12.0	18.0	190.0
Pocillopora meandrina	1.0										1.0
Montipora verrucosa						3.0					3.0
Montipora patula						2.0				3.0	5.0
QUADRAT TOTAL	97.0	92.0	84.0	49.0	51.0	63.0	57.0	81.0	33.0	50.0	657.0

APPENDIX A. Coral transect data at Awake'e.

REEF CORAL TRANSECT DATA SHEET (PERCENT COVER)											
TRANSECT SITE:	AWAKEE					MEAN CORAL COVER	68.6 %				
TRANSECT ID #:	1-60'					STD. DEV.	23.7				
DATE:	08/20/90					SPECIES COUNT	3				
						SPECIES DIVERSITY	0.759				
SPECIES	QUADRAT										SPECIES TOTAL
	1	2	3	4	5	6	7	8	9	10	
Porites lobata	42.0	12.0	21.0	21.0	26.0	46.0	42.0	46.0	43.0	38.0	337.0
Porites compressa	28.0	9.0	9.0	56.0	31.0	38.0	37.0	37.0	51.0	43.0	339.0
Pocillopora meandrina							10.0				10.0
QUADRAT TOTAL	70.0	21.0	30.0	77.0	57.0	84.0	89.0	83.0	94.0	81.0	686.0

REEF CORAL TRANSECT DATA SHEET (PERCENT COVER)											
TRANSECT SITE:	AWAKEE					MEAN CORAL COVER	39.6 %				
TRANSECT ID #:	11-15'					STD. DEV.	9.5				
DATE:	08/20/90					SPECIES COUNT	5				
						SPECIES DIVERSITY	1.082				
SPECIES	QUADRAT										SPECIES TOTAL
	1	2	3	4	5	6	7	8	9	10	
Porites lobata	23	8	21	3	13	26	31	6	14	9	154
Pocillopora meandrina	8	28	14	31	24	10	24	14	16	26	195
Montipora verrucosa			1		3	10		3		3	15
Montipora patula							3				6
Leptastrea purpurea	6	14	3				3				26
QUADRAT TOTAL	37	50	39	34	40	46	58	23	30	39	396

APPENDIX A. Coral transect data at Awake'e.

REEF CORAL TRANSECT DATA SHEET (PERCENT COVER)												
TRANSECT SITE:	AWAKEE				MEAN CORAL COVER							35.7 %
TRANSECT ID #:	11-30'				STD. DEV.							26.0
DATE:	08/20/90				SPECIES COUNT							5
					SPECIES DIVERSITY							0.877
SPECIES	QUADRAT										SPECIES TOTAL	
	1	2	3	4	5	6	7	8	9	10		
Porites lobata	61	4	8	12	14	12	26	21	22	61	241	
Porites compressa	36	2	10	10	3		14	5	9		89	
Pocillopora meandrina			4						4	7	15	
Montipora verrucosa		1			4	2			2		9	
Pavona varians								3			3	
QUADRAT TOTAL	97	7	22	22	21	14	40	29	37	68	357	

REEF CORAL TRANSECT DATA SHEET (PERCENT COVER)												
TRANSECT SITE:	AWAKEE				MEAN CORAL COVER							62.8 %
TRANSECT ID #:	11-60'				STD. DEV.							29.2
DATE:	08/20/90				SPECIES COUNT							4
					SPECIES DIVERSITY							0.685
SPECIES	QUADRAT										SPECIES TOTAL	
	1	2	3	4	5	6	7	8	9	10		
Porites lobata	51	72	33	66	22	48	12	31	41	12	388	
Porites compressa	31	26	21	25	75	21			24	15	238	
Pocillopora meandrina				1				1			1	
Montipora verrucosa											1	
QUADRAT TOTAL	82	98	54	92	97	69	13	31	65	27	628	

APPENDIX A. Coral transect data at Awake'e.

REEF CORAL TRANSECT DATA SHEET (PERCENT COVER)											
TRANSECT SITE:	AWAKEE					MEAN CORAL COVER	38.6 %				
TRANSECT ID #:	III-15'					STD. DEV.	15.2				
DATE:	08/20/90					SPECIES COUNT	7				
						SPECIES DIVERSITY	1.332				
SPECIES	QUADRAT										SPECIES TOTAL
	1	2	3	4	5	6	7	8	9	10	
Porites lobata	21	43	6	28	8	11	28	37	14	8	204
Pocillopora meandrina			12	16	14	16	16		10	10	94
Montipora verrucosa		8		8		1	6				23
Montipora patula			10	5							15
Pavona duerdeni	6	4									10
Pavona varians	2						7	19	3	6	37
Leptastrea purpurea		3									3
QUADRAT TOTAL	29	58	28	57	22	28	57	56	27	24	386

REEF CORAL TRANSECT DATA SHEET (PERCENT COVER)											
TRANSECT SITE:	AWAKEE					MEAN CORAL COVER	52.3 %				
TRANSECT ID #:	III-30					STD. DEV.	27.3				
DATE:	08/20/90					SPECIES COUNT	4				
						SPECIES DIVERSITY	0.751				
SPECIES	QUADRAT										SPECIES TOTAL
	1	2	3	4	5	6	7	8	9	10	
Porites lobata	66.0	42.0	44.0	38.0	3.0	24.0	21.0	12.0	43.0	31.0	324.0
Porites compressa	21.0	36.0	31.0	44.0		16.0	12.0	8.0	11.0	10.0	189.0
Montipora verrucosa			2.0					3.0	2.0		7.0
Pavona varians		3.0									3.0
QUADRAT TOTAL	87.0	81.0	77.0	82.0	3.0	40.0	33.0	23.0	56.0	41.0	523.0

APPENDIX A. Coral transect data at Awake'e.

REEF CORAL TRANSECT DATA SHEET (PERCENT COVER)											
TRANSECT SITE:	AWAKEE				MEAN CORAL COVER	67.9 %					
TRANSECT ID #:	III-60				STD. DEV.	15.5					
DATE:	08/20/90				SPECIES COUNT	3					
					SPECIES DIVERSITY	0.753					
SPECIES	QUADRAT										SPECIES TOTAL
	1	2	3	4	5	6	7	8	9	10	
Porites lobata	47	36	26	27	53	18	45	28	41	52	373
Porites compressa	32	36	23	19	5	28	35	52	25	41	296
Pocillopora meandrina	1		3						6		10
QUADRAT TOTAL	80	72	52	46	58	46	80	80	72	93	679

APPENDIX B. Sea urchin transect data at Awakee.

SEA URCHIN TRANSECT DATA SHEET (SPECIES ABUNDANCE)											
TRANSECT SITE:	AWAKEE				MEAN URCHIN NO.	8.4					
TRANSECT ID #:	I-15				STD. DEV.	5.3					
DATE:	08/20/90				SPECIES COUNT	5					
					SPECIES DIVERSITY	0.180					
SPECIES	QUADRAT										SPECIES TOTAL
	1	2	3	4	5	6	7	8	9	10	
Echinometra matheai	18	4	4	6	10	3	6	6	4	6	67
Echinometra oblonga									1		1
Echinost. aciculatus			1								1
Hetero. mammillatus	2					2				2	6
Tripneustes gratilla	3		1		2	1	2				9
QUADRAT TOTAL	23	4	6	6	12	6	8	6	5	8	84

SEA URCHIN TRANSECT DATA SHEET (SPECIES ABUNDANCE)											
TRANSECT SITE:	AWAKEE				MEAN URCHIN NO.	6.4					
TRANSECT ID #:	I-30				STD. DEV.	3.7					
DATE:	08/20/90				SPECIES COUNT	3					
					SPECIES DIVERSITY	0.074					
SPECIES	QUADRAT										SPECIES TOTAL
	1	2	3	4	5	6	7	8	9	10	
Echinometra matheai		10	3	7	6	4	9	3	4	13	59
Hetero. mammillatus					1			1			2
Tripneustes gratilla		1			1				1		3
QUADRAT TOTAL	0	11	3	7	8	4	9	4	5	13	64

SEA URCHIN TRANSECT DATA SHEET (SPECIES ABUNDANCE)											
TRANSECT SITE:	AWAKEE				MEAN URCHIN NO.	0.9					
TRANSECT ID #:	I-60'				STD. DEV.	1.0					
DATE:	08/20/90				SPECIES COUNT	2					
					SPECIES DIVERSITY	0.270					
SPECIES	QUADRAT										SPECIES TOTAL
	1	2	3	4	5	6	7	8	9	10	
Echinometra matheai							2		3	1	6
Tripneustes gratilla	1					2					3
QUADRAT TOTAL	1	0	0	0	0	2	2	0	3	1	9

APPENDIX B. Sea urchin transect data at Awake'e.

SEA URCHIN TRANSECT DATA SHEET (SPECIES ABUNDANCE)											
TRANSECT SITE:	AWAKEE				MEAN URCHIN NO.	9.6					
TRANSECT ID #:	II-15				STD. DEV.	5.0					
DATE:	08/20/90				SPECIES COUNT	3					
					SPECIES DIVERSITY	0.098					
SPECIES	QUADRAT										SPECIES TOTAL
	1	2	3	4	5	6	7	8	9	10	
Echinometra matheai	11	1	18	16	9	8	6	6	3	8	86
Hetero. mammillatus							1			1	2
Tripneustes gratilla		2	2		1		2	1			8
QUADRAT TOTAL	11	3	20	16	10	8	9	7	3	9	96

SEA URCHIN TRANSECT DATA SHEET (SPECIES ABUNDANCE)											
TRANSECT SITE:	AWAKEE				MEAN URCHIN NO.	4					
TRANSECT ID #:	II-30				STD. DEV.	3.4					
DATE:	08/20/90				SPECIES COUNT	3					
					SPECIES DIVERSITY	0.346					
SPECIES	QUADRAT										SPECIES TOTAL
	1	2	3	4	5	6	7	8	9	10	
Echinometra matheai	8	2					3	2	1	4	20
Hetero. mammillatus	1							1	6	6	14
Tripneustes gratilla		2			2	1		1			6
QUADRAT TOTAL	9	4	0	0	2	1	3	4	7	10	40

SEA URCHIN TRANSECT DATA SHEET (SPECIES ABUNDANCE)											
TRANSECT SITE:	AWAKEE				MEAN URCHIN NO.	0.4					
TRANSECT ID #:	II-60				STD. DEV.	0.5					
DATE:	08/20/90				SPECIES COUNT	2					
					SPECIES DIVERSITY	0					
SPECIES	QUADRAT										SPECIES TOTAL
	1	2	3	4	5	6	7	8	9	10	
Hetero. mammillatus	1			1							2
Tripneustes gratilla						1			1		2
QUADRAT TOTAL	1	0	0	1	0	1	0	0	1	0	4

APPENDIX B. Sea urchin transect data at Awake'e.

SEA URCHIN TRANSECT DATA SHEET (SPECIES ABUNDANCE)											
TRANSECT SITE:	AWAKEE				MEAN URCHIN NO.	7.7					
TRANSECT ID #:	III-15'				STD. DEV.	3.7					
DATE:	08/20/90				SPECIES COUNT	3					
					SPECIES DIVERSITY	0.265					
SPECIES	QUADRAT										SPECIES TOTAL
	1	2	3	4	5	6	7	8	9	10	
Echinometra matheai	4	9	6	8	8	3		2	9	3	52
Hetero. mammillatus	12						1	3			16
Tripneustes gratilla				2	1	4	1			1	9
QUADRAT TOTAL	16	9	6	10	9	7	2	5	9	4	77

SEA URCHIN TRANSECT DATA SHEET (SPECIES ABUNDANCE)											
TRANSECT SITE:	AWAKEE				MEAN URCHIN NO.	8.1					
TRANSECT ID #:	III-30				STD. DEV.	4.3					
DATE:	08/20/90				SPECIES COUNT	3					
					SPECIES DIVERSITY	0.326					
SPECIES	QUADRAT										SPECIES TOTAL
	1	2	3	4	5	6	7	8	9	10	
Echinometra matheai	6	3	1	3	3	3	3	3	9	11	45
Hetero. mammillatus			1	1							2
Tripneustes gratilla	2	3		1	8		3	7	6	4	34
QUADRAT TOTAL	8	6	2	5	11	3	6	10	15	15	81

SEA URCHIN TRANSECT DATA SHEET (SPECIES ABUNDANCE)											
TRANSECT SITE:	AWAKEE				MEAN URCHIN NO.	0.6					
TRANSECT ID #:	III-60				STD. DEV.	0.7					
DATE:	08/20/90				SPECIES COUNT	2					
					SPECIES DIVERSITY	0					
SPECIES	QUADRAT										SPECIES TOTAL
	1	2	3	4	5	6	7	8	9	10	
Hetero. mammillatus	1			1		1					3
Tripneustes gratilla					1	1			1		3
QUADRAT TOTAL	1	0	0	1	1	2	0	0	1	0	6

APPENDIX B

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BOTANICAL ASSESSMENT REPORT MANINI'OWALI/AWAKE'E LAND EXCHANGE PARCELS NORTH KONA, ISLAND OF HAWAI'I

by

Winona P. Char
October 1990

INTRODUCTION

An assessment of the botanical resources found on both the State of Hawai'i Manini'owali land (Parcel A) and the client's Awake'e land (Parcel B) is summarized below. The information is drawn from the two previous field studies conducted by the principal investigator. This report will be incorporated into the Environmental Assessment addressing both parcels for the Land Exchange proposal.

DESCRIPTION OF THE VEGETATION

Manini'owali (Parcel A): In the assessment prepared for this parcel (Char 1989), three broad vegetation types were recognized. The coastal strand consists of a narrow beach with waterworn boulders and coralline rubble from Kua Bay to Kakapa Bay. It is poorly developed with only a few coastal species; these include 'aki'aki, pa'u-o-Hi'i-'aka, beach morning-glory or pohuehue, and kipukai. Low, windswept kiawe trees are found back of the strand.

A small anchialine pond is found on the northern end of Kua Bay, however, this may be outside the exchange parcel.

Fountain grass grassland covers the most area on Parcel A and occurs on very weathered pahoehoe flows. Grass cover is dense, from 70 to 90%. Scattered through the grassland are 6 to 12 ft. tall kiawe trees. Other common associates are 'ilima, 'uhaloa, and a'ali'i. A cinder cone found along the Kuki'o boundary also supports this vegetation type. A rather dense ring of kiawe trees is found at the base of this cinder cone.

Scrub vegetation on lava is found on the 'a'a flow on the upper one-half of the parcel, bordering the Queen Ka'ahumanu Highway. Vegetation is sparse, consisting primarily of scattered patches of fountain grass, kiawe, pluchea, 'uhaloa, and 'ilima.

Awake'e (Parcel B): In the survey conducted by Char in 1986, five major vegetation types were recognized. The coastal strand occurs on rocky substrate with a few areas of coralline rubble. Like the Manini'owali parcel, it is poorly developed and shares the same common coastal species. By Awake'e Bay and near the anchialine ponds, are small groves of milo, coconut, and tree heliotrope. Again low, windswept kiawe trees are found back of the strand.

A number of anchialine ponds which are surrounded by pond vegetation can be found behind Awake'e Bay. These ponds are part of the larger Makalawena-Awake'e pond complex. This pond complex provides important habitat for several endangered Hawaiian waterbirds. Plants commonly found around the ponds are water hyssop, 'ehu'awa, 'ohelo-kai, pohuehue, and a few kiawe trees.

Closed-canopy kiawe forests occur on the lower portion of the site, on pahoehoe flows covered by a thin layer of reddish-brown soil.

The trees are from 18 to 25 ft. tall. Ground cover is sparse with bare soil, rocky outcroppings, or leaf and branch litter common.

Open-canopy kiawe forests cover most of Parcel B and consist of scattered kiawe trees. Ground cover is very dense and dominated by the introduced fountain grass.

On the Pu'u Kili cinder cone, vegetation consists of a fountain grass grassland, forming 90 to 95% cover in most places. Locally common are patches of 'ilima. The large pits on the cinder cones support a dense kiawe forest.

SENSITIVE NATIVE PLANT COMMUNITIES & THREATENED & ENDANGERED PLANTS

The vegetation on both parcels, except for the coastal strand and pond vegetation, is dominated by introduced species, primarily kiawe and fountain grass. It is species poor. No sensitive native remnant plant communities were found on the sites. No officially listed, proposed or candidate threatened and endangered plants were found on the Awake'e parcel during the intensive field studies (Char 1986). For the Manini'owali parcel, only a brief field reconnaissance was conducted to sample each of the vegetation types. The assessment report prepared from that site visit noted that the pololei fern, a candidate endangered species, may occur on the areas with very weathered pahoehoe. A more intensive field survey made during the rainy season was recommended for the flora study that would need to be prepared for an Environmental Impact Statement should the land exchange be approved.

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September 1989.

APPENDIX C

SURVEY OF THE AVIFAUNA AND FERAL MAMMALS AT
AWAKEE/MANINI OWALI, NORTH KONA, HAWAII

Prepared for
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1 October 1990

INTRODUCTION

The purpose of this report is to summarize the findings of a three day (9-10 September 1989, 27 September 1990) bird and mammal field survey of lands located at Awakee/Manini Owali, North Kona, Hawaii.. Also included are references to pertinent literature as well as unpublished reports:

The objectives of the field survey were to:

- 1- Document what bird and mammal species occur on the property or may likely occur given the type of habitats available.
- 2- Provide some baseline data on the relative (estimated) abundance of each species.
- 3- Determine the presence or likely occurrence of any native fauna particularly any that are considered "Endangered" or "Threatened". If such occur or may likely be found on or near the property identify what features of the habitat may be essential for these species.
- 4- Identify any special or unique habitats for wildlife that may occur on the property and note what importance these sites may have for the fauna in this region.

GENERAL SITE DESCRIPTION

The property surveyed lies makai of Queen Kaahumanu Highway (Fig.1). Large areas of the site contain barren lava with patches of open parkland habitat made up primarily of Kiawe (Prosopis pallida) and Fountain Grass (Pennisetum setaceum). Milo (Thespesia populnea) also occurs in the coastal sections of Awakee. The largest and most dense patches of vegetation are located along the shoreline and around the base of Puu Kuili. Opauala Pond is located adjacent to Awakee and a much smaller pond occurs just mauka of Kua Bay (see Fig.1).

Weather during the field survey was variable with clear mornings and partly cloudy afternoons. All days of the survey had easterly winds.

STUDY METHODS

Field observations were made with the aid of binoculars and by listening for vocalizations. These observations were concentrated during the peak bird activity periods of early morning and late afternoon. Attention was also paid to the presence of tracks and scats as indicators of bird and mammal activity. At various locations (see Fig.1) eight minute counts were made of all birds seen or heard. Between these counts (census) stations observations of birds seen or heard were also noted. These data provide the basis for the relative

(estimated) abundance figures given in this report (Table 1). Published and unpublished reports of birds known from similar habitat on lands close to this site and elsewhere in West Hawaii were also consulted in order to acquire a more complete picture of the possible species that might occur in the area (Bruner 1979, 1980, 1984a, 1984b, 1984c, 1985a, 1985b, 1986, 1988a, 1988b, 1989a, 1989b, 1989c, 1990a, 1990b; Hawaii Audubon Society 1989; Pratt et al. 1987; David 1989, 1990). Observations of feral mammals were limited to visual sightings and evidence in the form of skeletal remains, scats and tracks. No attempts were made to trap mammals in order to obtain data on their relative (estimated) abundance and distribution. Two evenings were devoted to searching for the presence of owls and the Hawaiian Hoary Bat (Lasiurus cinereus semotus).

Scientific names used herein follow those given in the most recent American Ornithologist's Union Checklist (A.O.U. 1983), Hawaii's Birds (Hawaii Audubon Society 1989); A Field Guide to the Birds of Hawaii and the Tropical Pacific (Pratt et al. 1987); Mammal Species of the World (Honacki et al. 1982); Hawaiian Coastal Plants and Hawaiian Forest Plants (Merlin 1977a, 1977b).

RESULTS AND DISCUSSION

Resident Endemic (Native) Land and Water Birds:

No Short-eared Owl or Pueo (Asio flammeus sandwichensis) were observed but this bird could potentially occur on occasion at this location. Pueo are relatively common on the island of Hawaii particularly at higher elevations (Berger 1972, Hawaii Audubon Society 1989; Pratt et al. 1987). On 10 September 1989 and 27 September 1990 Black-necked Stilt (Ae'o) (Himantopus mexicanus knudseni) were seen flying along the shore from Awakee toward Opaepa Pond. This endemic and endangered species is not as common on Hawaii as it is on some of the other islands in the State. Suitable habitat such as shallow ponds with small islands free of mammalian predators are scarce on the Big Island especially along the Kona Coast. Opaepa represents a vital resource for this species as well as for other waterbirds both native and migratory (Bruner 1986).

Migratory Indigenous (Native) Birds:

Migratory shorebirds winter in Hawaii between the months of August through May. Some juveniles will stay through the summer months as well (Johnson and Johnson 1983). Of all the shorebirds species which winter in Hawaii the Pacific Golden Plover (Pluvialis fulva) are the most abundant. Plover prefer open areas such as exposed intertidal reef, rocky shorelines, mud flats,

lawns, pastures, plowed fields and sparse grasslands. They arrive in Hawaii in early August and depart to their arctic breeding grounds during the last week of April (Johnson et al. 1981). Bruner (1983) and Johnson et al. (1989) have also shown plover are extremely site-faithful on their wintering grounds and many establish foraging territories which they defend vigorously. Such behavior makes it possible to acquire a fairly good estimate of the abundance of plover in any one area. These populations likewise remain relatively stable over many years (Johnson et al. 1989). A total of nine Pacific Golden Plover were recorded during the three days of the survey. These birds were observed along the shoreline and on open lava flows. Much of the property, however, is covered in brush and tall grass and is therefore unsuitable for plover. A total of five Wandering Tattler (Heteroscelus incanus) were also recorded along the rocky shoreline of the property. This species is usually solitary (Pratt et al. 1987). Other possible shorebirds which should be expected although not found on this survey include: Ruddy Turnstone (Arenaria interpres) and Sanderling (Calidris alba).

Resident Indigenous (Native) Birds:

No indigenous species were recorded. Black-crowned Night Heron (Nycticorax nycticorax) are found at Opaepala Pond (Bruner 1986).

Resident Indigenous (Native) Seabirds:

No seabirds were observed on the property. Some seabirds nest and roost on barren lava flows in Hawaii but at much higher elevation (Pratt et al. 1987).

Exotic (Introduced) Birds:

A total of 12 species of exotic birds were recorded during the field survey. Bruner (1986) found 11 species on the adjoining Makalawena property. The most abundant species were Zebra Dove (Geopelia striata), Yellow-fronted Canary (Serinus mozambicus) and Yellow-billed Cardinal (Paroaria capitata). Common Myna (Acridotheres tristis) and House Sparrow (Passer domesticus) are most often found in urban areas and hence their scarcity or absence on this property. The Yellow-billed Cardinal has in the last 10 years expanded its range along the Kona Coast. A close relative, the Red-crested Cardinal (Paroaria coronata), is common on Oahu. Like its relative, the Yellow-billed Cardinal, it prefers lowland disturbed habitats and does not range into upper elevation forests.

Given the habitats found on the property as well as data from surveys elsewhere in West Hawaii (Bruner 1979, 1980, 1984a, 1984b, 1984c, 1985a, 1986, 1988a, 1988b, 1989a, 1989b, 1989c, 1990a, 1990b) and information provided in Berger (1972); Hawaii Audubon Society (1989); Pratt et al. (1987) and David (1989, 1990) the following exotic bird species might also be expected

to occur on or near the property: Barn Owl (Tyto alba), Ring-necked Pheasant (Phasianus colchicus), Erckel's Francolin (Francolinus erkelii), California Quail (Callipepla californica), Japanese Quail (Coturnix japonica), Northern Mockingbird (Mimus polyglottos), Saffron Finch (Sicalis flaveola) and Lavender Waxbill (Estrilda caerulescens).

Feral Mammals:

Small Indian Mongoose (Herpestes auropunctatus), mice (Mus musculus), feral cats and goats were found on the survey. Feral donkeys have been recorded on the nearby Kaupulehu property (Bruner 1985, 1988b). No trapping was conducted in order to assess the relative abundance of mammals.

Records of the endemic and endangered Hawaiian Hoary Bat are sketchy but the species has been reported from Hawaii (Tomich 1986; Kepler and Scott 1990). None were observed on this field survey despite evening searches of the area. This species roosts solitarily in trees. Much remains to be known about the natural history of this bat and its ecological requirements here in Hawaii. Bruner (1984d) found bats on the Sheraton Waikoloa Beach Resort Property.

CONCLUSION

A brief field survey such as this one can at best provide only a limited perspective of the wildlife. Not all species will necessarily be observed and information on their use of the site must be sketched together from brief observations and the available literature. The number of species and the relative abundance of each species may vary throughout the year due to available resources and reproductive success. Species which are migratory will quite obviously be a part of the faunal picture only at certain times during the year. Exotic species sometimes prosper for a time only to later disappear or become a less significant part of the ecosystem (Williams 1987). Thus only long term studies can provide a comprehensive view of the bird and mammal populations in a particular area. However, when brief field studies are coupled with data gathered from other similar habitats the value of the conclusions drawn are significantly increased.

The following are some general conclusions related to bird and mammal activity on the property.

- 1- All representative types of habitat found on the property were censused. The more densely forested coastal sections of the property support the greatest number of birds. The more open parklands were virtually devoid of avifauna save for the Warbling Silverbill (Lonchura malabarica).

- 2- The Awakee site particularly the makai section with its anchialine ponds is a more valuable habitat for wildlife than property located to the north. Native birds such as Black-crowned Night Heron and Black-necked Stilt rely on these wetlands for foraging and nesting. Exotic birds likewise depend on these ponds for drinking water and forage in the dense vegetation surrounding the ponds.
- 3- The property supports the normal array of exotic species of birds one would expect in this type of environment in Hawaii. However, some species typically found in this habitat were not recorded. This could have been due to the fact that the survey was too brief, or that their numbers are so low that they went undetected or a combination of these and other factors. The low numbers of some species may be attributed to lack of specific food resources such as, flowering kiawe trees.
- 4- In order to obtain more definitive data on mammals a trapping program would be required. However, the brief observations obtained on this survey did not find that the numbers of feral mammals differed dramatically from data gathered on other faunal surveys in similar habitat in West Hawaii.

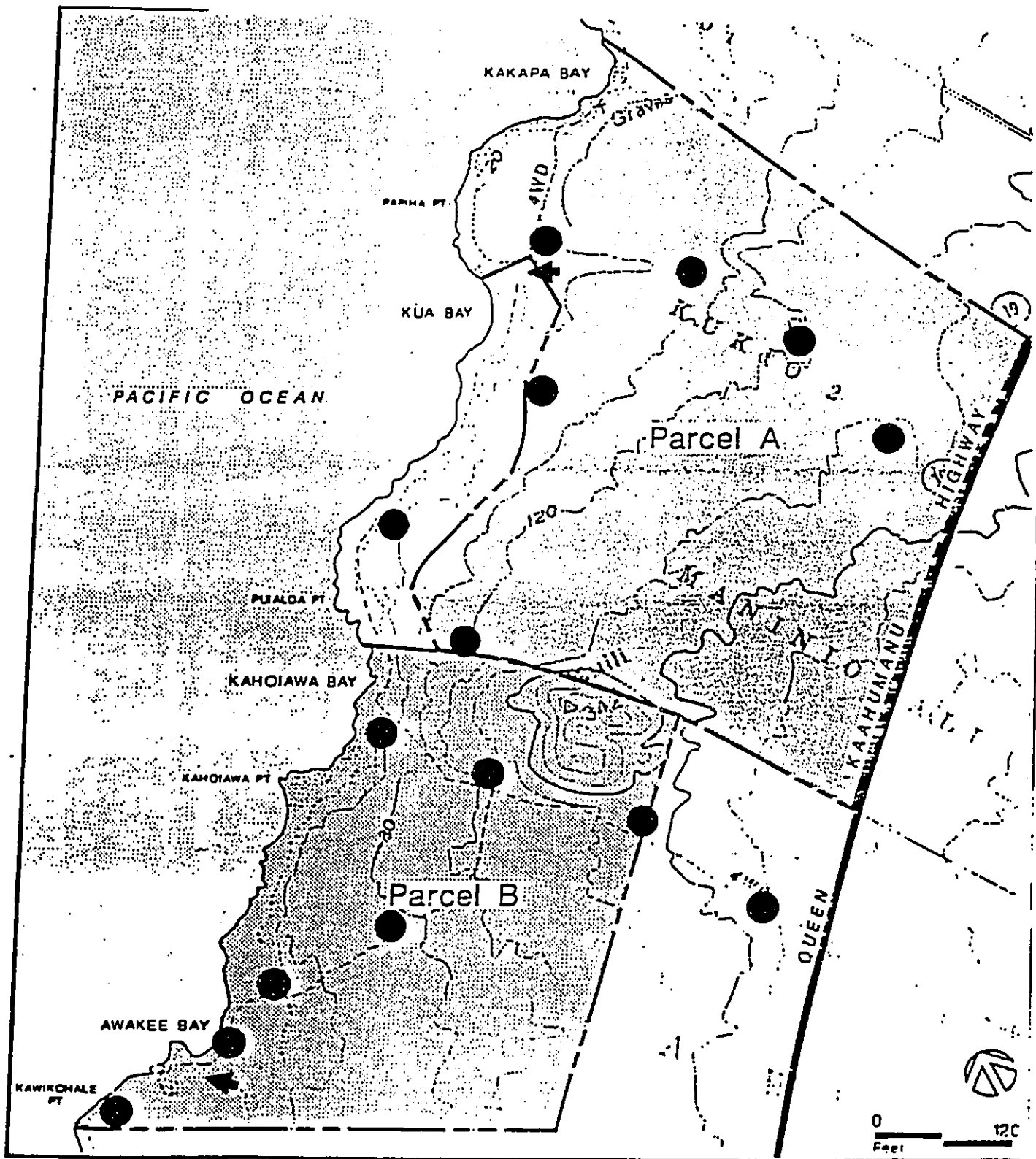


Fig. 1. Location of faunal survey with census stations marked by solid circles. Arrows indicate the location of wetland habitat in the form of small anchialine ponds. Those ponds at Awakee are more numerous and of greater importance to birds than the pond located at Kua Bay. Opaeula Pond lies to the south of Awakee.

TABLE 1

Exotic (introduced) birds recorded at Awakee/Manini Owali, North Kona, Hawaii

COMMON NAME	SCIENTIFIC NAME	RELATIVE ABUNDANCE*
Gray Francolin	<u>Francolinus pondicerianus</u>	U = 3
Black Francolin	<u>Francolinus francolinus</u>	R = 3
Spotted Dove	<u>Streptopelia chinensis</u>	U = 2
Zebra Dove	<u>Geopelia striata</u>	A = 12
Common Myna	<u>Acridotheres tristis</u>	R = 5
Yellow-billed Cardinal	<u>Paroaria capitata</u>	A = 13
Northern Cardinal	<u>Cardinalis cardinalis</u>	U = 4
Japanese White-eye	<u>Zosterops japonicus</u>	C = 6
Nutmeg Mannikin	<u>Lonchura punctulata</u>	R = 4
Warbling Silverbill	<u>Lonchura malabarica</u>	C = 6
House Finch	<u>Carpodacus mexicanus</u>	R = 8
Yellow-fronted Canary	<u>Serinus mozambicus</u>	A = 10

* (see page 12 for key to symbols)

KEY TO TABLE 1

Relative (estimate) abundance = number of times observed during survey or average number on eight minute counts.

A = abundant (ave. 10+) number which follows is average of data from all survey days

C = common (ave. 5-10) number which follows is average of data from all survey days

U = uncommon (ave. less than 5) number which follows is average of data from all survey days

R = recorded (seen or heard at times other than on 8 min. counts or on one count only) number which follows is the total number seen or heard over the duration of three survey days.

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APPENDIX D

Ms.101290

Initial Cultural Resource Management Plan
Awake'e-Manini'ōwali Land Exchange
North Kona, Hawai'i Island

by

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INTRODUCTION

Previous efforts to implement the Awake'e-Manini'ōwali land exchange have been unsuccessful. One of the major criticisms of the previous proceedings was the lack of coordination with members of the community and various agencies to address their various concerns. Concerns relating to cultural matters comprised a good portion of the testimony given before the legislature and included preservation of archaeological sites, trails, burials, and integrity of the environment. In addition, the initial archaeological effort consisted of a cursory surface inventory and the preliminary report did not provide the basis to assess the significance of the archaeological remains.

The North Kona Development Corporation is currently seeking reenactment of the land exchange. The Applied Research Group of the Bishop Museum has been retained under contract to develop, refine, and implement an initial cultural resource management plan for Manini'ōwali. This undertaking entails conducting archaeological surveys as well as effecting coordination with various individuals, community groups, and pertinent agencies not only during the crucial planning stages, but throughout the subsequent stages of the project. This approach, recommended by the Museum, is one that is encouraged and strongly supported by the North Kona Development Corporation.

Briefly, the anticipated phases of archaeological work are as follows:

- 1) Initial Cultural Resources Management Plan
- 2) Phase I Intensive Archaeological Survey
 - a) Increment I - Mapping, Limited Testing and Burial Assessment
 - b) Increment II - Subsurface Testing and Final Cultural Resources Management Plan
- 3) Phase II Intensive Data Recovery
- 4) Post-mitigation Procedures
 - a) Monitoring During Construction
 - b) Preservation/Interpretation

Since the results of previous archaeological surveys within the subject parcel and adjoining *ahupua'a* including Awake'e, Kūki'o 2, and Makalawena are available, analyzing these results together with locational information obtained from aerial photographic analysis, archaeological site type/distributions can be interpreted. This would allow for preliminary conceptual planning around preservation and mitigation guidelines.

The scope of work for this project includes:

1. consulting with pertinent individuals, community groups, and agencies in order to document their concerns relating to cultural matters.
2. review of previous reconnaissance survey reports for the subject area and adjoining parcels.
3. field examination of previously recorded archaeological sites.
4. application of appropriate initial significance evaluations.
5. preparation of an initial resource management plan.
6. coordination with the Historic Preservation Program, State Department of Land and Natural Resources.

Project Location

The project area, situated on the western slope of Hualālai Volcano, is the *maka'i* portion of Manini'ōwali *ahupua'a*, North Kona District, Hawai'i Island. The project area is bounded by Kūki'o 2 *ahupua'a* to the north; Awake'e *ahupua'a* to the south; and Queen Ka'ahumanu highway to the east; and the Pacific Ocean to the West.

Manini'ōwali is part of the dry, barren portion of North Kona where the annual rainfall rarely exceeds 20 inches per year (Armstrong 1973:57), and the mean temperatures along the coast range from 70 to 76 degrees F.

The present land surface of Manini'ōwali is defined by prehistoric pahoehoe and historic aa lava flows. Two cinder cones are situated within the project area. Pu'u Kuili, located on the southern end of the parcel, exceeds 340 ft. Another cinder cone, which exceeds 200 ft., is located at the north end of the project area.

Vegetation within the project area includes fountain grass (*Pennisetum secaceum*), and kiawe (*Prosopis pallida*), which is densely concentrated along portions of the coastal areas (Armstrong 1973:64). Recent aa lava flows are barren of any vegetation.

Previous Archaeology

Previous archaeological surveys within the project area in Manini'ōwali were conducted by Soehren (1982), Cordy (1986), and Ladefoged (1989). A total of 131 archaeological sites were identified, consisting of 2,703 features. While Soehren and Cordy concentrated in the coastal areas, Ladefoged conducted a survey from the coast inland to Queen Ka'ahumanu highway. Results from these surveys indicated that the majority of sites were concentrated in the coastal zone. These sites were defined as permanent habitation complexes and ceremonial features. Further inland, the density of sites decreased. Sites within the inland zone included overhang shelters, C-shapes, and pits. These sites were interpreted as temporary habitation. Trails linked the coastal sites with the inland sites.

Awake'e *ahupua'a*, located south of Manini'ōwali *ahupua'a*, was surveyed by Donham in 1987. Eighty-four archaeological sites, consisting of 239 features, were recorded. Seventy-five percent of the sites were located within 300 meters from the shoreline. Donham interpreted 9 of the coastal sites as permanent habitation sites. Twenty-four inland sites, including overhang shelters, depressions, and agricultural-type features, were interpreted as temporary habitation sites.

Makalawena *ahupua'a*, located south of Awake'e *ahupua'a*, was surveyed by Donham in 1986. Forty-nine archaeological sites, consisting of 121 features, were recorded. Coastal habitation sites were identified as historic. Due to

storm wave destruction and historic influence, there is a lack of permanent habitation prehistoric sites along the coast. Evidence of prehistoric sites is best indicated by temporary habitation and shelter sites located inland (Donham 1986).

Kūki'o 1 *ahupua'a*, located north of Manini'ōwali *ahupua'a*, was surveyed by Walker in 1985. Sixty-nine archaeological sites, consisting of 178 features, were recorded. Forty-seven percent of these sites were located near the shoreline. Inland sites, including overhang shelters, were interpreted as temporary habitation sites.

Based on archaeological, ethnological, and ethnohistorical information, the general prehistoric settlement pattern for North Kona has been characterized by three major zones (Rosendahl 1973:60-61): a narrow, arid coastal habitation zone associated with exploitation of various marine resources; a sloping, barren middle zone characterized by exposed aa and pahoehoe, and devoid of soil and vegetation other than grasses; and an upland habitation zone associated with agricultural exploitation.

Archaeological information from the subject parcel and adjoining *ahupua'a* supports the above generalized settlement pattern. Each *ahupua'a* exhibited permanent coastal habitation sites and temporary inland habitation sites. Differences between each *ahupua'a* was feature specific. Makalawena sites indicated a historic influence and a lack of prehistoric components on the coast, but inland sites continued to contain temporary habitation sites. Manini'ōwali contained long, narrow enclosures along the coast, interpreted as habitation and canoe houses. Awake'e had an increase in C-shapes and U-shapes, but a decrease in enclosures compared to Manini'ōwali.

SURVEY RESULTS

Between September 25-27, 1990, eight members of the Applied Research Group, Bishop Museum, conducted a field assessment within the project area in order to evaluate previously recorded archaeological sites. This assessment provides initial data needed for the decision making process for the land

exchange, as well as facilitating planning and implementation of future phases of work.

Table 1 lists the initial significance evaluations for each archaeological site within the project area. All of the recorded sites meet Criterion D of the National Register Criteria for Evaluating Significance of Historic Properties. Other applicable significance criteria are listed for sites with specific features which include burials or ceremonial structures.

Field procedures included teams of archaeologists relocating and evaluating sites recorded by Ladefoged in 1989. Once a site was identified, each feature was re-examined and the overall significance of the site was assessed. Sketch maps and photographs were taken if necessary. Sites areas were redefined and plotted on an aerial map. New temporary numbers (T-1 through 86) were assigned and cross-referenced with Athens' temporary numbers. Temporary site numbers T-58 through T-65, and T-77, were not assigned.

Several sites recorded by Ladefoged (1989) were redefined and grouped together into a single, larger complex. This process enabled the establishment of preliminary preservation precincts and determination of coastal setbacks, thus, allowing initial conceptual planning and formulation of initial cultural resource management guidelines.

During the current field assessment, evidence of extensive looting were observed at several sites, especially in areas easily accessible along the coast. Lava tube shelters were vandalized, evidenced by backdirt piles located outside the shelter entrances. Large amounts of midden and artifacts were mixed in the backdirt piles, they will need to be further examined. Photographs of selected sites/features are included as Appendix A.

Site T-21 Coastal Habitation Complex

This complex located in the area surrounding Kakapa Bay, consists of over 300 features including enclosures, overhang shelters, C-shapes, cairns, trails, pavements, pits, mounds, alignments, petroglyphs, possible burials, and a possible ceremonial structure. According to Hannah Springer (personal

communication), burials are located in this site complex. While surveying the northwest area of this complex, petroglyphs were discovered on a pahoehoe outcrop. Two human figures holding spears over their heads were recorded. Along this pahoehoe flow were numerous lava tubes that may contain burials.

Located approximately 20 meters inland from the coral beach at Kakapa Bay and at the base of an aa lava flow is a large rectangular enclosure. This feature is approximately 10 meters long and 8 meters wide. Rectangular pahoehoe slabs, that may have been artificially shaped, define the base of the west wall. The structure is constructed of aa cobbles and boulders, and the walls are core-filled. In plan view, the structure is notched (northeast corner), which is uncommon, if not unique to Hawai'i Island. This feature probably served as a ceremonial function. An excavated depression probably caused by looters was observed inside the structure.

Sites T-52, 53, 54, 55, 67, 37, 38 Anchialine Pond and Associated Features

This complex is located along Kua Bay and consists of numerous features including an anchialine pond, a canoe house, trails, enclosures, platforms, and other habitation features. Due to previous grading disturbance, numerous features were destroyed or impacted including the anchialine pond. The pond has been partially covered by aa lava while associated features nearby have also been impacted.

Several overhang shelters along the coast have been looted as indicated by backdirt piles outside the overhang entrances. These piles are mixed with abundant midden and artifacts, and will need to be examined.

Site Complex T-69, 70, 71, 72, 73, 74, 75 Coastal Habitation Complex

Seven sites, located along Puialoa Point, were grouped together into one site complex. Archaeological features within this complex include a canoe house, enclosures, overhang shelters, trails, pits, alignments, pavements, lava tubes, mounds, and cairns. Numerous shelters contained midden and artifacts. Several of the mounds and lava tubes may contain burials, as indicated by scattered coral and upright slabs.

Sites T-23 and T-24 Temporary Habitation and Burials

This complex, located in the central area of the subject parcel on a pahoehoe outcrop, consists of lava tube shelters, walls, C-shapes, quarries, mounds, a trail, and burials. Site T-23, a complex of temporary habitation features, connects to Site T-24 by a trail. While investigating a lava tube at Site T-24, burials were discovered down a long tube extension. The tube opened into a large cavern where ten burials were identified. One of the burials was placed in a canoe, and two other burials were bundled. Other burials were seen in tubes extending away from the cavern. Some of the burials date to the historic era evidenced by a wood framed mirror and a wooden pipe associated with one of the burials. Based on the number of lava tubes observed within the intermediate zone of the project area, the potential exists for additional burials.

CONCLUSIONS AND RECOMMENDATIONS

A surface assessment was completed which relocated previously recorded sites and provided initial significance evaluations. Utilizing the results of this survey, together with surveys in adjoining *ahupua'a*, and locational information obtained from aerial photographs, guidelines for preservation and mitigation were determined.

The Applied Research Group contacted individuals, representatives of community groups and agencies, who stated their concerns in prior testimonies. Individuals contacted included Debbie Abreu, Hannah Springer, Ruby McDonald, and Leon Sterling, Jr. A summary from these meetings are presented in Appendix B.

A total of 79 sites were recorded within the project area. Many of the sites recorded earlier have either been combined into larger complexes or were eliminated upon reassessment as natural features. The three settlement or activity zones generally recognized for the North Kona region is applicable for Manini'ōwali, although only two, the shoreline and intermediate zones, are within the project area. The few variations noted within the project area as well as among the neighboring *ahupua'a* are interpreted to be induced by

localized geological/topographical characteristics rather than by any significant cultural or temporal differences. Many of the coastal sites have been extensively and systematically looted. Measures to prevent future looting and vandalism are needed.

Incorporation of the following guidelines as conditions of the Awake'e-Manini'ōwali land exchange is recommended:

1. The whole shoreline between Awake'e and Kuki'o 2, including the coastal site complexes and coastal trails as depicted on the site location map, be excluded from the land exchange.
2. The cinder cone on the northern boundary of the property including associated sites and mauka-makai trails and other selected inland sites be preserved.
3. All human burial sites in the project area be preserved in-situ. To avoid vandalism in lava tubes burials, the tube entrances should be sealed.
4. Ensure the longterm preservation and integrity of sites by including a buffer zone around each site to be preserved.
5. Ensure the integrity of the environment by utilizing endemic/indigenous flora for landscaping and maintaining unobstructed view corridors especially inland from the coastal trails.
6. Establish a cooperative agreement between the developer/owner and the State for the maintenance, improvement, and site preservation/interpretation/protection for the shoreline areas.
7. Provision should be included to ensure that all conditions are applicable to any new owners of the property.

Following the approval of the Awake'e-Manini'ōwali land exchange, a Phase I intensive survey for the entire Manini'ōwali project area is recommended. Since several of the features were initially interpreted to contain human

burials, verification of these potential burial features must be conducted prior to any developmental planning. Results from this level of work will determine final preservation and development zones.

In view of recent developments regarding human burials, the following procedures are recommended should additional human remains be encountered:

1. excavations will be terminated with no disturbance of the remains;
2. a blessing will be conducted;
3. the feature will be restored to its original condition; and
4. the feature will be permanently preserved in-situ.

Other Phase I tasks will include:

1. historical literature and documents research,
2. detailed plan and locational maps of archaeological sites and features,
3. limited testing at selected features in order to obtain chronological and stratigraphical sequences,
4. appropriate laboratory procedures,
5. report writeup, editing, review, and production, and
6. preparation of the final cultural resource management plan.

INITIAL CULTURAL RESOURCE MANAGEMENT PLAN

Under normal circumstances, an intensive survey phase is completed prior to the formulation of a cultural resource management plan since a specific level of data is required to determine the future disposition of sites and

features. In this instance, such an effort is precluded by scheduling constraints and economics since the development plans are contingent upon implementation of the land exchange. However, as mentioned earlier, some initial management decisions can be made when the surface data of Manini'ōwali are considered in context with the data available from neighboring ahupua'a and site type/distribution analysis.

This initial cultural resource management plan includes two components, a preservation plan and a data recovery plan.

Preservation Plan

The preservation plan will address sites located within the shoreline setback and significant sites or features slated for preservation in the inland areas. Twenty-two sites are recommended for preservation and 19 are within the coastal zone. Several of the coastal sites were severely looted. Preservation guidelines need to include site protection measures to guard against future looting.

The selection criteria for in-situ preservation are:

1. integrity of surface structural components,
2. representative examples of site/feature types,
3. educational and/or interpretive potential,
4. religious or ceremonial function, and
5. well-defined major trails and segments, and
6. presence of human burials.

The coastal habitation complexes recommended for preservation include Sites T-21, T-37, T-38, T-52, T-53, T-54, T-55, T-67, T-69, T-70, T-71, T-72, T-73, T-74, and T-75. In addition to these sites, the main coastal trail also will be preserved.

Sites recommended for permanent in-situ preservation in inland areas include Sites T-23 and T-24. Preservation of the cinder cone and *mauka-makai*

trails also reflect the concerns of community members (See Appendix). Sites T-23 and T-24 contain burials and should be preserved in-situ.

Sites slated for permanent in-situ preservation will be placed in two categories, active or passive preservation, contingent on the results of further data recovery. Active preservation entails stabilization/restoration for public interpretation purposes. Passive preservation primarily involves data banking for future research and/or interpretation purposes.

Conceptual Preservation Plan

The current level of available data is adequate to permit some broadbased conceptual preservation parameters to be defined primarily for the coastal area, but also for isolated clusters in the inland areas.

The coastal sites most suited for active preservation and incorporation into an interpretive program are situated towards the northern sector of the project area from Kua Bay to Kakapa Bay. The archaeological complex around the anchialine pond (T-54) at Kua Bay include habitation terrace and platform features (T-53, 54), canoe shed (T-52), and the southern terminus of the longest intact coastal trail segment. This trail continues inland across the aa flow to Kakapa Bay. Several features (T-56, 57), interpreted to be temporary habitation complexes, are present within the coastal section of the aa flow *makai* of the trail. The complex (T-21) at Kakapa Bay is perhaps the most significant and includes a prominent, formal platform, most likely with a religious function; some probable burial features; several coastal habitation features; a small anchialine pond; and several sets of petroglyphs in the pahoehoe *kipuka* adjacent to the northern property line. The two *mauka-makai* trails also leads inland from this complex to the cinder cone area.

The other coastal sites will be included in the coastal setback under the passive preservation category.

The longest segment of the *mauka-makai* trail extends inland from the cinder cone in a southeasterly orientation to the eastern boundary of the project area where it is truncated by the Queen Kaahumanu Highway. This trail

and selected features along its route, such as cairns and overhang shelters, should be preserved as a pedestrian shoreline access easement. The lavatube burial complex (T-24) will be incorporated into the passive preservation category and restricted from public access. If other such sites are identified, isolated passive preservation zones will be established.

DATA RECOVERY PLAN

Intensive data recovery is recommended for sites not included in the preservation plan. These sites have excellent potential to provide data to address general research questions on the settlement and use of the North Kona region as well as specific questions on the prehistory of Manini'ōwali *ahupua'a*. The following specific research questions need to be addressed:

1. How do these sites relate to the overall settlement pattern of Manini'ōwali *ahupua'a* and the region?
2. What were the functions of the sites? What activities took place at the sites? Were any of these activities of a specialized nature?
3. What were the temporal origins of the sites? Are all of the sites contemporaneous? How were the sites spatially, temporally and functionally associated with one another?
4. What exploitative strategies were being employed by the inhabitants? How did they adapt to the micro-environments in the area? What marine ecozones were being exploited?

To address the above questions, data recovery will be carried out primarily in sites located in areas to be impacted. Sites/features will be selected based on their research potential. The selection process also will consider the frequencies of feature types.

Two types of excavation procedures with differing levels of intensity are recommended:

1. Limited excavations- non-contiguous, controlled excavations for the express purpose of obtaining datable materials and stratigraphic control to allow broad determinations of chronological and functional parameters of sites.
2. Areal excavations- contiguous excavations that cover relatively large areas or portions of sites for the purpose of defining spatial relationships between subsurface features and activity areas. Areal excavations will also result in obtaining quantitative sample material for subsequent analyses.

Table 1

SUMMARY OF SITES AND FEATURES RECORDED ON PROJECT AREA

TEMP. SITE NO.	NO. OF FEATURES	FEATURE TYPES	PROBABLE FUNCTION	INITIAL SIGNIFICANCE ASSESSMENT*
T-1	4	Depressions, cupboard	Quarry, storage	D
T-2	5	Pits	Quarry	D
T-3	1	Pit	Quarry	D
T-4	2	Overhang shelter, depression	Temporary habitation	D
T-5	1	Overhang shelter	Temporary habitation	D
T-6	5-10	Pits	Quarry	D
T-7	7	Pits, cairn, overhang shelter	Quarry, temporary habitation	D
T-8	3	Cairns, trail	Transportation	D
T-9	32	Pits, trail, overhang shelter	Quarry, temporary habitation	D
T-10	1	Lava tube	Temporary habitation	D
T-11	1	Trail	Transportation	D
T-12	8	Pits	Quarry	D
T-13	1	Trail	Transportation	D
T-14	9	Pits	Quarry	D
T-15	1	Stone shade	Temporary habitation	D
T-16	1	Overhang shelter	Temporary habitation	D
T-17	1	Modified outcrop	Agriculture, possible burial	D,E
T-18	2	C-shape, overhang shelter	Temporary habitation	D
T-19	2	Cupboard, modified outcrop	Agriculture, storage	D
T-20	3	Modified outcrop, trails	Temporary habitation, transportation	D
T-21	300+	Enclosures, overhang shelters, cairns, petroglyphs	Habitation complex, possible burial	C,D,E

Table 1. Continued.

TEMP. SITE NO.	NO. OF FEATURES	FEATURE TYPES	PROBABLE FUNCTION	INITIAL SIGNIFICANCE ASSESSMENT*
T-22	9	C-shapes, cupboard, overhang shelters, mounds, depressions	Temporary habitation	D
T-23	14	Pits, trail, mound, walls, lava tubes	Temporary habitation, possible burial	D,E
T-24	2	Lava tubes	Habitation/burial	D,E
T-25	1	Pit	Quarry	D
T-26	3	Overhang shelter, pits	Quarry	D
T-27	8	Pits	Quarry	D
T-28	20	Pits	Quarry	D
T-29	1	Pits	Quarry	D
T-30	1	Cairn	Marker	D
T-31	2	Pits	Quarry	D
T-32	20	Pits	Quarry	D
T-33	15	Cupboards	Storage, possible burials	D,E
T-34	9	Overhang shelters, lava tube, cairns, pits	Habitation	D
T-35	9	Pits, enclosures	Temporary habitation	D
T-36	4	Mounds, pit	Agriculture	D
T-37	21	Trail, overhang shelters, L-shape, pits	Habitation complex	C,D
T-38	7	Cupboards, lava tube, C-shapes, pits	Habitation complex	D
T-39	16	Pits, cairns, lava tube, pavement, trail, mound, alignments, C-shape	Habitation complex	D
T-40	4	Pit	Quarry	D
T-41	5	Lava tubes, alignments	Temporary habitation	D

Table 1. Continued.

TEMP. SITE NO.	NO. OF FEATURES	FEATURE TYPES	PROBABLE FUNCTION	INITIAL SIGNIFICANCE ASSESSMENT*
T-42	2	Pit, overhang shelter	Temporary habitation	D
T-43	8	C-shape, pits, cairns, alignments	Temporary habitation	D
T-44	1	Enclosure	Temporary habitation	D
T-45	4	Cairns, C-shape, overhang shelter	Temporary habitation	D
T-46	2	C-shape, pit	Temporary habitation	D
T-47	3	Cairns	Markers	D
T-48	1	Modified outcrop	Temporary habitation, possible burials	D,E
T-49	3	Lava tubes	Temporary habitation, burials	D,E
T-50	1	Trail	Transportation	D
T-51	11	Cupboards, terraces, overhang shelter, depressions	Agriculture	D
T-52	14	Canoe house, trails, terraces, enclosure, alignments, midden scatter, platforms, pavement	Habitation	C,D
T-53	9	Pits, enclosures, overhang shelters	Habitation	D
T-54	1	Anchialine pond	Possible aquaculture	D
T-55	21	Pits, alignments, terrace, pavements, overhang shelter	Temporary habitation	D
T-56	2	Trail, pits	Temporary habitation	D
T-57	4	Alignment, pits, overhang shelters, trail	Temporary habitation	D
T-66	1	Trail	Transportation	D
T-67	24	Trail, C-shapes, mounds, pavements, enclosures, overhang shelters, pits	Temporary habitation	D

Table 1. Continued¹.

TEMP. SITE NO.	NO. OF FEATURES	FEATURE TYPES	PROBABLE FUNCTION	INITIAL SIGNIFICANCE ASSESSMENT*
T-68	9	Overhang shelters, pits, cairn, alignment	Temporary habitation complex	D
T-69	31	Pits, enclosures, canoe house, mound, terrace, alignments, cairns, lava tube	Habitation complex, possible burial	C,D,E
T-70	11	Alignments, C-shape, cairn, pits, mounds, overhang shelters, pavement	Temporary habitation, possible burials	D,E
T-71	44	Pits, alignments, mounds, overhang shelters	Temporary habitation	D
T-72	4	Alignments, pit	Agriculture, possible burials	D,E
T-73	25	Alignments, pits, mounds	Agriculture, possible burials	D,E
T-74	24	Alignments, cairn, pits, mounds, overhang shelters, U-shape	Temporary habitation	D
T-75	66+	Enclosures, canoe house, platform, alignments, C-shapes, cairns, pits, overhang shelter, lava tubes, mounds	Habitation complex	C,D,E
T-76	20	Pavements, alignments, C-shape, cairn, pits, hearths, mounds, overhang shelters	Habitation complex	D
T-77	3	Pits, alignment	Agriculture	D
T-78	8	C-shape, cairn, lava tubes, mound, trail, pavement, midden scatter	Temporary habitation	D
T-79	4	Lava tube	Temporary habitation	D
T-80	1	Pit	Agriculture	D
T-81	1	Cairn	Marker	D
T-82	11	Alignment, pits	Agriculture	D
T-83	1	Lava tube	Temporary habitation	D

Table 1. Continued.

TEMP. SITE NO.	NO. OF FEATURES	FEATURE TYPES	PROBABLE FUNCTION	INITIAL SIGNIFICANCE ASSESSMENT*
T-84	5	Pits	Agriculture	D
T-85	6	Pits, cupboards, C-shape, alignment	Temporary habitation	D
T-86	4	Lava tube, pits	Temporary habitation	D
T-87	15	Pits, alignment, cairns	Agriculture	D

*National Register of Historic Places Significance Criteria:

- Criterion A Specifies sites associated with events of broad patterns important to Hawai'i's prehistory and history.
- Criterion B Applies to sites associated with the lives of persons important to Hawai'i's past.
- Criterion C References sites reflecting distinctive architecture characteristic of a type, period, or method of construction, or presenting the work of a master, or possessing high artistic value.
- Criterion D Applies to sites which have yielded, or are likely to yield, information important to further understanding of traditional culture, history, or prehistory.
- Criterion E Specifies sites or places which have significant historic or (as proposed) cultural value to an ethnic group of the State.

APPENDIX A

Photos of Project Area



Figure 1. Overview of Project Area to Southeast.



Figure 2. Lava Tube Showing Looting.



Figure 3. Lava Tube Showing Looting.

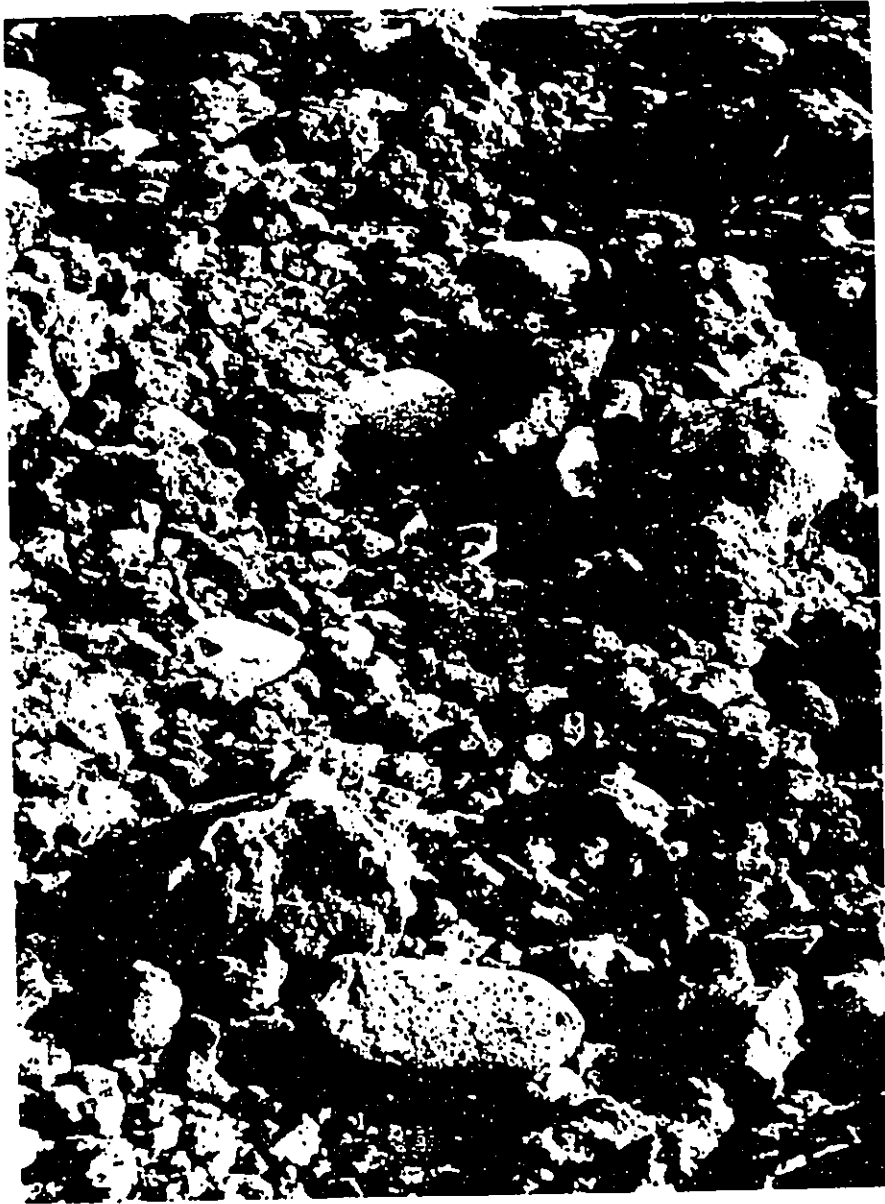


Figure 4. Coastal Trails Showing Waterworn Stepping-Stones.



Figure 5. Cairns Located at Site T-21.



Figure 6. Rectangular Pahoehoe Slabs Defining Base
of West Wall of Possible Ceremonial
Structure at Site T-21.

APPENDIX B

ARCHAEOLOGICAL CONCERNS OF THE COMMUNITY

In March of 1990, members of the Hawai'i Island community expressed concern over the proposed land exchange of Manini'owale and Awake'e. All of the testimony presented had a common theme--members of the community and community organizations did not have the opportunity to express their concerns prior to any decisions being made on the proposed land exchange. With this in mind, a number of community members and organizations were contacted and asked for their concerns regarding the archaeological resources in the area. The following individuals and organizations were contacted:

<u>NAME</u>	<u>ORGANIZATION</u>
Dr. Ross Cordy	State Historic Preservation Program
Ms. Debbie Abreu	Na Ala Hele
Ms. Hannah Springer	
Ms. Ruby Keanaaina McDonald	Office of Hawaiian Affairs Kona Hawaiian Civic Club
Rev. Leon K. Sterling, Jr.	Kauwa No Ka Kino o Kristo

The following is a summary of the concerns expressed by each individual.

Ross Cordy

- 1) Need information to be able to make initial determinations of site significance.
- 2) Need a better site location map.
- 3) Need a feature table with possible functional interpretations and initial significance evaluations.
- 4) Include either sketch maps or photographs of selected sites.
- 5) Determination of what sites and areas should be excluded from the exchange because of importance to the State.

Debbie Abreu

- 1) The main concern is the preservation of the coastal trail and its ambiance.
- 2) The state should retain ownership of the coastal trail.
- 3) The portion of the trail near Kua Bay that was destroyed by grubbing needs to be restored.
- 4) The coastal area is currently being used as a park without the needed infra-structure of a park, this needs to be rectified.
- 5) The integrity and ambiance of the coastal area needs to be maintained and protected from encroachment by resort developments.

Hannah Springer

- 1) Preservation of the coastal site complex at Kakapa Bay, because this area appears to have been the most densely settled area and because the area contains human burials.
- 2) Preservation of the cinder cone on the north side of the property inland of Kakapa Bay and the trails that connect this cone to the settlement at the Bay because:
 - a) the cone is a prominent geological feature in the area, that may have been used as a look out for schools of fish;
 - b) the trails are unique in the area because they are paved with water worn boulders set into the ground surface; and
 - c) the coastal complex at Kakapa Bay, the cinder cone, and the connecting trails should be viewed as one large complex.

Ruby McDonald

- 1) The cinder cone on the north side of the property should be preserved.
- 2) There should be a set back from the coast for development.
- 3) The *mauka-makai* trails should be preserved.
- 4) In addition, she is concerned with:
 - a) the ceded land issue; and
 - b) the fact that Kona's infrastructure is severely overburdened at present and can not handle any more development.

Leon Sterling

- 1) The coastal area and the cinder cone on the north side of the property should be preserved.
- 2) Need a monitoring program by the State on the conditions of the exchange to ensure that they are complied with.
- 3) The State should retain the water rights of the property.

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APPENDIX E

**Summary of
Previous Archaeological Research
and Findings,
Existing Conditions, and Recommendations**

**Land of Awakee
North Kona District, Island of Hawaii
(TMK:3-7-2-04:3)**

by

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INTRODUCTION

The purpose of the present document is to summarize previous research and findings, and to outline existing conditions and recommendations with respect to cultural resources located within the Awakee project area. This report has been prepared at the request of Jeff Overton of Group 70. This document is comprised of three primary sections. The first section provides a brief description of the location and environmental context of the project area; the

second section summarizes the results of previous archaeological work within the Awakee property; the third and final section reviews the current status of professional and agency recommendations regarding cultural resources, identifying in particular those conditions and recommendations which could materially affect potential future development of these lands.

PROJECT LOCATION AND ENVIRONMENTAL CONTEXT

The Awakee lands are comprised of c. 350 acres located within the western (seaward) portion of Awakee ahupua'a, North Kona District (TMK:3-7-2-04:3) (Figure 1). The project area is bounded on the north by Maniniowali ahupua'a and on the west by the Pacific Ocean. Hawaii State lands within Awakee border the project area to the south and east. Makalawena ahupua'a is immediately to the south of Awakee and borders the project area only at the western end, within c. 250 m from the shoreline.

The general climatological patterns affecting Awakee are those characteristic of Kekaha, the dry, barren portion of North Kona noted for its harsh lava-covered terrain and its excellent offshore marine resources. Rainfall along the coastal areas of Kekaha rarely exceeds 20 inches per year because of mountains that block the moisture-laden northeast trade winds.

Awakee is situated on the lower western slope of Hualalai Volcano, which is the source of the prehistoric pahoehoe and aa lava flows that form the present land surface (Figure 1). Prehistoric pahoehoe, with pockets of rough, scaly pahoehoe and aa, covers most of the project area (c. 240 ac). Elevation of this substrate zone ranges from 20 to 120 ft, and a relatively major escarpment is present at about the 80 ft contour, 300 to 500 m inland from the shoreline. The pahoehoe rockland zone is vegetated with a thick growth of fountain grass (*Pennisetum setaceum* [Forsk.] Chiov.), and an overstory of *kiawe* (*Prosopis pallida* [Humb. and Bonpl. ex Willd.]). Lantana (*Lantana camara* L.) and native 'ilima (*Sida fallax* Walp.) also are present in this zone. *Kiawe* is generally scattered within the inland portions of the project area and is densely concentrated along the coast.

The northern portion of the project area (c. 55 ac) consists of cinderland and exhibits soil development from the crest to the lower slopes of the Puu Kuili cinder cone. Elevation within this soil zone ranges from 10 ft to 342 ft, within a relatively short distance of 490 m. The upper slopes of Puu Kuili (above 200 ft) are quite steep and are subjected to considerable erosion, which has deposited a relatively thick mantle of reddish-brown soil along the west-facing lower slopes. Such a soil mantle is unique along the coastal portion of South Kona and is more characteristic of the coastal terrain in North Kohala. The upper slopes of Puu Kuili are vegetated with sparse fountain grass, and a *kiawe* thicket is present in the crater at its crest.

The southern portion of the project area (c. 55 ac) consists of rough aa land and, with the exception of several *kipuka* (areas of preserved vegetation surrounded by lava), contains virtually no vegetation. Three major *kipuka* occur within the aa, all of which are older pahoehoe surfaces with thick fountain grass growth. A cluster of about 35 small anchialine ponds is present on the aa flow near the coast, immediately inland of Kawikohale Point. These ponds are of various sizes and shapes and, with one exception, have unsilted aa bottoms. The largest of the anchialine ponds, described by Emerson as the Awakee fishpond in his 1882 survey field log, has a silt deposit and is quite shallow.

The immediate coastal zone consists of rocky pahoehoe and aa points, coral storm beaches and terraces, and intermittent sand pockets. Coral and sand deposits are broadest at the southern end of Awakee Bay, between the large anchialine pond and the shoreline. A broad coral and sand beach also occurs along Kahoiawa Point.

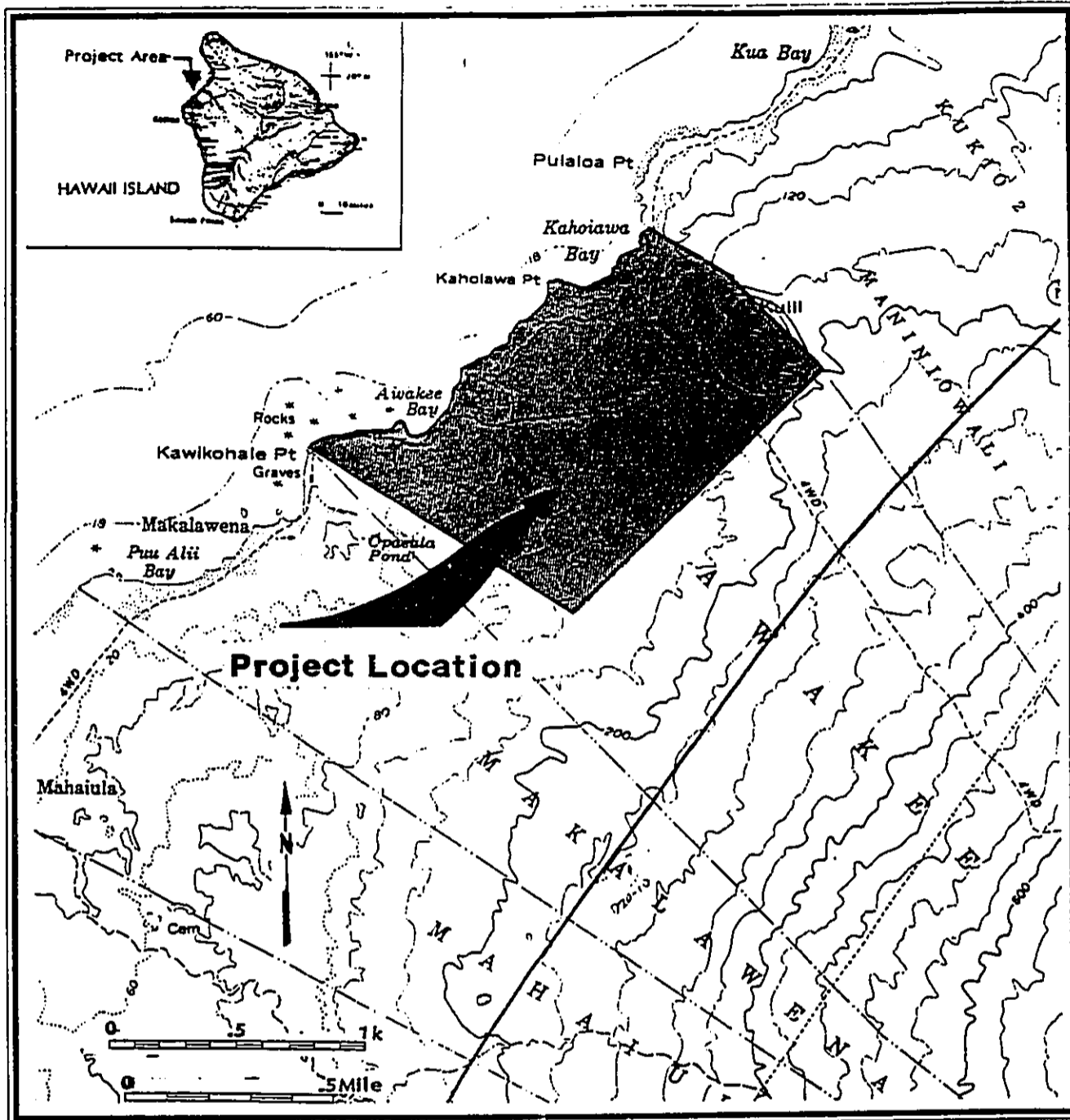


Figure 1. PROJECT LOCATION MAP

**SUMMARY OF PREVIOUS ARCHAEOLOGICAL RESEARCH AND FINDINGS,
EXISTING CONDITIONS, AND RECOMMENDATIONS - AWAKEE RESORT**

Land of Awakee, North Kona District, Island of Hawaii

PHRI Project 90-940

October 1990

PREVIOUS ARCHAEOLOGICAL WORK AND FINDINGS

The earliest archaeological field work at Awakee, and specifically within the project area, was conducted in 1930 by John E. Reinecke (n.d.); he located coastal sites in the Districts of North and South Kona for the Bernice P. Bishop Museum. Reinecke recorded four sites (Nos. 100-103) within Awakee; however, several additional sites that were not assigned numbers are mentioned in his manuscript. He inspected only the most immediate shoreline area—no more than a few hundred feet inland—and his site records are limited to brief verbal descriptions. According to Reinecke's observations, there were 15 to 16 identifiable house sites along the Awakee coastline. These were concentrated along the shoreline at Awakee Bay and were scattered along the coast south of Kaho'iawa Point. About half of these features could be associated with features located during reconnaissance undertaken by PHRI in 1986 (Donham 1987).

Reinecke's sites were later included in an inventory of Hawaii Island sites prepared by B.P. Bishop Museum in 1970 for the Hawaii County Planning Department (Emory 1970). That inventory was based entirely on existing records in the museum's Department of Anthropology and did not involve any field work. Emory's overview included only those sites identified by Reinecke and failed to include subsequent information collected by Soehren (1963).

In 1963, Lloyd J. Soehren of the Anthropology Department at B.P. Bishop Museum conducted historical research and an archaeological survey at Kaupulehu and Makalawena for B.P. Bishop Estate (Soehren 1963). A review of his Makalawena field notes by Donham (1987) indicated that Soehren had visited several sites within Awakee, which he briefly described in a manner similar to Reinecke.

Between June-October 1970, the Parks Division of the State Department of Land and Natural Resources conducted a surface survey of the Kailua-Kawaihae road corridor for the State Department of Transportation (Ching 1971). Three sites were identified within Awakee *ahupua'a*, and one site (1170) was later included in salvage work conducted by Rosendahl along the highway corridor. This small cave shelter site was within the construction right-of-way and was well east of the present Awakee Resort project area (Rosendahl 1973:5,16).

In July and August of 1986, PHRI conducted limited historical documentary research and a reconnaissance survey of the coastal portion of Makalawena for Kamehameha

Schools/Bishop Estate (Donham 1986). Donham identified a total of 49 sites, including two coastal trails (Sites T-4 and T-6) that merge and continue north into Awakee as one trail (subsequently designated Site T-182 in Donham 1987). Based on the findings of the reconnaissance survey and on limited historical research, Donham evaluated the trails as having moderate to high significance in terms of cultural and interpretive values (Donham 1986). Preservation with some level of interpretive development was recommended for the trail sections, which are associated with modified anchialine ponds north of Opa'eula Pond and with the Makalawena Cemetery in Makalawena.

The most recent archaeological research, and the only comprehensive survey undertaken within the Awakee Resort project area, is the full reconnaissance survey conducted by PHRI during the period September 22-October 1, 1986 (Donham 1987). During this project, 84 sites were identified, a total which includes sites previously identified by Soehren (1963) and by Reinecke in 1930 (n.d.).

The majority (75%) of the sites occur within the immediate coastal zone, which is defined as an area up to 300 m inland from the shoreline (which incorporates c. 125 ac). Sites reflecting permanent habitation (prehistoric and historic period), short-term occupation, agricultural activities, transportation, recreation, burial and possibly religious activities occur within the coastal zone. Sites occurring in the inland zone principally are short-term shelters, footpaths, cairns, and animal pens. Possible burial, ceremonial, and agricultural features were also located inland.

The Donham reconnaissance report concludes with recommendations for further work at specific sites. These recommendations were based on evaluations of site significance for research, interpretive, and/or cultural values. These findings and recommendations provided the basic information and framework for preparation of the Awakee Resort project area Mitigation Plan for Site Preservation and Data Recovery Excavations, prepared in August of 1988 (Jensen and Rosendahl 1988).

The 84 sites that have been identified to date are summarized in Table 1 (Summary of Identified Sites and Features; at end) of this document according to site number, formal type, tentative functional interpretation, cultural resource management value mode assessment, general field work tasks for recommended further work, and comments. The locations of all of these sites are shown on Figure 2.

RECOMMENDATIONS FROM PREVIOUS ARCHAEOLOGICAL RESEARCH

The full reconnaissance survey findings and preliminary conclusions reported by Donham (1987), including general evaluations and recommendations for site treatment, were subsequently reviewed and approved by the State Department of Land and Natural Resources-Historic Preservation Program/State Historic Preservation Office (DLNR-HPP/SHPO) and by the Hawaii County Planning Department. Table 2 summarizes the general significance assessments and recommended general treatments for all archaeological sites identified within the Awakee Resort project area.

Significance categories used in the site evaluation process were based on the National Register criteria for evaluation, as outlined in the Code of Federal Regulations (36 CFR Part 60). The DLNR-HPP/SHPO uses these criteria for evaluating cultural resources. Sites determined to be potentially significant for information content (Category A) fall under Criterion D, which defines significant resources as ones which "...have yielded, or may be likely to yield, information important in prehistory of history." Sites potentially significant as representative examples of site types (Category B) are evaluated under Criterion C, which defines significant resources as those which "...embody the distinctive characteristics of a type, period, or method of construction...or that represent a significant and distinguishable entity whose components may lack individual distinction."

Sites with potential cultural significance (Category C) are evaluated under guidelines prepared by the Advisory Council on Historic Preservation (ACHP) entitled "Guidelines for Consideration of Traditional Cultural Values in Historic Preservation Review" (Draft Report, August 1985). The guidelines define cultural value as "...the contribution made by an historic property to an ongoing society or cultural system. A traditional cultural value is a cultural value that has historical depth." The guidelines further specify that "[a] property need not have been in consistent use since antiquity by a cultural system in order to have traditional cultural value."

Sixty-five of the 84 archaeological sites identified within the Awakee project area have been determined to be significant solely for their information content. During the reconnaissance survey conducted in 1986, sufficient data was collected from 37 of these 65 sites such that they no longer contained endangered information, and a recommendation for no further data collection work has been approved by state and county agencies. The following sites are included in this category:

Sites T-102, T-106, T-109, T-117, T-118, T-121, T-122, T-124 thru -128, T-130 thru -132, T-134 thru -136, T-143, T-144, T-147, T-148, T-156, T-161, and T-166 thru -178.

The remaining 28 sites determined to be significant solely for their information content still retained significant information, and additional data collection was therefore recommended for them. The sites in this category include:

Sites T-107, T-108, T-110 thru -116, T-120, T-123, T-129, T-133, T-141, T-142, T-146, T-149, T-150, T-151, T-153 thru -155, T-157 thru -160, T-162, and T-164.

In addition, data collection, with possible subsequent preservation "as is" and/or possible interpretive development has been recommended for 14 of the 84 sites located within the project area. The recommendation for data collection is based on a finding of residual information content and data potentials at all 14 of these sites. The recommendations for possible interpretive development and/or preservation "as is" were developed, as follows:

- a. For Sites T-104 and -137, possible interpretive development has been recommended in view of the presence of unique attributes/representation of a "type," as well as potential cultural value in consideration of the presence of shrines;
- b. For Sites T-101, -103, -140, -165, and -184, possible interpretive development has been recommended because of the presence of unique attributes/representation of a "type"; in addition, possible preservation "as is" has been recommended for two of these sites (T-165 and -184) in consideration of potential cultural values in the form of possible human burials;
- c. Preservation "as is" has been recommended for Sites T-105, -152, and -163 in consideration of cultural values in the form of possible human burials; and,
- d. Preservation "as is" has been recommended for Sites 139, -145, -179, and -181 because all possess unique attributes and/or are representative of a type, plus one or more features (shrines) at these sites have been ascribed potential cultural value.

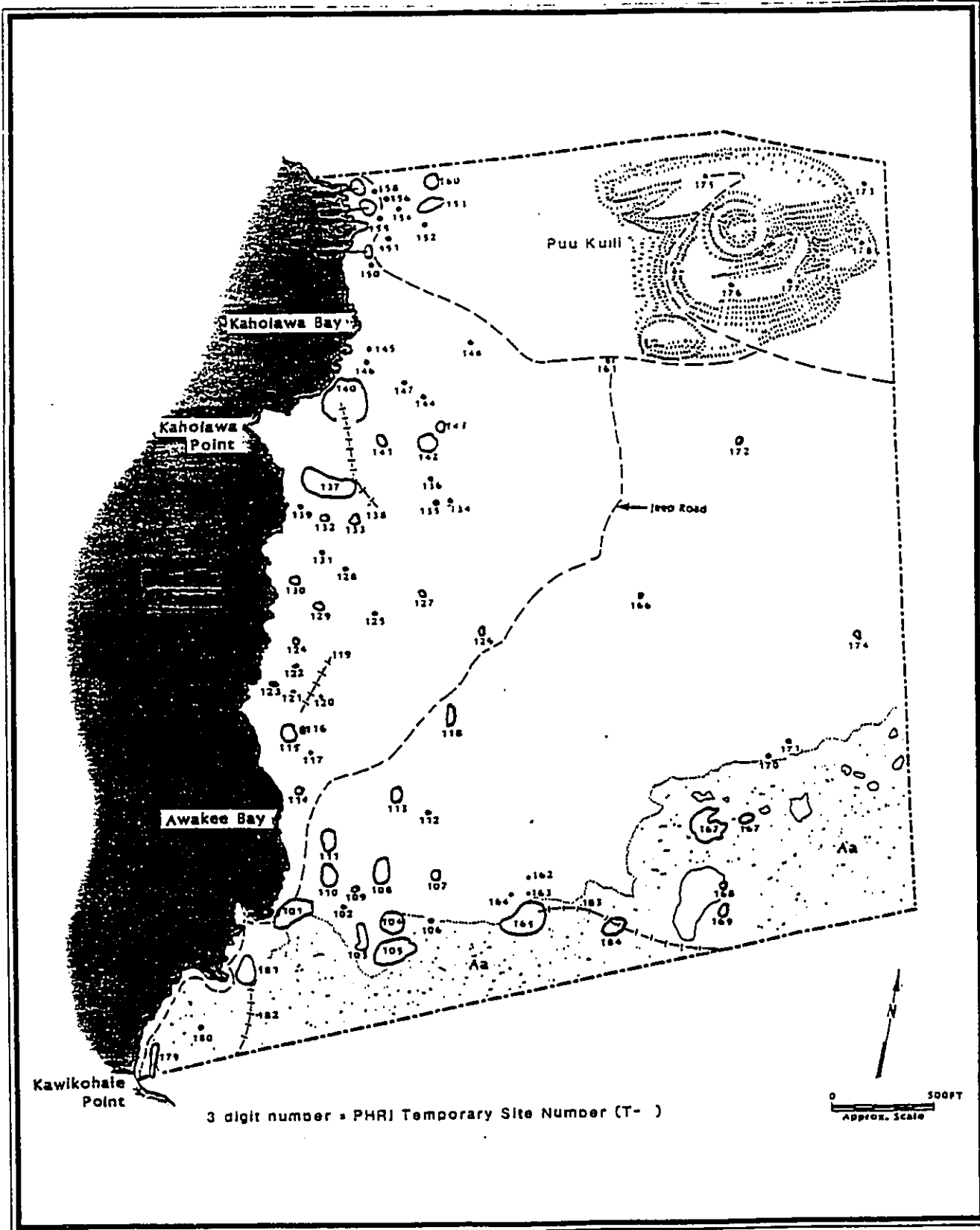


Figure 2. SITE LOCATION MAP

Table 2.

**SUMMARY OF GENERAL SIGNIFICANCE ASSESSMENTS
AND RECOMMENDED GENERAL TREATMENTS**

Site/Fea Desig.	Significance Category				Recommended Treatment			
	A	X	B	C	FDC	NFW	PID	PAI
T-107	+	-	-	-	+	-	-	-
T-108	+	-	-	-	+	-	-	-
T-110	+	-	-	-	+	-	-	-
T-111	+	-	-	-	+	-	-	-
T-112	+	-	-	-	+	-	-	-
T-113	+	-	-	-	+	-	-	-
T-114	+	-	-	-	+	-	-	-
T-115	+	-	-	-	+	-	-	-
T-116	+	-	-	-	+	-	-	-
T-120	+	-	-	-	+	-	-	-
T-123	+	-	-	-	+	-	-	-
T-129	+	-	-	-	+	-	-	-
T-133	+	-	-	-	+	-	-	-
T-141	+	-	-	-	+	-	-	-
T-142	+	-	-	-	+	-	-	-
T-146	+	-	-	-	+	-	-	-
T-149	+	-	-	-	+	-	-	-
T-150	+	-	-	-	+	-	-	-
T-151	+	-	-	-	+	-	-	-
T-153	+	-	-	-	+	-	-	-
T-154	+	-	-	-	+	-	-	-
T-155	+	-	-	-	+	-	-	-
T-157	+	-	-	-	+	-	-	-
T-158	+	-	-	-	+	-	-	-
T-159	+	-	-	-	+	-	-	-

General Significance Categories:

- A = Important for information content, further data collection necessary (PHRI=research value);
- X = Important for information content, no further data collection necessary (PHRI=research value, SHPO=not significant);
- B = Excellent example of site type at local, region, island, state, or national level (PHRI=interpretive value); and
- C = Culturally significant (PHRI=cultural value).

Recommended General Treatments:

- FDC = Further data collection necessary (further survey and testing, and possibly subsequent data recovery/mitigation excavations);
- NFW = No further work of any kind necessary, sufficient data collected archaeological clearance recommended, no preservation potential;
- PID = Preservation with some level of interpretive development recommended (including appropriate related data recovery work);
- PAI = Preservation "as is", with no further work (and possible inclusion into landscaping), or minimal further data collection necessary.

Table 2. (cont.)

Site/Fea Desig.	Significance Category				Recommended Treatment			
	A	X	B	C	FDC	NFW	PID	PAI
T-160	+	-	-	-	+	-	-	-
T-162	+	-	-	-	+	-	-	-
T-164	+	-	-	-	+	-	-	-
Subtotal:	28	0	0	0	28	0	0	0
T-102	-	+	-	-	-	+	-	-
T-106	-	+	-	-	-	+	-	-
T-109	-	+	-	-	-	+	-	-
T-117	-	+	-	-	-	+	-	-
T-118	-	+	-	-	-	+	-	-
T-121	-	+	-	-	-	+	-	-
T-122	-	+	-	-	-	+	-	-
T-124	-	+	-	-	-	+	-	-
T-125	-	+	-	-	-	+	-	-
T-126	-	+	-	-	-	+	-	-
T-127	-	+	-	-	-	+	-	-
T-128	-	+	-	-	-	+	-	-
T-130	-	+	-	-	-	+	-	-
T-131	-	+	-	-	-	+	-	-
T-132	-	+	-	-	-	+	-	-
T-134	-	+	-	-	-	+	-	-
T-135	-	+	-	-	-	+	-	-
T-136	-	+	-	-	-	+	-	-
T-143	-	+	-	-	-	+	-	-
T-144	-	+	-	-	-	+	-	-
T-147	-	+	-	-	-	+	-	-
T-148	-	+	-	-	-	+	-	-
T-156	-	+	-	-	-	+	-	-
T-161	-	+	-	-	-	+	-	-
T-166	-	+	-	-	-	+	-	-
T-167	-	+	-	-	-	+	-	-
T-168	-	+	-	-	-	+	-	-
T-169	-	+	-	-	-	+	-	-
T-170	-	+	-	-	-	+	-	-
T-171	-	+	-	-	-	+	-	-
T-172	-	+	-	-	-	+	-	-
T-173	-	+	-	-	-	+	-	-
T-174	-	+	-	-	-	+	-	-
T-175	-	+	-	-	-	+	-	-
T-176	-	+	-	-	-	+	-	-
T-177	-	+	-	-	-	+	-	-
T-178	-	+	-	-	-	+	-	-
Subtotal:	0	37	0	0	0	37	0	0

Table 2. (cont.)

Site/Fea Desig.	Significance Category				Recommended Treatment			
	A	X	B	C	FDC	NFW	PID	PAI
T-101	+	-	+	-	+	-	+	-
T-103	+	-	+	-	+	-	+	-
T-140	+	-	+	-	+	-	+	-
Subtotal:	3	0	3	0	3	0	3	0
T-104	+	-	+	+	+	-	+	-
T-137	+	-	+	+	+	-	+	-
Subtotal:	2	0	2	2	2	0	2	0
T-139	+	-	+	+	+	-	-	+
T-145	+	-	+	+	+	-	-	+
T-179	+	-	+	+	+	-	-	+
T-181	+	-	+	+	+	-	-	+
Subtotal:	4	0	4	4	4	0	0	4
T-165	+	-	+	*	+	-	+	*
T-184	+	-	+	*	+	-	+	*
Subtotal:	2	0	2	2	2	0	2	2
T-105	+	-	-	*	+	-	-	*
T-152	+	-	-	*	+	-	-	*
T-163	+	-	-	*	+	-	-	*
Subtotal:	3	0	0	3	3	0	0	3
T-119	-	+	+	+	-	-	+	-
T-138	-	+	+	+	-	-	+	-
T-182	-	+	+	+	-	-	+	-
T-183	-	+	+	+	-	-	+	-
Subtotal:	0	4	4	4	0	0	4	0
T-180	-	-	-	+	-	+	-	+
Subtotal:	0	0	0	1	0	1	0	1
Total: 84	42	41	15	16	42	38	11	10

*Provisional assessment; definite assessment pending further data collection (i.e., testing features for presence/absence of skeletal remains).

In addition to the 14 sites identified above, preservation and interpretive development, without associated data recovery, has been recommended for five sites (Sites T-119, -138, -180, -182, and -183). The information recovered during the reconnaissance survey was sufficient to preserve the useful information content from all of these sites, thus justifying the recommendation that no additional data collection work was necessary. However, all five of these sites possess cultural values, and four also exhibit attributes which render them excellent examples of site types at the local, regional, and/or island level. These findings justified a recommendation of preservation "as is" and/or possible interpretive development, depending on the results of additional data recovery among other project area sites.

For those sites in which burials have been documented as existing, or at which such features might later be encountered, the recommended treatment is to preserve and protect the specific burial features. If this becomes no longer feasible, disinterment of skeletal remains would have to be conducted. Such disinterment would, in turn, have to be undertaken in compliance with Act 265 (Chapter 6E).

Site-specific recommendations for appropriate further data collection at 42 of the 84 Awakee sites are summarized in Table 3.

Finally, a general qualification has been made with regard to the findings of significance and potential significance, as discussed above and outlined in Table 2. The existing assessments and recommended treatments have been based on the findings of surface reconnaissance only. There is always the possibility that during development activity involving land disturbance, previously unknown or unexpected subsurface cultural features, deposits, or burials might be encountered. In such a situation, immediate archaeological inspection, evaluation, and recommendation would have to be made.

Following completion of the 1986-1987 full reconnaissance survey, PHRI prepared a Detailed Content Outline for Management Plan (PHRI Project 429-042588). This plan, submitted in April of 1988, represented the preliminary step in satisfying Condition G of the General Plan Amendment Ordinance No. 87-128, subsequently approved by the County of Hawaii, Kahala Capital Corporation. The overall objective of the Detailed Management Plan Content Outline was to establish the minimal components of a formal archaeological mitigation plan that would satisfy Condition G.

In August of 1988, under the same project number, PHRI prepared and submitted a Draft "Mitigation Plan for Site Preservation and Data Recovery Excavations, Awakee Resort." Comments received from the State of Hawaii, Department of Land and Natural Resources, Historic Sites Section (Nagata to Rosendahl, dated September 14, 1988), provisionally accepted the Mitigation Plan as a partial fulfillment of the detailed preservation and archaeological data recovery plans, with the understanding that prior to considering the Plan complete that (1) additional submittals would need to be approved, and (2) certain revisions would have to be made to the Draft. To date, however, all parties are in agreement as to precisely which identified sites are to be included within the Mitigation Plan for preservation, data recovery, or some combination of the two. The only issues outstanding in this regard are the following: (a) what action to take for verified burial sites, (b) what action to take if and when previously unidentified burials are later encountered, and (c) which project area sites will need to be included in a second phase of data recovery field work (i.e., mitigative-level excavation work).

Lastly, in October of 1988, PHRI provided expert testimony re. cultural resources findings and recommendations for the Awakee Resort project area. The testimony conformed with the findings and recommendations of the 1986-1987 full reconnaissance survey, as discussed above in the present report.

Table 3.

**SUMMARY OF SITE-SPECIFIC RECOMMENDATIONS FOR
APPROPRIATE FURTHER DATA COLLECTION**

Major Task Category	Site Number	Inferred Function	Site Number	Inferred Function
Detailed Recording	T-139	Religious/habitation	T-181	Aquaculture
	T-146	Indeterminate	T-182	Transportation
	T-179	Recreation/aqua.	T-183	Transportation
Detailed Recording and Surface Collection	T-116	Temp. habitation	T-155	Temp. habitation
	T-155	Temp. habitation		
Detailed Recording, Surface Collection, and/or Test Excavations	T-101	Habitation	T-133	Temp. habitation
	T-103	Hab./recreation	T-137	Habitation
	T-104	Habitation	T-140	Habitation
	T-105	Indeterminate	T-142	Habitation
	T-107	Habitation	T-149	Habitation
	T-108	Habitation	T-153	Habitation
	T-110	Habitation	T-154	Temp. habitation
	T-111	Temp. habitation	T-157	Habitation
	T-112	Temp. habitation	T-158	Temp. habitation
	T-113	Temp. habitation	T-159	Temp. habitation
	T-115	Habitation	T-164	Habitation
	T-123	Indeterminate	T-165	Hab./ceremonial
	T-129	Habitation	T-184	Habitation
Detailed Recording and Test Excavations	T-114	Indeterminate	T-152	Indeterminate
	T-120	Temp. habitation	T-160	Poss. habitation
	T-145	Indeterminate	T-162	Poss. habitation
	T-150	Temp. habitation	T-163	Indeterminate
	T-151	Temp. habitation		

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Table 1.

SUMMARY OF IDENTIFIED SITES AND FEATURES

Site & Feature Number	Formal Site/Feature Type	Tentative Functional Interpretation	*CRM Value Mode Assess.			*Field Work Tasks			Comments
			R	I	C	DR	SC	EX	
T-101	Complex (4)*	Habitation	H	H	M	+	+	+	Fea. A contains 'lll'ill paved surface, cistern and walls; Feas. B-D consist of three smaller terraces with scattered 'lll'ill; identified by Soehren as BPBM Sites D20-10, -11
A	Enclosed terrace								
B	Terrace								
C	Platform								
D	Terrace								
T-102	Walled depression	Poss. Agricultural	L	L	L	-	-	-	Overhang appears too small and low for habitation
T-103	Complex (2)	Habitation/recreation	H	H	M	+	+	+	Fea. A poss. a small holua slide; 'lll'ill present within Fea. B; identified by Soehren as BPBM Site D20-12
A	Ramp								
B	Enclosure								
T-104	Complex (5)	Habitation	H	H	M/H	+	+	+	Fea. A platform contains coral boulder paved section (poss. shrine); artifacts and marine shell midden present
A	Platform								
B	Mound								
C	Mound/platform								
D	Cairn								

*Cultural Resource Management (CRM) Value Mode Assessment--

Nature: R = scientific research,
I = interpretive,
C = cultural;
Degree: H = high, M = moderate, L = low.

*Field Work Tasks: DR = detailed recording (scaled drawings, photographs, and written descriptions), SC = surface collections, EX = test excavations.

*Number of component features within complex.

Table 1. (Cont.)

Site & Feature Number	Formal Site/Feature Type	Tentative Functional Interpretation	CRM Value Mode Assess.			Field Work Tasks			Comments
			R	I	C	DR	SC	EX	
T-120	Complex (cont.)								
B	Cairn								Fea. A contains waterworn boulders and upright slabs; Fea. E consists of a temporary shelter with upright slabs
C	Cairn								
D	Cairn								
E	Modified outcrop								
T-121	Complex (2)	Temporary habitation	L	L	L	-	-	-	With the exception of waterworn boulders on Fea. B, no portable remains present
A	C-shaped wall								
B	Cairn								
T-122	Complex (4)	Poss. Agricultural	L	L	L	-	-	-	Waterworn boulders present and poss. utilized in breaking bedrock
A	Pahoehoe clearing								
B	Pahoehoe clearing								
C	Pahoehoe clearing								
D	Pahoehoe clearing								
T-123	Buried alignment	Indeterminate	M	M	M	+	+	+	Semicircular-shaped boulder alignment buried in sand
T-124	Walled depression	Indeterminate	L	L	L	-	-	-	No portable remains present
T-125	Terrace	Indeterminate	L	L	L	-	-	-	Two pieces shell present; structure appears vague
T-126	Complex (3)	Indeterminate/misc.	L	L	L	-	-	-	Feas. B and C poss. boundary markers
A	Walled depression								
B	Cairn								
C	Cairn								
T-127	Complex (3)	Indeterminate	L	L	L	-	-	-	Consists of rubble walls around edge of depressions; Fea. B utilizes several upright slabs
A	Walled depression								
B	Walled depression								
C	Walled depression								

Table 1. (Cont.)

Site & Feature Number	Formal Site/Feature Type	Tentative Functional Interpretation	CRM Value Mode Assess.			Field Work Tasks			Comments
			R	I	C	DR	SC	EX	
T-128 A B	Complex (2) Overhang shelter Boulder alignment	Temporary habitation	L	L	L	-	-	-	Fea. A contains sparse amounts of marine shell midden
T-129 A B C D E F	Complex (6) Modified outcrop Terrace Footpath Ash concentration Ash concentration Collapsed C-shape	Habitation	M	M	M	+	+	+	Contains marine shell midden; excellent view of the ocean; Fea. A utilized as a shelter; Fea. C contains several waterworn stepping- stones toward ocean; Fea. D c. 2.0 m in dia.
T-130	U-shaped wall	Temporary habitation	M	L	L	-	-	-	Structure in good condition; two half-gallon glass bottles and sparse shell present
T-131	Pahoehoe excavation	Indeterminate	L	L	L	-	-	-	One small waterworn boulder present
T-132 A B	Complex (2) Filled depression Coral/midden concentration	Temporary habitation	L	L	L	-	-	-	Fea. B consists of coral pebbles and sparse marine shell on bedrock
T-133 A B	Complex (2) Overhang shelter Overhang shelter	Temporary habitation	M	M	L	+	+	+	Contains moderate amounts of marine shell midden and artifacts including volcanic glass
T-134	Cave shelter	Temporary shelter	L	L	L	-	-	-	Cave slightly modified with a narrow, boulder- filled crack at entrance
T-135	Pahoehoe clearing	Indeterminate	L	L	L	-	-	-	No portable remains visible

Table 1. (Cont.)

Site & Feature Number	Formal Site/Feature Type	Tentative Functional Interpretation	CRM Value Mode Assess.			Field Work Tasks			Comments
			R	I	C	DR	SC	EX	
T-136 A B	Complex (2) Midden scatter Collapsed tube	Temporary shelter	L	L	L	-	-	-	Fea. A contains sparse marine shell on bedrock; Fea. B poss. utilized as a shelter
T-137 A B C D E F G H I J K L	Complex (12) C-shaped wall Cave shelter Low platform Mound Mound Mound Mound Walled blister/tube Walled blister Cairn Poss. trail Terrace remnant	Habitation	H	H	M/H	+	+	+	Associated with Site T-138 trail; contains moderate amounts of shell midden; Feas. A and H poss. previously identified Site D20-13; Fea. C poss. a shrine; Fea. K contains waterworn stepping-stones; Fea. G contains centrally placed upright slabs; Fea. L partially destroyed(?) by high surf
T-138	Footpath	Transportation	M	H	H	-	-	-	Portion of coastal trail to Kahoiawa Bay
T-139 A B	Complex (2) Coral boulder mound Midden concentration	Religious/habitation	M/H	H	H	+	-	-	Fea. A poss. shrine; Fea. B midden on bedrock
T-140 A B C D E F G H I J K	Complex (13) C-shaped wall Cave shelter L-shaped wall C-shaped wall/cairn Cairn Cairn Cairn Cairn Cave shelter Cairn Cave shelter	Habitation	H	H	M	+	+	+	Contains moderate to high amounts of marine shell midden and artifacts, including volcanic glass; deposit disturbed by pot-hunter excavation; complex situated at Kahoiawa Bay; associated with T-138 trail; Fea. A

Table 1. (Cont.)

Site & Feature Number	Formal Site/Feature Type	Tentative Functional Interpretation	CRM Value			Field Work			Comments
			Mode Assess.			Tasks			
			R	I	C	DR	SC	EX	
T-140	Complex (cont.)								
L	Terrace								poss. previously identified Site D20-13
M	U-shaped wall								
T-141	Complex (2)	Temporary	M	L	L	+	+	-	Fea. A contains sparse to moderate amounts of marine shell midden on bedrock
A	Cave shelter	habitation							
B	Overhang shelter								
T-142	Complex (4)	Habitation	H	M	M	+	+	+	Deposit partially disturbed by pothunters, but intact deposit present; contains moderate to high amounts of marine shell midden; volcanic glass present
A	Cave shelter								
B	Collapsed C-shape								
C	Cave shelter								
D	Cave shelter								
T-143	Bedrock excavation	Indeterminate	L	L	L	-	-	-	Crude terrace at entrance
T-144	Cairn	Indeterminate	L	L	L	-	-	-	No visible trail in area
T-145	Modified/ terraced outcrop	Indeterminate	M/H	H	H	+	-	+	Utilizes numerous coral boulders; poss. shrine
T-146	Wall or trail causeway	Indeterminate	M	M	L/H	+	-	-	Area overgrown with <u>kiawe</u>
T-147	Cairn	Indeterminate	L	L	L	-	-	-	No visible trail in area
T-148	Modified outcrop	Indeterminate	L	L	L	-	-	-	Poss. natural feature
T-149	Terrace	Habitation	H	M	M	+	+	+	Contains soil surface; waterworn basalt boulders present

Table 1. (Cont.)

Site & Feature Number	Formal Site/Feature Type	Tentative Functional Interpretation	CRM Value			Field Work Tasks			Comments
			Mode	Assess.		DR	SC	EX	
			R	I	C				
T-150 A B	Complex (2) C-shaped wall Rubble pile	Temporary habitation	M	L	L	+	-	+	Fea. B contains waterworn basalt boulders on top
T-151	Shelter remnant	Temporary habitation	M	L	L	+	-	+	Poss. a collapsed C-shaped wall
T-152 A B	Complex (2) Cairn Cairn	Indeterminate	L/H	L/M	L/H	+	-	+	Poss. grave markers; contains coral and waterworn boulders
T-153 A B C D E	Complex (5) Enclosure Terrace Cairn/platform Terrace Cairn	Habitation	M	L	L/H	+	+	+	Contains scatter of marine shell midden; waterworn boulders and thin soil in area; Fea. C poss. burial
T-154	Enclosure	Temporary habitation	M	L	L	+	+	+	Contains marine shell midden and volcanic glass; thin soil present
T-155	C-shaped wall	Temporary habitation	M	L	L	+	+	-	Box-shaped; marine shell midden present on bedrock
T-156	Wall remnant	Indeterminate	L	L	L	-	-	-	Waterworn basalt boulders present; poss. walled shelter
T-157 A B C	Complex (3) Enclosure U-shaped wall Midden scatter	Habitation	H	M/H	M	+	+	+	Contains moderate amounts of marine shell midden and artifacts including volcanic glass;
T-158	C-shaped wall	Temporary habitation	M	L	L	+	+	+	Midden, soil deposit present
T-159	Enclosure/ terrace	Habitation	H	M	M	+	+	+	Marine shell midden present; site partially destroyed by high surf

Table 1. (Cont.)

Site & Feature Number	Formal Site/Feature Type	Tentative Functional Interpretation	CRM Value Mode Assess.			Field Work Tasks			Comments
			R	I	C	DR	SC	EX	
T-160 A B	Complex (2) C-shaped wall Enclosure wall	Poss. habitation	M	L	L	+	-	+	Situated on top of knoll; excellent view of coast
T-161	Cairn	Road marker	L	L	L	-	-	-	Marks junction of present jeep road
T-162 A B C D	Complex (4) Rubble pile Walled shelter Cairn Rubble pile	Poss. Habitation	M	L	L	+	-	+	Fea. A poss. collapsed platform; Fea. B poss. a pen
T-163	Collapsed platform	Indeterminate	L/H	L/M	L/H	+	-	+	Poss. burial
T-164 A B C	Complex (3) Large cave Overhang Rubble piles around Fea. B	Habitation	H	M	M	+	+	+	Deposit extensively excavated by pothunters; very little intact deposit remaining; contains moderate to high amounts of shell midden and artifacts incl. volcanic glass
T-165 A B C D E F G H I J K L M N O P Q R	Complex (37) Large terrace Small platform Cairn Cairn C-shaped wall Walled shelter Platform Aa excavation C-shaped wall Platform Platform C-shaped wall Walled shelter Walled shelter Aa excavation Cairn Cairn Walled shelter	Habitation/ ceremonial	H	H	L/H	+	+	+	Site complex associated with and constructed along Site T-163 trail; features situated near or on north edge of aa flow; scattered marine shell midden and artifacts present; site complex also appears associated with Site T-164; hearth feature containing ash and organic matrix present on Fea. G; several features poss. burials

Table 1. (Cont.)

Site & Feature Number	Formal Site/Feature Type	Tentative Functional Interpretation	CRM Value Mode Assess.			Field Work Tasks			Comments
			R	I	C	DR	SC	EX	
T-171	C-shaped wall	Temporary shelter	L	L	L	-	-	-	No portable remains
T-172	Cave shelter	Temporary shelter	L	L	L	-	-	-	Very sparse shell midden on bedrock
T-173	Enclosure	Indeterminate	L	L	L	-	-	-	With exception of coral fragments, no portable remains
T-174 A B	Complex (2) Cairn Cairn	Indeterminate	L	L	L	-	-	-	No visible trail in area; isolated feature
T-175	Rubble pile	Survey marker	L	L	L	-	-	-	Remnants of old survey station; situated on Puu Kuili
T-176 A B	Complex (2) Rubble pile Rubble pile	Indeterminate	L	L	L	-	-	-	Fea. B poss. recent; situated on Puu Kuili
T-177	Rubble pile	Indeterminate	L	L	L	-	-	-	Situated on Puu Kuili
T-178	Wall remnants	Poss. shelter	L	L	L	-	-	-	Situated on Puu Kuili
T-179	Modified pond	Recreation/ aquaculture	H	H	H	+	-	-	Anchialine pond deepened and modified with walls and platforms
T-180	Modified pond	Recreation	L	H	H	-	-	-	Anchialine pond deepened by removing submerged rocks
T-181	Modified pond	Aquaculture	M/H	H	H	+	-	-	Anchialine pond modified with wall
T-182	Footpath	Transportation	H	H	H	+	-	-	Coastal footpath to Makalawena

