D. Botanical Resources Assessment

(LeGrande Biological Surveys, Inc.)

BOTANICAL RESOURCES ASSESSMENT FOR THE
HAWAII MEMORIAL PARK EXPANSION
KANEOHE, OAHU

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INTRODUCTION

This report includes the findings of a botanical study conducted at the proposed site for the Hawaii Memorial Park Expansion Project on the island of Oahu, Hawaii. LeGrande Biological Surveys Inc. carried out a botanical field survey of the above location on September 19 & 21, 2006. The primary objectives of the field studies were to:

1) provide a general description of the vegetation on the project site;
2) inventory the flora; and
3) search for threatened and endangered species as well as species of concern.

Federal and State of Hawaii listed species status follows U.S. Fish and Wildlife (USFWS) (1999a and 1999b, 2004) and Federal Register (2002).

GENERAL SITE DESCRIPTION

The area proposed for expansion includes approximately 60 acres of undeveloped land makai or northeast of the existing Hawaii Memorial Park in Kaneohe. The survey area is bounded by residential housing to the west and a natural ridgeline to the east. The northernmost boundary is near the Pohai Nani Retirement Home.

The property consists of relatively steep cliff areas to the east descending from a natural ridgeline that drops in elevation and levels out creating several small gulches that run east to west. The majority of the parcel is characterized by a Lowland Alien Wet Forest. The subject property is at 942 ft elevation at its highest point along the ridge that divides Kaneohe and Kailua Districts and at approximately 200 ft at its lowest elevations at the northwest boundaries. The parcel has been disturbed historically and alteration of native plant habitat has been in place for some time with very few of the natural plant elements remaining. Feral pigs (*Sus scrofa*) continue to degrade the vegetation and understory plants by rooting, resulting in soil disturbance.

SURVEY METHODS

Prior to undertaking the field studies, a search was made of the pertinent literature to familiarize the principal investigator with other botanical studies conducted in the general area. Information from the Hawaii Biodiversity and Mapping Program database was reviewed. Topographic maps were examined to determine terrain characteristics, access, boundaries, and reference points.

A walk-through survey method was used. The parcel boundaries were surveyed by foot. Transects through the interior of the property were walked at 20 foot intervals. The survey area included the area proposed for the park expansion as well as a buffer that extends mauka up to an elevation of 600 feet. Notes were made on plant associations and distribution, disturbances, topography, substrate types, exposure, drainage, etc. Plant identifications were made in the field; plants that were not positively identified were collected for later determination, and for comparison with the recent taxonomic literature.

DESCRIPTION OF THE VEGETATION

The entire survey area is a highly disturbed Schefflera/Java Plum Forest. A total of 95 plant species were observed within the survey area. 84 are alien (introduced), five are Polynesian introductions, five are indigenous (native to the Hawaiian Islands and elsewhere), and two endemic (native to the Hawaiian Islands and found nowhere else on earth). Therefore, 88% of the plant species observed are alien, 5% are Polynesian introductions, and 7% native.

An inventory of all the plants observed within the survey site is presented in the species list at the end of the report.

The existing Ocean View section of HMP is dominated by mowed grass and landscaping plantings. The edges of the area consists of weedy sections that are dominated either by tall trees such as Java plum (*Syzygium cumini*), *Falcataria moluccana* and mango (*Mangifera indica*), or smaller shrubs like koa haole (*Leucaena leucocephala*), sourbush (*Pluchea carolinensis*), Hilo holly (Ardisia crenata), castor bean (*Ricinus communis*), and golden crown-beard (*Verbesina encelioides*). Grass species include sourgrass (*Digitaria insularis*), broomsedge (*Andropogon virginicus*), molasses grass (*Melinis minutiflora*), and swollen fingergrass (*Chloris barbata*).

The remaining undeveloped section of the survey area is dominated by an alien forest of octopus tree (*Schefflera actinophylla*) and java plum. Other scattered trees include African tulip (*Spathodea campanulata*), date palm (*Phoenix dactylifera*), Chinese banyan (*Ficus microcarpa*), Coconut (*Cocos nucifera*), and Christmas berry (*Schinus terebinthifolius*). Shrub species include slender mimosa (*Desmanthus pernambucans*), shoebutton ardisia (*Ardisia elliptica*), and kolomona (*Senna surattensis*). In open areas vines such as *Ipomoea obscura*, little bell (*I. triloba*), and ivy gourd (*Coccinea grandis*) were observed climbing along the ground or in trees in shrubs. Groundcover consisted mainly of fern species such as laua`e (*Phymatosorus grossus*) and pala`a (*Sphenomeris chinensis*), and an alien grass species; basket grass (*Oplismenus hirtellus*).

An area not planned for HMP expansion, but included in the plant survey is a portion of an open sloping ridge that harbors the Kawaewae Heiau (Sterling & Summers, 1988). The main section of the heiau is cleared of most plant species. Some of the weedy plants still growing within the heiau structure include ti (*Cordyline fruticosa*), papaya (*Carica papaya*), Spanish needle (*Bidens pilosa*), and balsam pear (*Momordica charantia*). Two juvenile koa (*Acacia koa*) trees were observed at the southern end of the heiau, they appear to have been planted.

Five Polynesian introduced plant species were observed within the survey area. They include ti (*Cordyline fruticosa*), niu or coconut (*Cocos nucifera*), kukui (*Aleurites moluccana*), mai`a or banana (*Musa* sp,) and hau (*Hibiscus tiliaceus*). The kukui and hau were observed scattered throughout the survey area especially in the small gulches and ravines. Ti plants were observed along the boundary of the existing memorial park and scrub vegetation as well as along several of the ridges within the area proposed for the

new cemetery expansion. A few coconut trees were observed near the gulch bottom at the end of Lipalu Street.

Five indigenous plant species were observed infrequently in the area; `uhaloa (*Waltheria indica*), hala (*Pandanus tectorius*), ka`e`e or sea bean (*Mucuna gigantea*), pala`a (*Sphenomeris chinensis*), and moa (*Psilotum nudum*). The two endemic species include the two koa trees observed near the heiau and `akia (Wikstroemia oahuensis var. oahuensis) which was mainly observed near the edges of the Ocean View section and the upper elevations near the ridgeline.

DISCUSSION AND RECOMMENDATIONS

None of the plant species observed on the project site is a threatened and endangered species or a species of concern (U.S. Fish and Wildlife Service, 1999a, 1999b, 2004; Wagner et. al., 1999). A concerted effort was made in surveying for `ohi`a lehua (*Metrosideros sp.*) within the subject property, as it is usually more likely to find native species near pockets of extant `ohi`a lehua plants. None were located during the two-day survey.

The Kawaewae Heiau is actively being cared for and maintained and would make an appropriate area for outplanting some of the native and Polynesian introduced plants that are found within the proposed expansion area. This in addition to using native plants in the landscaping of the future memorial park would help to perpetuate these extant taxa in the immediate area.

No wetlands were encountered during this survey. None of the three essential criteria for defining a federally recognized wetland were present within the study site. Those being: hydrophytic vegetation, hydric soils, and wetland hydrology.

The proposed expansion of the Hawaii Memorial Park is not expected to have significant negative impacts on the botanical resources of the site or the general region.

Literature Cited

Evehuis, N.L. and L.G. Eldredge, editors. 1999-2002. Records of the Hawaii Biological Survey. Bishop Museum Occasional Papers Nos. 58-70.

Federal Register. 2002. Department of the Interior, Fish and Wildlife Service, 50 CFR 17. Endangered and Threatened Wildlife and Plants. Review of Species That Are Candidate or Proposed for Listing as Endangered or Threatened; Annual Notice of Findings on Recycled Petition; Annual Description of Progress on Listing Actions. *Federal Register*, **67** No. 14 (Thursday, June 13, 2002): 40657-40679.

Palmer, Daniel D. 2003. Hawaii's Ferns and Fern Allies. University of Hawaii Press, Honolulu.

Staples G. W. and D. R. Herbst. 2005. A Tropical Garden Flora: Plants cultivated in the Hawaiian Islands and other tropical places. Bishop Museum Press.

Sterling, E.P. and C.C. Summers. 1988. Sites of Oahu. Bishop Museum Press, Oahu.

U.S. Fish and Wildlife Service. 1999a. U.S. Fish and Wildlife Service species list, plants. March 23, 1999. Pacific Islands Office, Honolulu, HI.

U.S. Fish and Wildlife Service. 1999b. Endangered and threatened wildlife and plants. 50 CFR 17.11 and 17.12. December 31, 1999.

U.S. Fish and Wildlife Service. 2004. Hawaiian Islands Plants: Updated June 15, 2004, Listed and Candidate Species, as Designated under the U.S. Endangered Species Act. 17pp.

Wagner, W.L., D.R. Herbst, and S.H. Sohmer. 1990. Manual of the flowering plants of Hawaii. 2 vols. University of Hawaii Press and Bishop Museum Press, Honolulu. Bishop Museum Special Publication 83.

Wagner, W.L. and D.R. Herbst. 1999. Supplement to the Manual of the flowering plants of Hawaii, pp. 1855-1918. In: Wagner, W.L., D.R. Herbst, and S.H. Sohmer. 1990. Manual of the flowering plants of Hawaii. Revised Edition. 2 vols. University of Hawaii Press and Bishop Museum Press, Honolulu.

PLANTS SPECIES LIST – Hawaii Memorial Park Expansion, Oahu, Hawaii

The following checklist is an inventory of all the plant species observed within the survey site for the proposed Hawaii Memorial Park Expansion. The plant names are arranged alphabetically by family and then by species into each of four groups: Gymnosperms, Ferns and Fern Allies (Pteridophytes), Monocots, and Dicots. The taxonomy and nomenclature of the Ferns and Fern Allies follow Palmer (2002), while the gymnosperms and flowering plants, Monocots and Dicots, are in accordance with Wagner *et al*. (1990) and Wagner and Herbst (1999) and Staples and Herbst (2005). Recent name changes are those recorded in the Hawaii Biological Survey series (Evehuis and Eldredge, eds, 1999-2002).

For each species, the following name is provided:

1. Scientific name with author citation.
2. Common English and/or Hawaiian name(s), when known.
3. Biogeographic status. The following symbols are used:

   E= endemic= native only to the Hawaiian Islands.

   I= indigenous= native to the Hawaiian Islands and elsewhere.

   P=Polynesian introduced=species that were introduced by the Polynesian migration to Hawaii, either intentionally or unintentionally, and are now naturalized.

   X=introduced or alien = all those plants brought to the Hawaiian Islands by humans, intentionally or accidentally, after Western contact, that is Cook's arrival in the islands in 1778.

HAWAII MEMORIAL PARK PLANT SPECIES LIST
SEPTEMBER 2006

SCIENTIFIC NAME	COMMON NAME	STATUS
GYMNOSPERMS		
ARAUCARIACEAE		
Araucaria columnaris (G.Forst.) Hook.f.	Cook pine	X
PTERIDOPHYTES		
NEPHROLEPIDACEAE		
Nephrolepis multiflora (Roxb.) F.M. Jarrett ex C.V. Morton		X
LINDSAEACEAE		
Sphenomeris chinensis (L.) Maxon	Pala`a	I
POLYPODIACEAE		
Phymatosorus grossus (Langsd. & Fisch.) Brownlie	Laua`e	X
PSILOTACEAE		
Psilotum nudum (L.) P. Beauv.	Moa, upright whiskfern	I
THELYPTERIDACEAE		
Christella parasitica (L.) Lev.		X
MONOCOTS		
AGAVACEAE		
Cordyline fruticosa (L.) A.Chev.	Ti, ki	P
ALOEACEAE		
Aloe vera (L.) N.L.Burm.	Aloe	X
ARACEAE		
Dracaena sp. L.	dracaena	X
ARECACEAE		
Cocos nucifera L.	coconut	P
Phoenix dactylifera L.	Date palm	X
COMMELINACEAE		
Commelina diffusa Burm.f,	honohono	X

SCIENTIFIC NAME	COMMON NAME	STATUS
HELICONIACEAE		
Heliconia sp.	heliconia	X
IRIDACEAE		
Trimezia martinicensis (Jacq.) Herbert	Yellow iris	X
MUSACEAE		
Musa sp. L.	banana	P
ORCHIDACEAE		
Arundina graminifolia (D.Don) Hochr.	Bamboo orchid	X
Spathoglottis plicata Blume	Philippine ground orchid	X
PANDANACEAE		
Pandanus tectorius Parkinson ex Z	hala	I
POACEAE		
Andropogon virginicus L.	broomsedge	X
Cenchrus ciliaris L.	Buffelgrass	X
Chloris barbata (L.) Sw.	Swollen fingergrass	X
Cynodon dactylon (L.) Pers	manienie	X
Digitaria insularis (L.) Mez ex Ekman	sourgrass	X
Melinis minutiflora P.Beauv.	Molasses grass	X
Oplismenus hirtellus (L.) P.Beauv.	Basketgrass, honohono	X
Panicum maximum L.	Guinea grass	X
Paspalum conjugatum P.J.Bergius	Hilo grass	X
Setaria verticillata (L.) P.Beauv.	Bristly foxtail	X
DICOTS		
ANACARDIACEAE		
Mangifera indica L.	mango	X
Schinus terebinthifolius Raddi	Christmas berry	X
APIACEAE		
Centella asiatica (L.) Urb.	Asiatic pennywort	X
ARALIACEAE		
Schefflera actinophylla (Endl.) Harms	Octopus tree	X
ASTERACEAE		
Bidens pilosa L.	Spanish needle	X
Crassocephalum crepidioides (Benth.) S.Moore	crassocephalum	X
Emilia fosbergii Nicolson	Red pualele	X

SCIENTIFIC NAME	COMMON NAME	STATUS
ASTERACEAE (cont.)		
Pluchea carolinensis (Jacq.) G. Don	sourbush	X
Sphagneticola trilobata (L.) Pruski	wedelia	X
Synedrella nodiflora (L.) Gaertn.	nodeweed	X
Verbesina encelioides (Cav.) Benth. & Hook	Golden crown-beard	X
BIGNONIACEAE		
Spathodea campanulata P. Beauv.	African tulip	X
Tabebuia heterophylla (DC.) Britton	Pink tecoma	X
CARICACEAE		
Carica papaya L.	papaya	X
CASUARINACEAE		
Casuarina equisetifolia L.	ironwood	X
CLUSIACEAE		
Clusia rosea Jacq.	Autograph tree	X
CONVOLVULACEAE		
Ipomoea cairica (L.) Sweet	koali ai	X
Ipomoea obscura (L.) Ker Gawl.		X
Ipomoea triloba L.	Little bell	X
CUCURBITACEAE		
Coccinea grandis (L.) Voigt	Ivy gourd	X
Momordica charantia L.	Balsam pear	X
EUPHORBIACEAE		
Aleurites moluccana (L.) Willd.	kukui	P
Chamaesyce hypercifolia (L.) Millsp.	graceful spurge	X
Ricinus communis L.	Castor bean	X
FABACEAE		
Acacia confusa Merr.	Formosan koa	X
Acacia koa A.Gray	koa	E
Acacia farnesiana (L.) Willd.	Klu, aroma, kolu	X
Chamaecrista nictitans (L.) Moench	Partridge pea	X
Desmanthus pernambucanus (L.) Thell.	Slender mimosa	X
Desmodium tortuosum (Sw.) DC.	Florida beggarweed	X
Desmodium triflorum (L.) DC.	Tick clover	X
Falcataria moluccana (Miq.) Barenby & J.W.Grimes		X

SCIENTIFIC NAME	COMMON NAME	STATUS
FABACEAE (cont.)		
Indigofera hendecaphylla Jacq.	Creeping indigo	X
Indigofera suffritocosa Mill.	Iniko	X
Leucaena leucocephala (Lam.) de Wit	Koa haole	X
Mimosa pudica L. var. *unijuga* (Duchass. & Walp.) Griseb.	Sensitive plant	X
Mucuna gigantea (Willd.) DC. ssp. *gigantea* Ohashi & Tateishi	Sea bean, ka`e`e	I
Samanea saman (Jacq.) Merr.	monkeypod	X
Senna surattensis (Burm.f.) H.S.Irwin & Barneby	kolomona	X
Senna pendula (Humb. & Bonpl. ex Willd.) Kunth var. *advena* (Vogel) H.S.Irwin & Barneby		X
LAMIACEAE		
Hyptis pectinata (L.) Poit.	Comb hyptis	X
Leonotis nepetifolia (L.) R.Br.	Lion's ear	X
LAURACEAE		
Cinnamomum sp.	cinnamon	X
MALVACEAE		
Abutilon grandifolium (Willd.) Sweet	Hairy abutilon	X
Hibiscus tiliaceus L.	hau	P
Malvastrum coromandelianum (L.) Garcke	False mallow	X
Sida rhombifolia L.		X
MELASTOMATACEAAE		
Clidemia hirta (L.) D.Don. var. *hirta*	Koster's curse	X
Dissotis rotundifolia (Sm.) Triana		X
Melastoma septemnervium Lour.	melastoma	X
MORACEAE		
Ficus microcarpa L.f.	Chinese banyan	X
MYRSINACEAE		
Ardisia crenata Sims	Hilo holly	X
Ardisia elliptica Thunb.	Shoebutton ardisia	X
MYRTACEAE		
Psidium cattleianum Sabine	Strawberry guava	X
Psidium guajava L.	Common guava	X
Syzygium cumini (L.) Skeels	Java plum	X

SCIENTIFIC NAME	COMMON NAME	STATUS
PASSIFLORACEAE		
Passiflora edulis Sims	Passion fruit	X
Passiflora suberosa L.	Huehue haole	X
RUBIACEAE		
Paederia foetida L.	Maile pilau	X
Spermacoce assurgens Ruiz. & Pav.	buttonweed	X
SAPINDACEAE		
Filicium decipiens (Whit & Arn.) Thwaites	Fern tree	X
STERCULIACEAE		
Waltheria indica L.	`uhaloa	I
TILIACEAE		
Heliocarpus popayanensis Kunth	White moho	X
THYMELAEACEAE		
Wikstroemia oahuensis (A.Gray) Rock var. *oahuensis*	`akia	E
VERBENACEAE		
Citharexylum caudatum L.	fiddlewood	X
Lantana camara L.	lantana	X
Stachytarpheta jamaicensis (L.) Vahl	Jamaican vervain	X

ADDENDUM

HAWAII MEMORIAL PARK BOTANICAL SURVEY

LeGrande Biological Surveys Inc carried out a laua`e (*Phymatosorus grossus*) delineation survey at the proposed Hawaii Memorial Park Expansion Project site on August 23, 2008. The goal was to map populations of laua`e fern with a GPS unit, focusing in an area planned for a cultural sites preservation corridor. Populations of laua`e were mapped in the field by walking the outside margins of monotypic stands of laua`e and taking GPS points at regular intervals. Maps were created using the GPS data. (Attached as page 2)

Fig 1. Flowers of the ka`e`e vine.

The delineated laua`e populations are dominated by a thick canopy of monkeypod (*Samanea saman*), java plum (*Syzygium cumini*), and octopus trees (*Schefflera actinophylla*). Several liana species were observed growing up into the canopy of the forest including, ka`e`e or sea bean (*Mucuna gigantea*), passion fruit (*Passiflora edulis*), and maile pilau (*Paederia foetida*). Ka`e`e is an indigenous species with stunning yellowish-green flowers that grows on all of the main Hawaiian Islands. The population observed here is robust but is being smothered by both of the other introduced vine species mentioned (passion fruit and maile pilau).

Several bird's-nest ferns or `ekaha (*Asplenium nidus*) were observed growing as an epiphyte in monkeypod trees. This indigenous fern as well and an ornamental croton (*Codiaeum variegatum*) [introduced] and noni (*Morinda citrifolia*) [Polynesian introduction] were overlooked on the previous Hawaii Memorial Park Expansion plant survey.

The understory is dominated by laua`e fern and an alien grass species; basket grass (*Oplismenus hirtellus*).

Figure 2. View of typical laua`e population in mapped corridor.

A
B
C
D
E
F
A1
A2
A3
A4
B1
B2
B3
B4
B5
B6
B7
B8
B9
B10
B11
B12
B13
B14
B15
B16
B17
B18
B19
B20
B21
B22
B23
C1
C2
C3
C4
C5
C6
D1
D2
D3
D4
D5
D6
D7
D8
D9
E1
E2
E3
E4
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E8
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E10
E11
E12
E13
E14
E15
E16
E17
E18
E19
E20
E21
E22
E23
1 inch equals 100 feet

E. Avifaunal and Feral Mammal Field Survey

(Philip L. Bruner)

AVIFAUNAL AND FERAL MAMMAL FIELD SURVEY FOR THE HAWAIIAN MEMORIAL PARK EXPANSION AREA, KANEOHE, OAHU, HAWAII

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INTRODUCTION

This report presents the findings of a two day (26,27 September 2006) field survey of lands involved in the proposed Hawaiian Memorial Park Expansion in Kaneohe, Oahu, Hawaii. In addition to the field data this report also notes pertinent published and unpublished sources of birds and mammals to provide a broader view of the potential species known from this region of Oahu. The two objectives of the field survey were to:

1- Document the birds and mammals presently found on or near the property.

2- Locate and examine all habitats on the site and note their importance, if any, for native and migratory birds.

SITE DESCRIPTION

The area proposed for the Hawaiian Memorial park Expansion is presently covered in second growth forest. Some native trees such as Ohia (*Metrosideros polymorpha*) can be found along the higher ridges. Rainfall in this area promotes a dense tangle of vegetation. The surrounding lands include the existing Hawaiian Memorial Park and Veterans Cemetery as well as residential property (Fig.1).

METHODS OF THE FIELD SURVEY

The survey was conducted by walking the site using existing trails and an old road bed. Observations were focused during early morning, late afternoon and early evening hours when birds and mammals were most active and observable. The entire property was investigated. All birds seen and heard were tallied. Census stations were established throughout the site and eight minute counts of all birds seen or heard at these stations were tallied (Fig.1). These data were used to estimate the relative abundance of each bird species on the property. Rare or infrequently seen species were tallied whenever they were observed. Data on mammals were obtained by visual observations only. No trapping of mammals was conducted. The duration and nature of the field survey did not warrant trapping. A Pettersson Elecktronik AB Ultrasound Detector D-100 was used on the evening of 27 September to listen for the echolocation calls of the endangered Hawaiian Hoary Bat (*Lasiurus cinereus semotus*). The weather during the survey period was mixed with both clear skies and brief rain showers. The winds were light which resulted in excellent conditions for detecting vocalizing birds.

Scientific and common (vernacular) names of birds and mammals referred to in this report follow the taxonomy of Pyle (2002) and Honacki et al. (1982). Plant names are those given by Pratt (1998).

RESULTS OF THE FIELD SURVEY

Native Land Birds:

No native land birds were recorded on the survey. The elevation and available habitat at this site are not suitable for most native land birds. The Hawaiian Owl or Pueo (*Asio flammeus sandwichensis*) is listed by the State of Hawaii as endangered on Oahu but not elsewhere in the State. They hunt in grasslands, agricultural fields and forests (Pratt et al. 1987, Hawaii Audubon Society 2005). This species might on rare occasion forage in this area. The Oahu Amakihi (*Hemignathus flavus*) is seen in similar habitat on Tantalus and Lyon Arboretum in Honolulu and may also occur at this site (Pratt 1996).

Native Waterbirds:

No native waterbirds were recorded nor were any expected on this property due to an absence of suitable wetland habitat.

Seabirds:

No seabirds were recorded on the survey. None would be expected to nest at this location due to the presence of ground predators and human disturbance. Some species on occasion may fly over the property.

Migratory Birds:

The only species of migratory shorebird observed on lawns adjacent to the site was the Pacific Golden-Plover or Kolea (*Pluvialis fulva*). This abundant wintering shorebird forages on lawns, pastures and in agricultural fields as well as along shorelines. Kolea have been extensively studied both here in Hawaii and on their wintering grounds in western Alaska (Johnson et al. 1981, 1989, 1993, 2001a, 2001b). Radio telemetry studies on plover caught at Hawaiian Memorial Park have yielded important insights into the timing and location of their spring migration routes back to western Alaska (Johnson et al. 1997, 2006). Kolea are not listed as threatened or endangered.

Introduced (Alien) Birds:

Fourteen species of alien birds were tallied on the survey. Table One gives their names and relative abundance. None of these species are listed as threatened or endangered. The array of alien birds at this location is typical of this type of habitat in Windward Oahu (Hawaii Audubon Society 2005; Bruner 1989, 1993, 1994).

Mammals:

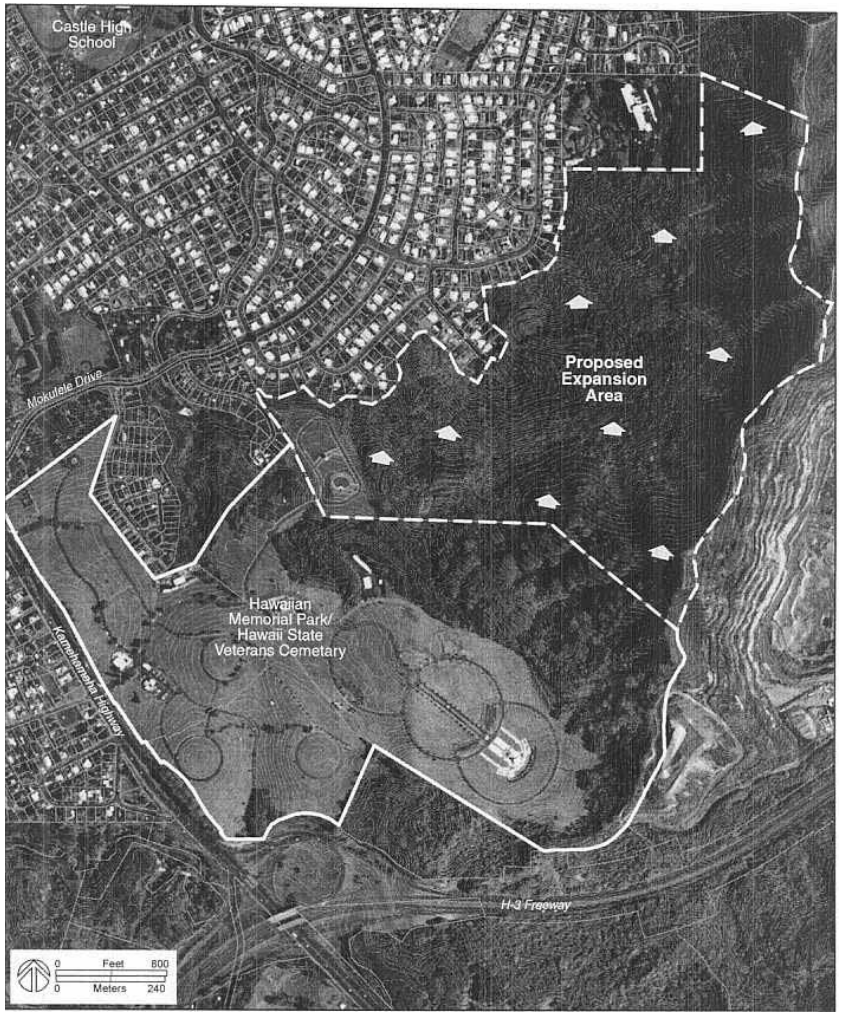
Eight cats (*Felis catus*), three Small Indian Mongoose (*Herpestes auropunctatus*), and four pigs (*Sus scrofa*) were observed over the duration of the survey. Pig tracks and areas rooted up by pigs were abundant throughout the site. Mice (*Mus musculus*) and rats

(*Rattus spp.*) undoubtedly occur on the site but were not observed. The native endangered Hawaiian Hoary Bat was not detected. This finding was not unexpected given the low numbers of bats reported to occur on Oahu (Tomich 1986, Kepler and Scott 1990). This species forages in a wide variety of habitats including: forests, agricultural lands, and urban areas. They are most abundant on Kauai and the Big Island. Jacobs (1991, 1993) and Reynolds et al. (1998) provide information on the occurrence and natural history of this species.

SUMMARY AND CONCLUSIONS

The purpose of this report was to present the findings of a bird and feral mammal field survey. No native land birds were recorded but the endangered Hawaiian Owl (Pueo) and the non-endangered Oahu Amakihi could on occasion forage at this site. No native waterbirds were recorded due to an absence of suitable habitat. No seabirds were seen. The migratory Kolea was observed on the lawn areas adjacent to the site. The array of alien birds recorded was typical of this region. No unusual species were recorded. The presence of feral mammals (cat, mongoose, pig) was expected at this site. The absence of the endangered Hawaiian Hoary Bat was not unexpected given the low numbers of bats reported to occur on Oahu. This second growth forest surrounded by developed property provides habitat for a variety of alien birds and mammals, none of

which are threatened or endangered. The clearing of this site and its subsequent conversion to lawn habitat will reduce the immediate, local populations of alien birds and mammals but will provide new foraging space for wintering Kolea (a migratory shorebird).



Aerial Photograph

Hawaiian Memorial Park Expansion
Kane'ohe, O'ahu

Fig. 1. Location of faunal survey. White arrows indicate approximate location of census stations.

TABLE 1

Relative abundance estimates: A=abundant (10+ on census stations; C=common (5-9 on census stations); U=uncommon (1-4 on census stations); R=recorded but not on census stations (number which follows is total found on the survey).

Common Name	Scientific name	Relative Abundance
Red Junglefowl	*Gallus gallus*	U
Spotted Dove	*Streptopelia chinensis*	A
Zebra Dove	*Geopelia striata*	C
Red-vented Bulbul	*Pycnonotus cafer*	A
Red-whiskered Bulbul	*Pycnonotus jocosus*	A
White-rumped Shama	*Copsychus malabaricus*	U
Red-billed Leiothrix	*Leiothrix lutea*	C
Japanese White-eye	*Zosterops japonicus*	A
Common Myna	*Acridotheres tristis*	C
Northern Cardinal	*Cardinalis cardinalis*	C
Red-crested Cardinal	*Paroaria coronata*	C
House Finch	*Carpodacus mexicanus*	A
House Sparrow	*Passer domesticus*	U
Java Sparrow	*Padda oryzivora*	R=16

SOURCES CITED

Bruner, P.L. 1989. Survey of the avifauna and feral mammals at the site of the proposed Castle Junction Interchange, Kaneohe, Oahu. Unpubl. ms. Prep. for Parson Hawaii, Honolulu.

__ 1993. Survey of the avifauna and feral mammals at the US Coast Guard Haiku Valley Omega Station, Kaneohe, Oahu. Unpubl. ms. Prep. for Woodward-Clyde Consultants.

_ 1994. Avifaunal and feral mammal survey of land proposed for an access road for Hope Chapel, Kaneohe, Oahu. Unpubl. ms. Prep. for PBR Hawaii.

Hawaii Audubon Society. 2005. Hawaii's Birds. Sixth Edition. Hawaii Audubon Society, Honolulu. 141pp.

Honacki, J.H., Kinman and J.W. Koeppl eds. Mammal species of the world: A Taxonomic and Geographic Reference. Allen Press, Inc. and the Association of Systematic Collections. Lawrence, Kansas. 694pp.

Jacobs, D.S. 1991. The distribution and abundance of the endangered Hawaiian Hoary Bat (*Lasiurus cinereus semotus*), on the island of Hawaii. Unpubl. report submitted to University of Hawaii, Department of Zoology.

_ 1993. Foraging behavior of the endangered Hawaiian Hoary Bat (*Lasiurus cinereus semotus)* Final report to U.S. Fish and Wildlife Service. Grant No. 14-48-0001-92570. Unpubl. ms.

Johnson, O.W., P.M. Johnson, PL. Bruner. 1981. Wintering behavior and site-faithfulness of Golden-Plovers on Oahu. 'Elepaio 41(12):123-130.

Johnson, O.W., M.L. Morton, P.L. Bruner and P.M. Johnson. 1989. Fat cyclicity, flight ranges and features of wintering behavior in Pacific Golden-Plovers. Condor 91:156-177.

Johnson, O.W., P.G. Connors, P.L. Bruner and J.L. Maron. 1993. Breeding ground fidelity and mate retention in the Pacific Golden-Plover. Wilson Bull. 105:60-67.

Johnson,O.W., N.Warnock, M.A. Bishop, A.J. Bennett, P.M. Johnson & R.J. Kienholz. 1997. Migration by radio-tagged Pacific Golden-Plovers from Hawaii to Alaska and their subsequent survival. Auk 114:521-524.

Johnson, O.W., P.L. Bruner, J.J. Rotella, P.M. Johnson, and A.E. Bruner. 2001a. Long term study of apparent survival in Pacific Golden-Plovers at a wintering ground on Oahu, Hawaiian Islands. The Auk 118(2):342-351.

Johnson, O.W., P.L. Bruner, A.E. Bruner, P.M. Johnson, R.J. Kienholz, and P.A. Brusseau. 2001b. Features of breeding biology in Pacific Golden-Plovers nesting on the Seward Peninsula, Alaska. Wader Study Group Bulletin 25:59-65.

Johnson, O.W., Goodwill, R. & Johnson P.M. 2006. Wintering ground fidelity and other features of Pacific Golden-Plovers *Pluvialis fulva* on Saipan, Mariana islands, with comparative observations from Oahu, Hawaiian Islands. Wader Study Group Bull. 109:67-72

Kepler, C.B. and J.M. Scott. 1990. Notes on the distribution and behavior of the endangered Hawaiian Hoary Bat (*Lasiurus cinereus semotus*). 'Elepaio 50(7):59-64.

Pratt, H.D. 1996. Hawaii's Birds. Mutual Publishing. Honolulu. 112pp.

1998. Hawaii's Trees and Shrubs. Mutual Publishing, Honolulu. 136pp.

Pratt, H.D., P.L. Bruner and D.G. Berrett. 1987. A field guide to the birds of Hawaii and the tropical Pacific. Princeton University Press. Princeton, New Jersey. 409pp.

Pyle, R.L. 2002. Checklist of the Birds of Hawaii – 2002. 'Elepaio 62(6):137-148.

Reynolds, M.H., B.M. B. Nielsen, and D.J. Jacobi. 1998. Surveys on the Hawaiian Hoary Bat in the district of Puna, Hawaii Island. 'Elepaio 57((9):153-157.

Tomich, P.Q. 1986. Mammals in Hawaii. Bishop Museum Press. Honolulu. 375pp.

F. Survey of Native Invertebrate Resources

(Steven Lee Montgomery, Ph.D.)

Survey of Native Invertebrate Resources at site of future expansion of Hawaiian Memorial Park, Kāne'ohe, O'ahu

August 1, 2008

Prepared by:
Steven Lee Montgomery, Ph. D., Waipahu, Hawai'i

Submitted to:
Helber Hastert & Fee, Planners

For: Hawaiian Memorial Life Plan Ltd.

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SUMMARY

The Hawaiian Memorial Park Expansion, Kāne'ohe, O'ahu, project site sampled in this survey yielded predominantly adventive insect species, and four native arthropods. No native mollusks were observed. No invertebrate listed under either federal or state endangered species statutes was located within the survey area.

INTRODUCTION

This report summarizes the findings of an invertebrate[1] survey conducted at the site of the planned expansion of Hawaiian Memorial Park, Kāne'ohe, O'ahu (Figure 1). Hawaiian Memorial Life Plan Ltd. proposes a mixture of cemetery expansion, residential units, and preservation of historic sites on approximately 56.6 acres adjacent to the present Hawaiian Memorial Park. This survey was conducted by Steven Lee Montgomery, Ph. D., for Helber Hastert & Fee, Planners, Honolulu, Hawai'i.

The primary purpose of this survey was to determine the presence or absence on the property of any endemic or indigenous terrestrial invertebrates, especially any species with legal status under federal or state threatened and endangered species statutes (DLNR 1998, USFWS, 2008). Invertebrates are often dominant fauna in natural Hawaiian environments. Native Hawaiian plant, vertebrate, and invertebrate populations are interdependent. Invertebrates are the food of some birds and the pollinators of plants. Certain insects are obligatorily attached to specific host plants and are able to use only that plant as their food. Those insect - host relationships are ancient and intertwined. Native invertebrates have proven inventive in adapting to opportunities in changed ecosystems. A surprising number of native arthropod species survive even in degraded habitats. Nevertheless, the overall health of native Hawaiian invertebrate populations depends upon habitat quality and absence or low levels of predators introduced from the continents. Sufficient food sources, host plant availability, and the absence or low levels of introduced, continental predators and parasites comprise a classic native, healthy ecosystem. Consequently, where appropriate in the survey discussion, host plants, and some introduced arthropods are also noted.

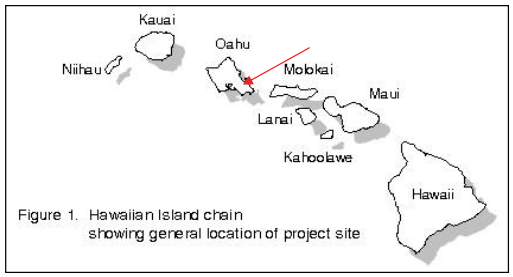


Figure 1. Hawaiian Island chain showing general location of project site

[1] Animals without backbones: insects, spiders, snails, shrimp, etc.

Figure 2: Typical sparse understory with alien canopy.

GENERAL SITE DESCRIPTION

The Hawaiian Memorial Park expansion site (HMPE) at Kāne'ohe, O'ahu, is a 56.6 acre (ac.) portion of a 164.4 ac. parcel TMK 4-5-33:001. The larger parcel is bound on the west by residential housing and a natural ridgeline on the east. A ridge separates the parcel from Kapa'a Quarry and the H-3 Freeway. Pohai Nani Good Samaritan Retirement Community is near the northern section of the proposed expansion. The south-southeastern boundary of the larger parcel is a steeply sloped, vegetated portion of the Hawaii State Veterans Cemetery.

The general area where the site is found has been through a variety of changes as first Polynesians, then Europeans adapted the area vegetation to their own needs. From early Hawaiian cultivation of crops and housing to rice cultivation and pineapple growing, feral grazing animals and formal cattle ranching (McCurdy and Hammatt 2008), the native vegetation - and native invertebrate population - was displaced by a succession of introduced plants or chewed and grubbed out by introduced mammals (Figure 2).

The parcel has been described by botanical consultants as a Lowland Alien Wet Forest where "with very few of the natural plant elements remaining… Feral pigs (*Sus scrofa*) continue to degrade the vegetation and understory plants by rooting, resulting in soil disturbance." (LeGrande 2006).

Figure 3

Although open, grassy areas (Figure 3) and large fields of fern (Figure 4) may seem pleasant to view, they are devoid of native Hawaiian plants to serve as hosts or shelter for native invertebrates.

Figure 4

Only two native Hawaiian plants were encountered: a small patch of 'uhaloa (*Waltheria indica*) (Figure 5) and a single 'ākia (*Wikstroemia* spp.) (Figure 6). Both species appear to be unpalatable to livestock, commonly surviving in pastures and being rejected by feral goats. Both were swamped by introduced species. See Figure 9 for location.

Figure 5: 'Uhaloa (*Waltheria indica*) may be protected from grazing by fuzzy leaves.

'

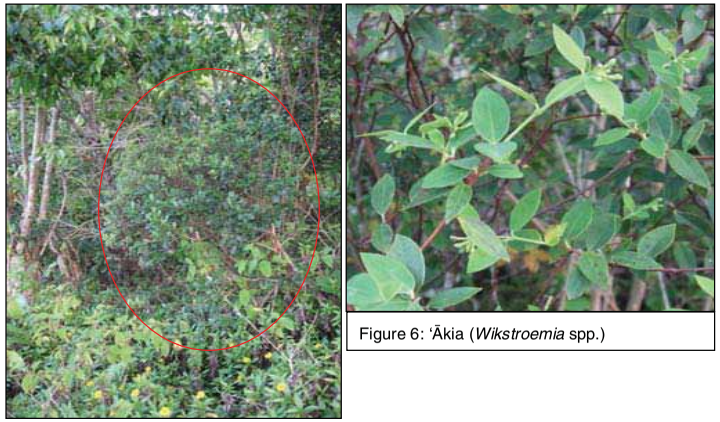


Figure 6: 'Ākia (*Wikstroemia* spp.)

Several introduced plants commonly substituted by native invertebrates for their native hosts, were not present. In comparison to less altered locations at similar elevations and with parallel rainfall, the introduced plants which remain provide very scant habitat for native invertebrates.

INVERTEBRATE SURVEY METHODS

Previous Surveys

Surveys for avian and mammalian (Bruner 2006) and botanical resources (LeGrande 2006) at the project area were very helpful in preparing for this study, but show no reference to previous invertebrate surveys nor did they note any invertebrate sightings during their surveys.

Fieldwork

Since 1968, I have taken part in field projects in environments similar to the project site, at other locations on the island of O'ahu, and throughout the island chain. Those experiences and the results of those surveys provided the basis for my study design and my analysis of results.

A field survey was conducted at the project site on July 26, 2008. I conducted a general assessment of terrain and habitats after reviewing maps and prior reports (above). Surveying efforts were conducted by day and night, a technique which is vital for a thorough survey. The property was traversed across all habitat types, alternately following established pathways to search for any native botanical resources and substitute host plant options for native invertebrates.

Collecting Methods

The following collecting methods for terrestrial invertebrates were used as appropriate to the terrain, botanical resources, and target species.

Figure 7: Monkeypod tree flux examined for *Drosophila*

Host plant searches: Host plants, both native and introduced, were sampled for arthropods that feed or rest on plants. Searches included visual inspection of resting sites and searching known feeding or breeding sites such as under dead bark.

A large Monkeypod tree sap exudate or flux was examined as a possible breeding site of *Drosophila* (Figure 7). Some native *Drosophila* flies are known to lay eggs only in sap fluxes where sweet, fermenting plant sap slowly leaks from a wound. Fermented by yeasts, the sap is made into a rich food for larval flies. Some introduced tree sap "tastes" enough like the native sap to entice some native flies to lay eggs at this resource when populations of the fly remain. This flux appeared devoid of larvae, even of *D. carbonaria*, which is known from Kailua since the 1990s. The flux is not a threat to the tree.

Sweep nets: This is a general method of censusing most flying and perching insects. A fine mesh net was swept across plants, leaf litter, etc. to sample any flying or perching insects. Transfer from the net was either by aspiration, or by placing the net contents into a holding container.

Visual observation: At all times, I was vigilant for any visual evidence of arthropod presence or activity. Visual observations provide valuable evidence and are a cross check that extends the reach of sampling techniques. Visual observation also included turning over rocks, dead wood, and other debris.

Light sampling: A survey of insects active at night is vital to a complete record of the fauna. Many insects are active only at night to evade birds, avoid desiccation and high temperatures, or to use night food sources, such as night opening flowers. Light sampling uses a bright light in front of a white cloth sheet. (Figure 8) Night active insects seem to mistake the collecting light for the light of the moon, which they use to orient themselves. In attempting to navigate by the entomologist's light, confused insects are drawn to circle the light and land on the cloth in confusion. This type of collecting is most successful during the dark phase of the moon, or under clouds blocking starlight. On level sites vegetation usually blocks the light from being seen over long distances, and moths and other night fliers are not drawn from distant locations outside the survey area.

Figure 8 : Light assists in surveying arthropods

The location for my light was chosen based on experience, potential host plant proximity, and terrain (Figure 9). Screening vegetation meant that the nearby housing areas contributed little competing light. The primary light source was a Mercury Vapor bulb. The sheet was monitored and visiting species observed. Light surveying was conducted for 4 hours in a location very near the only native plants seen during the survey.

Survey Limitations / Conditions

My ability to form advisory opinions is limited or influenced in the following ways:

Collecting conditions:

Weather: Weather was favorable for surveying during the entire field day with patchy clouds and light breezes during night light monitoring.

Seasons: Monitoring at a different time of the year might produce a longer or different arthropod list. Weather and seasonal vegetation changes play an especially important role in any survey of invertebrates. Many arthropods time their emergence and breeding to overlap or follow seasonal weather or to coincide with growth spurts of an important plant food. Host plant presence/absence, and seasonal changes, especially plant growth after heavy rains, affect the species collected. Given the short inventory of native plants at this site, seasonal factors are not an important factor in this instance.

Summer 2008 has seen several short rain events which put the vegetation in a better than normal summer condition to act as host to invertebrates. The low level of native plants found at the site, however, was a stronger factor in determining the invertebrates encountered.

Moon: The moon presented no competition to the collecting light. On July 26, 2008, the moon set at 1:54 p.m..[2] and did not rise again until July 27, 2008, 1:03 a.m. (USNO)

Limited duration:

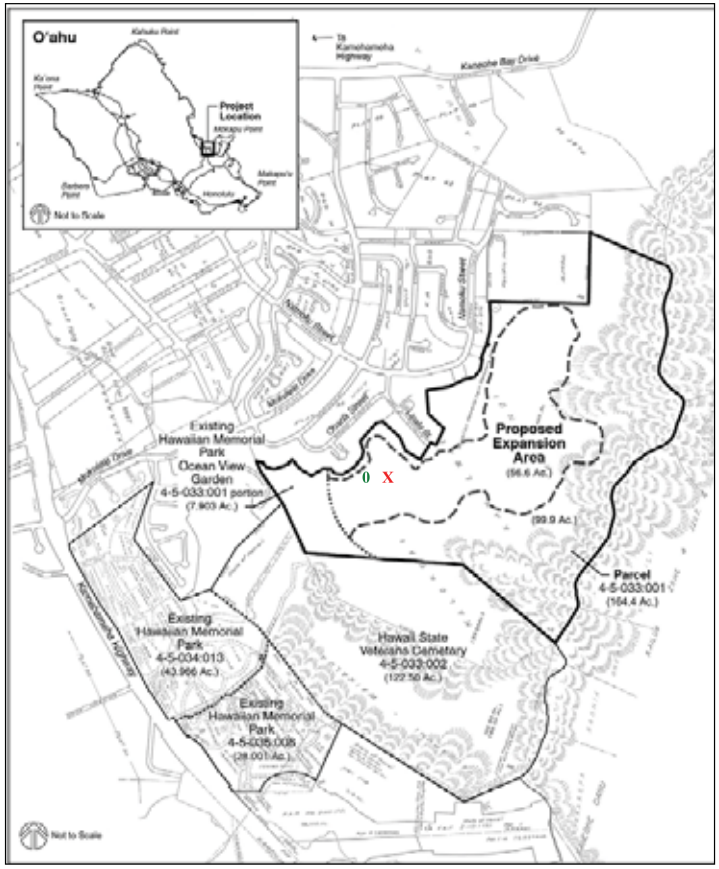
Surveying for a longer period of time might enlarge the list of species; however, given the size of the property, I believe the survey provides an adequate review of the property's resident native invertebrates. (See below: Invertebrates not present, page 12, for exceptions)

Physical limitations: The size of the property allowed the survey to cover the area adequately. The overall study strategy and light survey site selections were designed to achieve this aim. The resulting survey was representative and targeted in favor of locating and examining the few native host plants.

Selectivity: My survey was focused on finding any endemic and indigenous Hawaiian species. No attempt was made to collect or completely document the many common alien arthropod species present in the area.

[2] Times given are for Kāne'ohe, Honolulu County, Hawai'i (longitude W157.8, latitude N21.4).

Figure 9. Map of O'ahu project site and light survey location



X = site of night light monitoring
0 = general location of two native plants

From "Hawaiian Memorial Park Cemetery Expansion Environmental Impact Statement Prep Notice", Figure 2

INVERTEBRATE SURVEY RESULTS:

This discussion focuses on three native species encountered, on species that affect native invertebrate survival, and on adventive species of concern in human health.

ARTHROPODA: INSECTA

HEMIPTERA: HETEROPTERA (True bugs)

Miridae (Leaf bugs): ***Trigonotylus hawaiiensis***

This endemic bug, *Trigonotylus hawaiiensis* (Kirkaldy), 1902, is known from all the major islands, Laysan, and Nihoa. It is known from sea level to 5000 ft. and is widespread on O'ahu. It feeds on both native and alien grasses. (Zimmerman 1948)

LEPIDOPTERA (butterflies and moths)

Cosmopterigidae: ***Hyposmocoma*** sp.

Figure 10: *Hyposmocoma* sp.
Photo# starr-030724-0089
credit: "Forest & Kim Starr" (HEAR)

Adult *Hyposmocoma* or case bearer moths responded to the light survey. *Hyposmocoma* are called "case bearers" because after an early beginning inside a leaf curl or similar hiding place, the caterpillars create protection in an intricately constructed portable shell of their own silk. For camouflage, they add bits of their surroundings to the case using silk: snips of dry grass or leaves, flakes of bark, maybe a little dirt. The case is then easily mistaken by a predator as another part of their inedible landscape. These bunkers are fitted with a hinged lid (operculum), pulled shut by mandibles to defend them from enemies. Their relationship to the case is similar to that of a hermit crab to his shell. They are dependent on their case, and die if removed – even if protected from predators and given food. They don't move far, but feed while partly emerged from the case, dragging along their protective armor by their six true legs. Cases are sometimes attached to rocks or tree trunks and foliage. (Manning/Montgomery in Liittschwager & Middleton 2001) With over 500 kinds, *Hyposmocoma* micromoths are the greatest assemblage of Hawaiian Island moths, showing astonishing diversity. After writing 630 pages on them, Dr. Elwood Zimmerman lamented the inadequacy of his study. He noted an enormous cluster of species with explosive speciation and diverging radiation (Zimmerman 1978). Much remains to be learned about the life ways of this interesting group of insects now under study by University of Hawaii's Daniel Rubinoff and his graduate students (Rubinoff & Haines 2006).

Crambidae: ***Eudonia*** sp. (Moss moths)

There are 15 *Eudonia* species known from O'ahu, all Hawaiian endemics. Several O'ahu species are also known from other islands. None are considered rare, endangered, or threatened. Some species have been reared from moss where they build silken tunnels of protection in which to feed (Swezey 1910), but for many species the host plant is not recorded yet. (HBS 2002a, HOSTS, Zimmerman 1958)

Figure 11: *Mestolobes* sp.
Photo# starr-030825-0008
credit: "Forest & Kim Starr" (HEAR)

Crambidae: ***Mestolobes*** species (likely *minuscula*)

The commonest of the small moths or micro-moths, *Mestolobes* (Figure 11), responded to our light survey. It is known from every major island. Although a large genus of over 30 species, 10 known from O'ahu, it has not been studied in depth despite a 1906 plea to study its habits by R. C. L. Perkins (1907). It has been collected while visiting flowers for nectar diurnally and when responding to light. *Mestolobes* was reported to "often fly actively in cane fields" (Williams 1931). In the 1800s it was reported to fly in small groups and was seen at lower elevations (Perkins 1913). The host plant of this endemic is not certain. There is one record of one larvae reared from a host - the roots of sugar cane on O'ahu in 1930, yet it was never considered even a minor pest (Swezey 1931.) (HBS 2002a, HOSTS, Zimmerman 1958)

HYMENOPTERA (wasps, bees, ants)

Figure 13: Glaber ants were seen running trails on tree trunks

Formicidae: **Glaber ant**

Ochetellus glaber, a small black adventive ant, the Glaber ant, was seen on the property, but in much smaller numbers than the longlegged ant (see below). *O. glaber* seemed to occupy a different distribution from that used by the longlegged ant although it exhibited the same tree trail forming behavior. It may be nesting in dry wood and in old termite holes and should be naturally controlled by site clearing activity. It is known from all major islands (HBS 2002a). Both sweet and protein (i.e., native insects) are attractive foods. One authority states the ant "bites fiercely" (Tenorio and Nishida 1995). Use caution around nests in hollow stems and when near active ant trails.

Formicidae (ants): **Longlegged Ant**

The longlegged ant (*Anoplolepis gracilipes*) was seen on the property in great numbers. Nearly every tree had a column of these polyphagous ants marching up and down the trunk (Figure 12). Similarly, many areas on the ground were heavily patrolled. Alien ants are known to prey on other insects (Zimmerman 1948-80) and are well documented as a cause of low levels of native arthropods, especially in elevations up to 2000 ft. (Perkins 1913). Longlegged and bigheaded ants (*Pheidole megacephala*) do not seem to overlap in distribution. Rather they maintain separate territories, effectively apportioning the hunting grounds between themselves, offering few ant-free zones to native arthropods. Indeed, during daylight hours in the areas heavily infested with these predators, our travel through areas of dense vegetation created few of the typical flights or jumps of startled insects.

Figure 12: Longlegged ants were seen running up and down many trees on the property.

INVERTEBRATES NOT PRESENT:

Plant and invertebrate populations are interdependent; consequently, host plant availability is one way to review invertebrate health. As discussed in the botanical survey (LeGrande 2006) and archaeology report (McCurdy and Hammatt 2008), the area has a long history of human use, Hawaiian agriculture, rice and pineapple production, cattle ranching and coffee cultivation, with feral pigs currently present, all removed native plants. The resulting extremely low level of native plants serving as arthropod hosts leads to the absence of Hawaiian arthropods at this site.

Species not found

Any survey for federally protected species should include consideration of all native invertebrates (snails, spiders, and insects). A review of the archaeological survey of the area (McCurdy and Hammatt 2008) indicated no lava tubes at the project site which could support cave-adapted invertebrate species.

MOLLUSCA:

No native mollusks were observed during this survey.

Gastropoda Pulmonata

Achatinellidae: **Achatinella**

O'ahu does have protected snail species, the Oahu tree snails, but the flora, probable rats (Bruner 2006), and other factors now make this property unsuitable habitat for the native Hawaiian endemic snails listed as endangered.

LEPIDOPTERA

Sphingidae: *Manduca blackburni*

The Blackburn's sphinx moth[3] (Manduca blackburni), an endangered species (Fed Reg 1999-2000) was not found in this survey. Historically, the moth is known from drier locations and the critical habitat established for the moth on O'ahu is many miles distant from this property. Neither the moth's solanaceous native host plant, 'aiea (Nothocestrum sp.), nor the best alien host, tree tobacco (Nicotiana glauca), ever were observed on the property. In the project botanical survey (LeGrande 2006), no solanaceous plants, several of which can serve as hosts, were recorded.

DIPTERA

Drosophilidae: *Drosophila*

No native *Drosophila* were observed on the property. The property is now unsuitable habitat for the endemic *Drosophila* recently listed as endangered or threatened. These native Hawaiian picture wing flies require a much more native environment with host flora not offered at this property. (*Federal Register* 2006a, b). The location does not provide appropriate habitat now for any of the native *Drosophila* species

MEDICALLY IMPORTANT SPECIES

SEE Glaber ant on page 12

Centipedes, scorpions, black or brown widow spiders:

The piles of dead brush and the defensive structures built by the paint balling trespassers are classic habitat for centipedes, scorpions, black or brown widow spiders. Although these medically important species were not seen in this quick survey, they may be present in the area. Surveyors, crews clearing debris, etc should be alert for all these species which may pose a serious risk to some individuals. When moving stones or piled brush, wearing

[3] Blackburn hawk moth is the official common name recognized by the HES Committee on Common Names of Insects (1990). Blackburn's sphinx moth has come into popular usage.

gloves, covered shoes, long sleeves, and long pants will greatly reduce the risk of accidental contact and bites. Supervisors should be aware of any allergy by employees. Some individuals can experience anaphylactic reactions to venom of any of the mentioned arthropods, not just bees. Please see *What Bit Me?* (Nishida and Tenorio 1993) for additional information.

COLEOPTERA: Oedemeridae

Ananca bicolor (Fairmaire) 1849, or red-black false blister beetles responded to our light survey. The species is known from several major islands, including Oahu, and Midway. The beetles are attracted to lights, but also feed on flower pollen by day. When irritated or pressed (between clothing and skin, for example) they ooze a defensive irritating chemical causing blistering of skin. The susceptibility to blistering is reported to vary as do healing rates. Although irritating, uncomfortable, and very unpleasant, the blisters are not life threatening. Seek medical attention if blistering is widespread or does not heal promptly.

Figure 14: Red-black false blister beetle

See "*What's Bugging Me?*" (Tenorio and Nishida 1995) or for detailed discussion see University of Florida / Florida Dept. of Agriculture web site http://creatures.ifas.ufl.edu/urban/medical/blister_beetles.htm (Arnett 2008).

POTENTIAL IMPACTS

Potential Impacts on Native, Rare, Federally or State Listed Species

No federally or state listed endangered or threatened invertebrate species was found in this survey. No rare native Hawaiian invertebrate species were observed. The few native Hawaiian invertebrates observed are widespread in distribution. No anticipated actions related to the proposed project in the surveyed location will have a significant negative impact on an endemic or indigenous species. No part of the property is designated critical habitat for any threatened or endangered species.

RECOMMENDATIONS

Landscape with native plants:

The botanical survey recommended landscaping with native plants during the project (LeGrande 2006). In addition to their beauty and the positive cultural and social values communicated by the use of native plants, these plants would provide habitat for native arthropods while creating a more interesting area for walking and contemplation. Native plants will remain green and thus more fire resistant throughout the summer. Native plantings may have lower human maintenance costs when chosen to fit area needs. As native plants tend to reach a predicable height and foliage spread, well chosen plantings usually mean less hedge trimming and weed whacking. In the areas to be left without development or used to screen the HMP expansion from housing and traffic, native plants in a mix of ground cover, shrub, and tree heights will help slow run off and retain moisture when rains come while holding soil at very low on-going cost. The plantings will provide educational, visual, and aesthetic benefits to residents in the planned residential units as well. Native insects such as *Mestolobes* and other creatures will find this refuge over time.

With prior arrangement, native plants can be as convenient for mass plantings as the introduced plants commonly used to re-vegetate after new construction. A list of suppliers of native plants (see page 3 for O'ahu) is available at

http://hbs.bishopmuseum.org/botany/riparian/pdf/propagators.pdf

ACKNOWLEDGMENTS

Steven Lee Montgomery conducted all collecting and is responsible for all conclusions. Anita Manning assisted in the field and contributed to preparation of this report.

STANDARD NOMENCLATURE

Invertebrate names follow
Freshwater & Terrestrial Mollusk Checklist (HBS 2002b)
Common Names of Insects & Related Organisms (HES 1990)
Hawaiian Terrestrial Arthropod Checklist (HBS2002a; Nishida 2002)

Plant names follow
Manual of the Flowering Plants of Hawai'i (Wagner et al. 1999)
A Tropical Garden Flora (Staples and Herbst 2005)

Mammal names follow *Mammals in Hawai'i* (Tomich 1986).

Place name spelling follows *Place Names of Hawaii* (Pukui et al. 1976).

ABBREVIATIONS

DLNR Department of Land and Natural Resources, State of Hawai'i

HBS Hawai'i Biological Survey

n. new

sp. species

spp. more than one species

USFWS United States Fish and Wildlife Service

GLOSSARY[4]

Adventive: organisms introduced to an area but not purposefully.
Alien: occurring in the locality it occupies ONLY with human assistance, accidental or purposeful; not native. Both Polynesian introductions (e.g., coconut) and post-1778 introductions (e.g., guava, goats, and sheep) are aliens.
Arthropod: insects and related invertebrates (e.g., spiders) having an external skeleton and jointed legs.
Diurnal: active in the daylight hours
Endemic: naturally occurring, without human transport, ONLY in the locality occupied. Hawaii has a high percentage of endemic plants and animals, some in very small microenvironments.
Indigenous: naturally occurring without human assistance in the locality it occupies; may also occur elsewhere, including outside the Hawaiian Islands. (e.g., Naupaka kahakai (*Scaevola sericea*) is the same plant in Hawai'i and throughout the Pacific).
Insects: arthropods with six legs, and bodies in 3 sections
Invertebrates: animals without backbones (insects, spiders, snails / slugs, shrimp)
Larva/larval: an immature stage of development in offspring of many types of animals.
Mollusk: invertebrates in the phylum Mollusca. Common representatives are snails, slugs, mussels, clams, oysters, squids, and octopuses.
Native: organism that originated in area where it lives without human assistance. May be indigenous or endemic.
Naturalized: an alien organism that, with time, yet without further human assisted releases or plantings, has become established in an area to which it is not native.
Nocturnal: active or most apparent at night.
Pupa: the stage between larva and adult in insects with complete metamorphosis, a non-feeding and inactive stage often inside a case
Purposefully introduced: an organism brought into an area for a specific purpose, for example, as a biological control agent.
Polyphagous: eating many different types of food
Rare: threatened by extinction and low numbers.
Species: all individuals and populations of a particular type of organism, maintained by biological mechanisms that result in their breeding mostly with their kind.

4 Glossary based largely on definitions in *Biological Science: An Ecological Approach*, 7th ed., Kendall/Hunt Publishing Co., Dubuque, a high school text; on the glossary in *Manual of Flowering Plants of Hawai'i*, Vol.2, Wagner, et al., 1999, Bishop Museum Press, and other sources.

LITERATURE CITED

Arnett, Jr., Ross H. "False blister beetles." Originally published as Division of Plant Industry Entomology Circular 259. on web site of University of Florida / Florida Dept. of Agriculture http://creatures.ifas.ufl.edu/urban/medical/blister_beetles.htm Accessed July 28, 2008

Bruner, P. L. 2006. "Avifaunal and Feral Mammal Field Survey for the Hawaiian Memorial Park Expansion Area, Kaneohe, Oahu, Hawaii." Prepared for: Clark and Green Associates. 11 pp.

Department of Land and Natural Resources (DLNR). 1998. Indigenous Wildlife, Endangered and Threatened Wildlife and Plants, and Introduced Wild Birds. Department of Land and Natural Resources. State of Hawaii. Administrative Rule §13-134-1 -§13-134-10, March 2, 1998.

Federal Register. 1999-2000. Title 50, Vol. 1, Parts 1 to 199. [Revised as of October 1, 2000] U.S. Government Printing Office via GPO Access [CITE: 50CFR17.11, Page 102-143].

_____. 2006a. Title 50, Vol. 71, No. 89, May 9. *Endangered and Threatened Wildlife and Plants; Determination of Status for 12 Species of Picture-Wing Flies From the Hawaiian Islands*. [CITE: 50 CFR 17, Page 26835 -26852].

_____. 2006b. Vol. 71, No. 157, August 15. *Proposed Designation of Critical Habitat for 11 Species of Picture-Wing Flies From the Hawaiian Islands*. [CITE: 50 CFR Part 17, Page 46994 – 47054].

Hawai'i Biological Survey (HBS). 2002a. *Hawaiian Arthropod Checklist*, online authority file of terrestrial arthropod names for the Hawaiian Islands. B. P. Bishop Museum, Honolulu. www2.bishopmuseum.org/HBS/checklist/

_____. 2002b. Bishop Museum *Hawaiian Freshwater & Terrestrial Mollusk Checklist*. Accessed April 2008.

Hawaiian Entomological Society (HES). 1990. *Common Names of Insects & Related Organisms*. Committee on Common Names of Insects. 87 pp.

Hawaiian Ecosystems at Risk project (HEAR). Accessed July 2008. www.hear.org/starr/hiinsects/images

Helber Hastert & Fee, Planners. 2007. *Hawaiian Memorial Park Cemetery Expansion Environmental Impact Statement Preparation Notice*. for Hawaiian Memorial Life Plan Ltd. 46 pp.

LITERATURE CITED: cont.

HOSTS - a Database of the World's Lepidopteran Hostplants, Natural History Museum London. Accessed July 2008. www.nhm.ac.uk/research-curation/projects/hostplants/

LeGrande, M. 2006. "Botanical Resources Assessment for the Hawaii Memorial Park Expansion, Kaneohe, Oahu." Prepared for: Clark & Green Associates. 12 pp.

Liittschwager, D. and S. Middleton, photographers. 2001. *Remains of a Rainbow*, National Geographic / Environmental Defense Fund. Accompanying zoological captions by Manning, Montgomery, *et al.*

McCurdy, T. D. and Hammatt, H. H. 2008. "Archaeological Inventory Survey for the Hawaiian Memorial Park Expansion, Kāne'ohe Ahupua'a, Ko'olaupoko District, Island of O'ahu." Prepared for Helber, Hastert & Fee Planners. 124 pp.

Nishida, G. M. (ed.). 2002. *Hawaiian Terrestrial Arthropod Checklist*. Fourth edition. *Bishop Museum Technical Report* 22, 313 pp

Nishida, G. M. and J. M. Tenorio. 1993. *What Bit Me?* Univ. of Hawaii Press. 72 p.

Perkins, R.C.L. 1907. "The insects of Tantalus," *Proceedings of the Hawaiian Entomological Society,* 1(2):42.

Perkins, R. C. L. 1913. "Introduction. Being a review of the land-fauna of Hawaiia," and "Vertebrates." *In*: Sharp, D., ed., *Fauna Hawaiiensis. Vol. 1.* Cambridge University Press, Cambridge, and Bishop Museum Special Pub. 6. pp ix-ccxxviii.

Pukui, M. K., S. H. Elbert, and E. T. Mookini. 1976. *Place Names of Hawaii*. University of Hawaii Press, Honolulu, Hawai'i. 289 pp.

Rubinoff, D. and W. P. Haines. 2006. "*Hyposmocoma molluscivora* Description," *Science,* 311:1377

Staples, G. W. and D. R. Herbst. 2005. *A tropical garden flora.* Honolulu, Bishop Museum Press, 908 p.

Swezey, O. H. 1910. "Feeding Habits of Hawaiian Lepidoptera," *Proceedings of the Hawaiian Entomological Society*, 2(3):484.

Swezey, O. H. 1931. " Miscellaneous notes," *Proceedings of the Hawaiian Entomological Society*, 7(3):484.

LITERATURE CITED: cont.

Tenorio, J. M. and Nishida, G. M.. 1995. *What's Bugging Me?* University of Hawaii Press. 184 p.

Tomich, P. Q. 1986. Mammals in Hawaii. Bishop Museum Press, Honolulu, Hawaii. 375 p.

U.S. Fish & Wildlife Service (USFWS). 2008. USFWS Threatened and Endangered Species System (TESS), online at http://ecos.fws.gov/tess_public/StartTESS.do

U.S. Naval Observatory (USNO), Astronomical Applications Department. *Sun and Moon Data for One Day.* http://aa.usno.navy.mil/

Wagner, W. L., D. R. Herbst, and S. H. Sohmer. 1999. *Manual of the flowering plants of Hawaii*, Rev. ed. University of Hawaii Press and Bishop Museum Press, Honolulu, 1919 pp.

Williams, F. X. 1931. *Handbook of the Insects and Other Invertebrates of Hawaiian Sugar Cane Fields.* Experiment Station of the Hawaiian Sugar Planters' Association, Honolulu, Hawaii. 400 pp.

Zimmerman, E. C. 1948- 80. *Insects of Hawaii*. University of Hawaii Press, Honolulu.

_____. 1948. *Insects of Hawaii. Volume 3: Heteroptera*. University of Hawai'i Press, Honolulu. 255 pp.

_____. 1958. *Insects of Hawaii. Volume 8: Lepidoptera: Pyraloidea*. University of Hawai'i Press, Honolulu. ix + 456 pp

_____. 1978. *Insects of Hawaii. Volume 9: Microlepidoptera Part II*, University of Hawaii Press, Honolulu. Pp. 1029-1699.

_____. 2001. *Insects of Hawaii. Volume 1: Introduction.* University of Hawai'i Press, Honolulu. xx + 206 pp.

G. Archaeological Inventory Survey

(Cultural Surveys Hawai‘i, Inc.)

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September 22, 2008

David Shideler
Cultural Surveys Hawai`i, Inc.
P.O. Box 1114
Kailua Hawai`i 96734

LOG NO: 2008.1594
DOC NO: 0807LM12
Archaeology

Dear Mr. Shideler:

SUBJECT: Chapter 6E-42 Historic Preservation Review –
Archaeological Inventory Survey for the Hawaiian Memorial Park Expansion
Kāne`ohe Ahupua'a, Ko`olaupoko District, Island of O'ahu
TMK: (1) 4-5-033:001

Thank you for the opportunity to review the aforementioned archaeological inventory survey report (McCurdy and Hammatt, 2008), which we received on April 28, 2008. We apologize for the delay in our review. The survey was performed in advance of proposed development of the parcel. The proposed development includes new burial internment areas, automobile circulation and a residential subdivision. The land alteration associated with the proposed development would include grubbing and grading, excavations associated with the installation of sub-surface utilities and landscaping.

The survey documented the presence of 11 historic properties within or adjacent to the petition area. Six of these sites were previously recorded, SIHP 50-80-10-354, 4680, 4681, 4683, 4684, and 4686, the remaining 5 sites, SIHP 50-80-10-6929, 6930, 6931, 6932 and 6933, are new discoveries. Seven of the sites are located within the petition area, SIHP 4680, 4683, 4684, 4686, 6930, 6932 and 6933. Four sites are located outside the petition area SIHP 354, 4681, 6929 and 6931 but are directly adjacent to the petition area and mitigation actions for the protection of these sites should be considered. One previously identified site, SIHP 4682, was determined to be non-cultural and eliminated from the study.

At this time we do not concur with the proposed mitigation recommendations suggested in the report. We believe that several of the sites identified, SIHP 354, 4684, 6939, 6932 and 6931, should be preserved as a complex, not individually. If the survey did not provide a reasonable association of the sites then provide justification as to why the sites should not be preserved as a complex. We do not concur with the proposed relocation of the grinding stone. The location of the feature provides for the integrity of the site complex as a whole.

Additionally per Hawai`i Administrative Rules (HAR) Chapter 13-276-5(g) 'the report shall contain information on the consultation process with individuals knowledgeable about the project areas history, if discussions with the SHPD, background research or public input indicate a need to consult with knowledgeable individuals'. "Consultation process"' as defined by HAR 'means notifying interested organizations and individuals that a project could affect historic properties of interest to them; seeking their views on the identification, significance evaluation, and mitigation treatment of these properties; and considering their views in a god faith and appropriate manner during the review process' (emphasis added). As several of the sites, in particular the complex including Sites 354, 4684, 6939, 6932 and 6931,

are significant under Criteria E consultation with the Hawaiian community is an integral part of the mitigation process. It has come to our attention from members of the group partaking in stewardship of Kawa`ewa`e Heiau that they have not been informed of or consulted about the findings of the Archaeological Inventory Survey. Additionally at the August 13, 2008 O`ahu Island Burial Council Meeting, members of the council requested a joint site visit of the sites identified during the survey.

Additionally HAR Chapter 13-284-6(5)c states that 'Prior to submission of significance evaluations for properties other than architectural properties, the agency shall consult with ethnic organizations or members of the ethnic group for whom some of the historic properties may have significance under criterion "e", to seek their views on the significance evaluations. For Native Hawaiian properties which may have significance under criterion "e", the Office of Hawaiian Affairs (OHA) also shall be consulted'. HAR also requires consultation under 284-8 (2) for properties evaluated under Criterion "e" relating to the proposed forms 'mitigation', OHA also shall be consulted. Please provide the relevant consultation from OHA in the report.

At this time Section 2.4 of the report does not contain accurate or sufficient information on the consultation process. The Cultural Impact Assessment (Gollin et al 2008) referenced contains information relevant to mitigation, however as the CIA occurred prior to the AIS no relevant consultation relating to the newly identified sites has been conducted. The information that concerns the identification and preservation recommendations for the historic properties identified in the survey should be presented in this and other appropriate sections of the inventory survey report.

At this time the inventory survey cannot be accepted as satisfying the requirements of HAR Chapter 13-276(5). SHPD has additional concerns relating to sufficient testing, or lack thereof. The methodology of testing should also be proposed during the consultation process and may be considered as a second phase of the inventory survey once more concrete details related to development impacts are available. As the consultation undertaken for the CIA (Gollin 2008) states that a number of cultural experts believe that there are 'a significant number of `iwi kūpuna (ancestral remains) contained within the project area' we believe that consultation in regards to the nature of and need for testing must be conducted. This level of testing will depend on the alternate selected by Hawaiian Memorial Park as outlined in the DEIS. Alternatives with little or no land disturbing activity will require appropriate amounts of testing in impacted areas. This level of testing will be determined via communication with SHPD once relevant details are made available by the project proponent and through the consultation process.

We do not concur with the significance evaluations. We believe that you should re-evaluate the sites, in particular SIHP 354, 4684, 6939, 6932 and 6931, as a complex and consider applying criterion "a", "b", "c", "d" and "e". Kawa`ewa`e Heiau and the associated complex have legendary associations with Kamapua`a. Additionally Kawa`ewa`e was reportedly constructed by Olopana, an ali`i who came to power during a period of expansion and social/political change in Hawaiian history, during the 12th century (Thrum 1906). These evaluations should be discussed as well during the consultation process.

Please contact Lauren Morawski (O'ahu Archaeologist) at (808) 692-8015 if you have any questions or concerns regarding this letter.

Aloha,

Nancy McMahon, Archaeology and Historic Preservation Manager
State Historic Preservation Division

LM

Archaeological Inventory Survey for the Hawaiian Memorial Park Expansion, Kāneʻohe Ahupuaʻa, Koʻolaupoko District, Island of Oʻahu

(TMK: [1] 4-05-033:001)

Prepared for

Helber, Hastert & Fee Planners

Prepared by

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and

Hallett H. Hammatt, Ph.D.

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Management Summary

Reference	Archaeological Inventory Survey for the Hawaiian Memorial Park Expansion, Kāneʻohe Ahupuaʻa, Koʻolaupoko District, Island of Oʻahu TMK: [1] 4-05-033:001 (McCurdy and Hammatt 2008)
Date	January 2008
Project Number (s)	Cultural Surveys Hawaiʻi (CSH) Job Code: KANEO 2
Investigation Permit Number	Cultural Surveys Hawaiʻi, Inc. (CSH) completed the fieldwork component of the archaeological inventory survey under Hawaiʻi State Historic Preservation Division (SHPD) permit No. 07-19, per Hawaiʻi Administrative Rules (HAR) Chapter 13-13-282.
Project Location	The CSH project area is bordered on its *mauka* extent by the Hawaiian Memorial Park, and extends *makai* to the Pohai Nani Retirement Community, from the south and east by Kapaʻa Ridge, and the northwest by a housing development and Namoku Street. This project area is depicted on USGS 7.5 minute topographic quadrangle Kaneohe, HI (1998).
Land Jurisdiction	Private, Hawaiian Memorial Life Plan LTD
Agencies	State Historic Preservation Division
Project Description	Proposed development within the petition area is described as new burial areas, automobile circulation and a residential subdivision. Minimally, the land alteration would include surface grubbing and grading, excavations associated with the installation of sub-surface utilities, housing construction and landscaping.
Project Acreage	The CSH project area consisted of approximately 66 acres. The petition area, located within the project area is approximately 56.6 Acres
Area of Potential Effect (APE) and Survey Acreage	The APE is defined as the entire CSH project area, approximately 66 acres.
Historic Preservation Regulatory Context	At the request of Helber, Hastert & Fee Planners, CSH conducted this archaeological inventory survey. In consultation with SHPD, the inventory survey investigation was designed to fulfill the State requirements for an archaeological inventory survey per HAR Chapter 13-13-276 and Chapter 13-13-284.

Fieldwork Effort	The Fieldwork portion of this Archaeological Inventory Survey was carried out from October 17, 2006 to December 5, 2006 and from September 20, 2007 to October 10, 2007. The alternating CSH field crew consisted of David Shideler, M.A., Doug Borthwick, B.A., Todd D. McCurdy, M.A., Jon Tulchin, B.A., Nifae Hunkin, B.A., Matt Bell, B.A., Sean Barns, M.A., Lisa Gollin, Ph. D, Kulani Jones, B.S., Jennifer Olson, B.A., Sean Naleimaile, B.A., Auli‘i Mitchell, B.A., Kevin Dalton, B.A., and Kelly Uyeoka, B.A., under the general supervision of Hallett H. Hammatt, Ph.D. The field required approximately 62 person-days to complete. Fieldwork consisted of a 100% coverage pedestrian inspection of the project area and limited subsurface testing at select archaeological sites.
Number of Historic Properties Identified	A total of 11 historic properties were observed within or near the petition area. Six of these were previously recorded, SIHP #s 50-80-10-354, 50-80-10-4680, 50-80-10-4681, 50-80-10-4683, 50-80-10-4684 and 50-80-10-4686. The remaining five are new discoveries, SIHP #s 50-80-10-6929, 50-80-10-6930, 50-80-10-6931, 50-80-10-6932, and 50-80-10-6933. Seven of the historic properties are located within the petition area. They include, SIHP #s -4680, -4683,-4684,-4686, -6930, 6932 and 6933. Four of the properties (SIHP-354, -4681 -6929, and -6931) are located outside of the current petition area but close enough for consideration. Of these sites, six are considered pre-Contact and five historic. In addition SIHP # 50-80-10-4682, previously recorded by Szabian et al (1989), located in the vicinity of the petition area was determined to be non-Cultural in nature and therefore is not considered a historic property.
Historic Properties Within the Petition Area Recommended Eligible to the Hawai‘i Register of Historic Places (Hawai‘i Register)	Seven historic properties identified within the petition area are recommended eligible to the Hawai‘i Register: SIHP # 50-80-10-4680, a historic era terrace mound, has been evaluated as significant under Criterion D of the Hawai‘i Register of Historic Places. SIHP# s 50-80-10-4683 a historic era charcoal kiln, has been evaluated as significant under Criterion D of the Hawai‘i Register of Historic Places. SIHP # 50-80-10-4684, pre-contact habitation site consisting of a house structure, and terraces, has been evaluated as significant under Criterion D of the Hawai‘i Register of Historic Places.

	SIHP # 50-80-10-4686, a historic era rock alignment, has been evaluated as significant under Criterion D of the Hawai‘i Register of Historic Places. SIHP # 50-80-10-6930, a pre-Contact enclosure/potential ceremonial structure consisting of a rectangular shaped enclosure with an irregular notch in the east wall has been evaluated as significant under both Criterion D and E of the Hawai‘i Register of Historic Places. SIHP# 50-80-10-6932, a possible historic era storage area, has been evaluated as significant under Criterion D of the Hawai‘i Register of Historic Places. SIHP# 50-80-10-6933, a historic era charcoal kiln with an associated stone wall, has been evaluated as significant under Criterion D of the Hawai‘i Register of Historic Places.
Historic Properties in the Vicinity of the Petition Area Recommended Eligible to the Hawai‘i Register of Historic Places (Hawai‘i Register)	Four historic properties identified in the vicinity of the petition area are recommended eligible to the Hawai‘i Register: SIHP 50-80-10-354, Kawa‘ewa‘e Heiau, is located approximately 30 m (100 ft) west, outside of the current petition area on the Kaneohe side of the ridge that divides Kaneohe and Kailua (Oneawa Hills). It has been on the National Register of Historic Places (NHRP) since 1972. SIHP 50-80-10-354 has been evaluated as significant under both Criterion D and E of the Hawai‘i Register of Historic Places. SIHP# 50-80-10-4681, located approximately 15m (50 ft) southwest of the current petition area is a pre-Contact habitation site consisting of several c-shaped structures, a terrace wall and a circular rock feature has been evaluated as significant under Criterion D of the Hawai‘i Register of Historic Places. SIHP# 50-80-10-6929 is a pre-Contact site consisting of two concentrations of lithic debitage along an intermittent drainage approximately 20 m (66 ft) east of the project area. SIHP# 50-80-10-6929 has been evaluated as significant under Criterion D of the Hawai‘i Register of Historic Places. SIHP# 50-80-10-6931 located approximately 15m (50 ft) south of the current petition area is a possible pre-Contact ceremonial area. SIHP# 50-80-10-6931 has been evaluated as significant under both Criterion D and E of the Hawai‘i Register of Historic Places.

Project Effect	The archaeological inventory survey for the Hawaiian Memorial Park Expansion project identified eleven historic properties within or near the survey area that will likely, or potentially, be affected by the proposed project. They include SIHP #s 50-80-10-354, 50-80-10-4680, 50-80-10-4681, 50-80-10-4683, 50-80-10-4684, 50-80-10-4686, 50-80-10-6929, 50-80-10-6930, 50-80-10-6931, 50-80-10-6932, and 50-80-10-6933
Mitigation Recommendations for Historic Properties Located Within the Petition Area	Recommendations for the seven historic properties identified within the petition area include: SIHP# s 50-80-10-4680, -4686 and -6932 have been thoroughly documented with written descriptions, photographs, scale drawings, and recorded with GPS survey equipment. No further work is recommended for these as sufficient information regarding location, function, age, and construction methods of these historic properties has been generated by the current inventory survey investigation to mitigate any adverse effect caused by proposed development activities. SIHP# s 50-80-10-4683 and -6933 are historic charcoal kilns. No further work is recommended for these historic properties. Sufficient information regarding the location, function, age, and construction methods of these historic properties has been generated by the current inventory survey and other investigations (Meeker 1995, Dockall et al. 2003, and Allen 1987), to mitigate any adverse effect caused by proposed development activities. SIHP# 50-80-10-4684 is a pre-Contact habitation site . Preservation, in the form of avoidance and protection, is recommended for the SIHP # 50-80-10-4684. Additionally, a large grinding stone was discovered approximately 40 m south of SIHP# 50-80-10-4684. In the absence of any other cultural material and considering that it is a good example of its type, moving it within the preservation boundary for SIHP# 50-80-10-4684 is recommended. SIHP# 50-80-10-6930 is a pre-Contact enclosure/potential ceremonial structure. Preservation, in the form of avoidance and protection, is recommended for the SIHP # 50-80-10-6930.

Mitigation Recommendations for Historic Properties Located in the Vicinity of the Petition Area	Recommendations for the four historic properties identified in the vicinity of the petition area include: SIHP 50-80-10-354, Kawa‘ewa‘a Heiau, is located approximately 30 m (100 ft) west, outside of the current petition area. It has been on the National Register of Historic Places (NHRP) since 1972 and is maintained by the several concerned groups. The client has established a 100 ft. buffer around this historic property and continues to work with concerned “caretaker” groups. SIHP# 50-80-10-4681 located approximately 15m (50 ft) southwest of the current petition area is a pre-Contact habitation/agricultural site. Although sufficient data was observed to qualify SIHP# 50-80-10-4681 as a site, the vegetation, primarily *hau*, in the area was too dense to definitively establish the site boundaries. Preservation, in the form of avoidance and protection, is recommended for SIHP # 50-80-10-4681 with the understanding that the site boundaries be firmly established prior to interim protection measures. SIHP# 50-80-10-6929 is a pre-Contact quarry site located approximately 20 m (66 ft) east of the petition area. Preservation, in the form of avoidance and protection, is recommended. SIHP# 50-80-10-6931 located approximately 15m (50 ft) south of the current petition area is a possible pre-Contact ceremonial area. Preservation, in the form of avoidance and protection, is recommended for the SIHP # 50-80-10-6931.
Additional Recommendations	An archaeological monitoring program is recommended to address the potential of project related excavations impacting subsurface cultural material. Should SHPD require archaeological monitoring for the Hawaiian Memorial Park Expansion Project, an archaeological monitoring plan, written to fulfill the requirements of Hawai‘i Administrative Rules Chapter 13-279, will need to be reviewed and approved by SHPD prior to any land disturbing activities within the project area Additionally, it is recommended that a historic properties preservation plan be prepared for the proposed Hawaiian Memorial Park Expansion project, in accordance with Hawai‘i Administrative Rules (HAR) 13-277-3, to address buffer zones and protective measures for all historic properties recommended for preservation within and near the petition area. This preservation plan should detail the short and long term preservation measures that will safeguard the historic property during project construction and subsequent use of the petition area.

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Section 1 Introduction

1.1 Project Background

At the request of Helber, Hastert & Fee Planners, Cultural Surveys Hawai‘i, Inc. (CSH) conducted an archaeological inventory survey of approximately 66-acres of State Conservation land owned by Hawaiian Memorial Life Plan LTD. The initial project area consisted of approximately 53 acres. Following the pedestrian inspection, the boundaries of the Hawaiian Memorial Park Expansion project area were adjusted to include buffer zones for select archaeological resources identified along the periphery of the project area. As a result, an additional 13 acres was added to the project area to account for the lost acreage. The petition area defined for this report is approximately 56.6 acres (Figure 1). The current project area is located adjacent to the existing Hawaiian Memorial Park, Kāne‘ohe Ahupua’a, Ko‘olaupoko District, Island of O‘ahu (TMK: [1] 4-05-033:001) (Figure 2 and Figure 3). The *mauka* side the project area is bordered by the Hawaiian Memorial Park and extends *makai* to Pohai Nani Retirement Community. From the south and east it is bounded by Kapa‘a ridge, and to the northwest by a housing development and Namoku Street. The project area extends *mauka* to approximately 170 m (557 ft) elevation.

The project area consists of a privately owned, undeveloped area. Field survey work revealed that portions of the project area are being utilized for unauthorized hiking and paintball activities. Proposed developments within the project area include new internment areas, a residential subdivision and associated roadways. Minimally, the land alteration would include, surface grubbing and grading excavations associated with the installation of sub-surface utilities, housing construction, and landscaping.

In consultation with the Hawai‘i State Historic Preservation Division (SHPD), the inventory survey was designed to fulfill State requirements for an archaeological inventory survey per HAR Chapter 13-13-276 and Chapter 13-13-284. CSH completed the fieldwork component of the archaeological inventory survey under SHPD permit No. 07-19, per Hawai‘i Administrative Rules (HAR) Chapter 13-13-282.

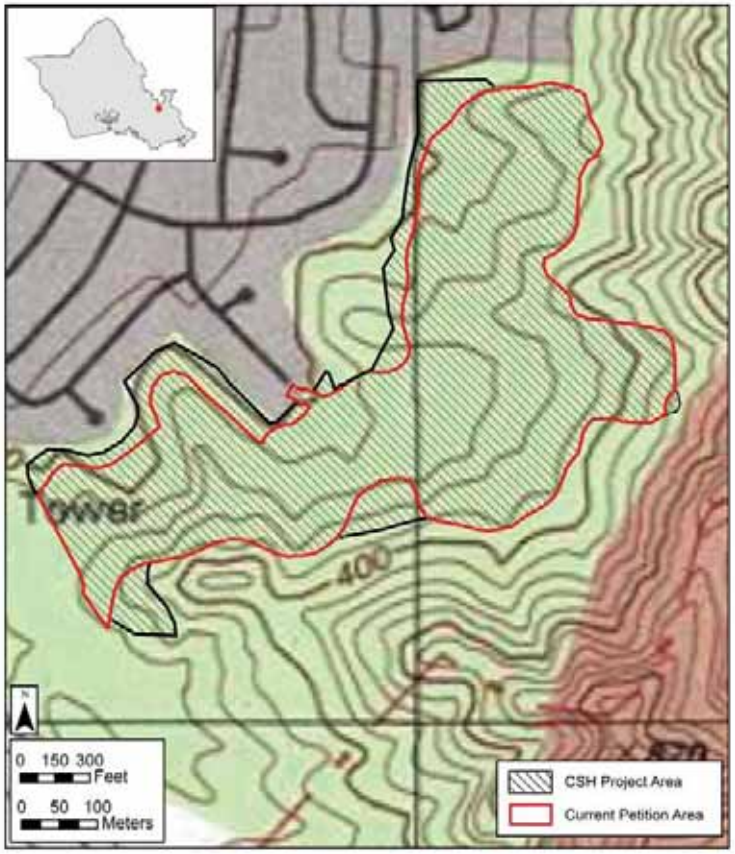


Figure 1. Portion of U.S. Geological Survey 7.5 Minute Series Topographic Map, Kaneohe, HI. Quadrangle (1998), showing the location of the project area.

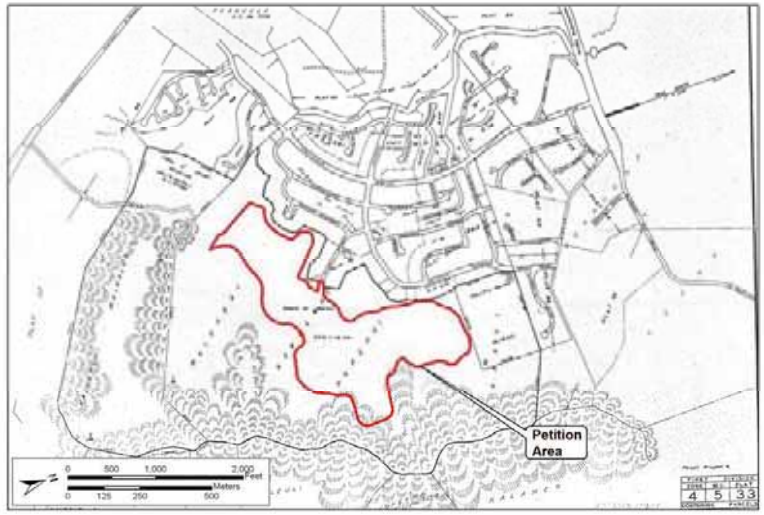


Figure 2. Tax Map Key (TMK: [1] 4-05-033:001) showing the current petition area.

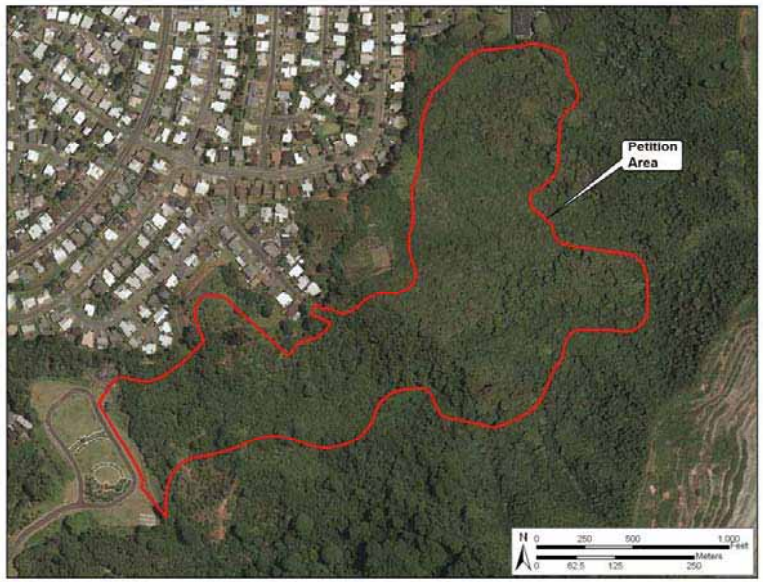


Figure 3. A 2005 aerial photograph showing the location of the current petition area (U.S. Geological Survey Orthoimagery 2005).

1.2 Scope of Work

The archaeological inventory survey and its accompanying report will document all historic properties within the subject parcel. The prepared inventory survey will be in compliance with state standards and will be submitted for review and approval to the State Historic Preservation Division/Department of Land and Natural Resources (SHPD/DLNR), and include the following elements.

1. A complete ground survey of the entire project area for the purpose of historic property identification and documentation. All historic properties would be located, described, and mapped with evaluation of function, interrelationships, and significance. Documentation will include photographs and scale drawings of selected historic properties. All historic properties will be assigned *Inventory of Historic Properties* numbers by the State.

2. Subsurface testing to determine if subsurface deposits are located in the project area, and, if so, evaluate their significance. If appropriate samples from these excavations are found, they will be analyzed for chronological and paleo-environmental information.

3. Research on historic and archaeological background, including search of historic maps, written records, and Land Commission Award documents. This research will focus on the specific area with general background on the *ahupua'a* and district and will emphasize settlement patterns.

4. Consultation with community members as part of the inventory survey process. This consultation requires contacting knowledgeable members of the community and requesting information on historic and cultural issues related to the property.

5. Preparation of a survey report which will include the following:

    a. A topographic map of the survey area showing all historic properties;

    b. Results of consultation with knowledgeable community members about the property and its historical and cultural issues.

    c. Description of all historic properties with selected photographs, scale drawings, and discussions of function;

d. Historical and archaeological background sections summarizing prehistoric and historic land use as they relate to the project area's historic properties;

e. A summary of historic property categories and their significance in an archaeological and historic context;

f. Recommendations based on all information generated that will specify what steps should be taken to mitigate impact of development on the project area's significant historic properties - such as data recovery (excavation) and preservation of specific areas. These recommendations will be developed in consultation with the client and the State agencies.

This scope of work also includes full coordination with the State Historic Preservation Division (SHPD), and County, relating to archaeological matters. This coordination takes place after consent of the owner or representatives.

1.3 Environmental Setting

1.3.1 Natural Environment

The project area is located within the Windward O‘ahu district of Ko‘olaupoko, and is situated within the *ahupua‘a* (traditional land division) of Kāne‘ohe. Kāne‘ohe is a large *ahupua‘a* of approximately 11,000 acres, extending from Windward crest of the Ko‘olau Range to include most of the Mōkapu Peninsula and is bordered by the *ahupua‘a* of He‘eia to the west and Kailua to the east. Elevations range from 60 meters above sea level (MSL) to 122 MSL, and annual rainfall is high at approximately 1500 millimeters (50 inches) (Giambelluca et al. 1986).

Soils in the proposed project area include Kāne‘ohe silty clay (KgC), 8-15% slopes, Kāne‘ohe silty clay (KHOF), 30-65% slopes; Alaeloa silty clay (AeE), 15-35 % slopes; and Alaeloa silty clay (ALF), 40-70 % slopes; and Helemano silty clay (HLMG), 30-90% slopes; (Foote et al. 1972). Kaneohe series soils are generally well-drained soils on terraces and alluvial fans on the windward side of Oahu. These soils developed in alluvium and colluvium derived from basic igneous rock. In a few places they developed in volcanic ash and in material weathered from cinders. The soils are gently sloping to very steep. Elevations range from 100 to 1,000 feet (Soil Survey of the State of Hawaii 2007).

The Alaeloa series consists of well-drained soils on uplands on the islands of Maui, Molokai, and Oahu. These soils developed in material weathered from basic igneous rock. They are gently sloping to very steep. Elevations range from 100 to 1,500 feet. The Helemano series consists of well-drained soils on alluvial fans and colluvial slopes on the sides of gulches. These soils are on the island of Oahu. They developed in alluvium and colluvium derived from basic igneous rock. They are steep to extremely steep. Elevations range from 500 to 1,200 feet (Soil Survey of the State of Hawaii 2007).

Kawa Stream is approximately 120-175 meters west of the project area. It is a relatively short (~4.1 km), perennial stream located mostly in the Pikoiloa Tract of southern Kāne‘ohe Town. The central branch of the stream arises within the National Veterans Cemetery and the stream eventually discharges into the south basin of Kāne‘ohe Bay. Kawa Stream has a drainage area of 4.0 km^2 (1.56 sq. mile) that includes the National Veterans Cemetery and most of Hawaiian Memorial Park (cemetery), nearly all of the residential urban development's east of Kamehameha Highway from the cemetery down to Kāne‘ohe Bay Drive (Pikoiloa subdivision, and Kailuapuhi, Waikalua Homestead), and the Bay View Golf Course (Koolau.net 2007).

Vegetation in the forest in and around the project area is dominated by alien/introduced species such as albizia trees (*Paraserianthes falcataria*), Christmas berry (*Schinus terebinthifolius)*, *he‘e* - octopus tree (*Schefflera actinophylla)*, Java plum (*Syzygium cumini*) lemon and strawberry guava (*Psidium guajava, Psidium cattleianum*), ironwood (*Cauarina* spp.), Cook and/or Norfolk Island pine (*Auracaria* spp.), cinnamon trees (*Cinnamomum* sp.), African tulip tree (*Spathodea campanulata*), and cultivar fruit trees such as mango (*Mangifera indica*), to name a few. There are several Polynesian introductions such as *kukui* (*Aleurites moluccana*), (true) kamani (*Calophyllum inophyllum*), *hau* (*Hibiscus tiliaceus*), *ki* or *ti* (*Cordyline fruticosa*), *noni* (*Morinda citrifolia*),*‘ohe* (possibly *Bambusa vulgaris* and/or *Schizostachyum glaucifolium*), and *mai‘a* - banana (*Musa* spp., possibly *M. paradisiaca*). Some of these Hawaiian "canoe plants" (plants brought by the early Polynesians in their canoes) are indicators of former Hawaiian habitation, agriculture and cultural use therefore, potential historic properties. For example, *kamani* was often planted around *heiau* (temples), and considered a sacred tree in parts of Polynesia; the same is true of *ki/ti*; both *ki/ti* and *mai‘a* were planted around taro *lo‘i* (pondfields); and, the latter, *mai‘a*, was planted around dwellings (http://www.canoeplants.com/contents.html). Understory and groundcover plants include grasses such as *honohono* - basketgrass (*Oplismenus hirtellus*), a number of ferns such as *laua‘e* or *maile*-scented fern (*Phymatosorus grossus*), bamboo orchid (*Arundina graminifolia*), and more. There are also a number of native plants within the project area such as the indigenous fern *pala‘ā* (*Sphenomeris chinensis)*, *neke* fern (*Cyclosorus interruptus*), wood fern (*Dryopteris* sp.), *ohi‘a lehua* trees (*Metrosideros* spp.), and the shrub/bush *ulei* (*Osteomeles anthyllidifolia*), to name a few. Several of the plants listed above have past and present ethnobotanical applications (e.g., as medicinal, building, weaving, *hula*, and *lei* plants) for native Hawaiians. Most significantly, *pala‘ā* is a culturally and economically valued native *hula* and *lei* fern. Although *S. chinensis* is not listed as endangered or threatened, its availability is declining dramatically (Ticktin et al. 2006).

1.3.2 Built Environment

The project area consists of a privately owned, undeveloped area. Field survey work revealed that portions of the project area are being utilized for unauthorized hiking and paintball activities. The *mauka* side the project area is bordered by the Hawaiian Memorial Park and extends *makai* to the Pohai Nani Retirement Community. From the south and east it is bounded by Kapa‘a ridge, and to the northwest by a housing development and Namoku Street.

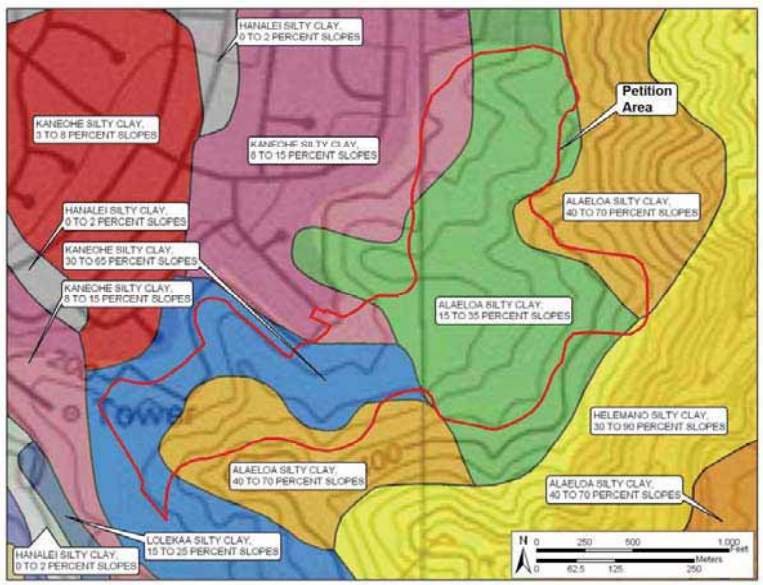


Figure 4. Overlay of Soil Survey of the State of Hawai‘i (Foote et al. 1972), indicating sediment types within the petition area (source: Soils Survey Geographic Database [SSUGRO] 2001, U.S. Department of Agriculture).

Section 2 Methods

2.1 Field Methods

The Fieldwork portion of this Archaeological Inventory Survey was carried out from October 17, 2006 to December 5, 2006 and from September 20, 2007 to October 10, 2007. The alternating CSH field crew consisted of David Shideler, M.A., Doug Borthwick, B.A., Todd D. McCurdy, M.A., Matt Bell, B.A., Jon Tulchin, B.A., Nifae Hunkin, B.A., Sean Barns, M.A., Lisa Gollin, Ph. D, Kulani Jones, B.S., Jennifer Olson, B.A., Sean Naleimaile, B.A., Auli‘i Mitchell, B.A., Kevin Dalton, B.A., and Kelly Uyeoka, B.A., under the general supervision of Hallett H. Hammatt, Ph.D. The field required 62 person-days to complete. Fieldwork consisted of a 100% coverage pedestrian inspection of the project area and limited subsurface testing at select archaeological sites

The pedestrian inspection of the project area was accomplished through systematic sweeps (transects) across the landscape. The spacing interval between archaeologists was 5-10 meters. All historic properties encountered were recorded and documented with a written field description, site map, photographs, and located utilizing the Global Positioning System technology of a Garmin GPSmap76S unit or a Trimble PRO XR GPS.

Subsurface testing consisted of the partial excavation, by hand, of selected surface archaeological features located during the pedestrian survey. The purpose of the subsurface testing was to aid in determining the function of located surface sites, as well as to possibly obtain datable materials for later radiocarbon dating. All excavated material was sifted through a 1/8 in. wire mesh screen to separate out the soil matrix; subsequently all cultural material was collected for analysis in the lab. Each test excavation was documented with a scale section profile, photographs, and sediment descriptions. Sediment descriptions included characterizations of Munsell color designations, compactness, texture, structure, inclusions, cultural material present, and boundary distinctness and topography.

2.2 Laboratory Methods

Laboratory analyses of material recovered from limited subsurface testing within the project area included:

1. Identification and cataloguing of traditional Hawaiian artifacts. Any artifacts collected *in situ* at the project area or contained within sediment samples were measured, weighed and classified by material type and artifact form. The analysis then focused on distinguishing artifact function.

2.3 Document Review

Historic and archival research included information obtained from the UH Hamilton Library, the State Historic Preservation Division Library, the Hawai‘i State Archives, the State Survey Office, and the Archives of the Bishop Museum. Previous archaeological reports for the area were reviewed, as were historic maps and primary and secondary historical sources. Information on Land Commission Awards was accessed through Waihona ‘Aina Corporation’s Māhele Data Base (<www.waihona.com>).

2.4 Consultation

Archaeologists from CSH have consulted and visited the project area at least two times with knowledgeable community members. On June 23, 2007, archaeologists from CSH, two principles of the Ko‘olaupoko Hawaiian Civic Club (KHCC), Donna Camvel and Mahealani Cypher, and a representative of Ka‘Ailehua, Wali Camvel, visited four of the historic properties identified during Archaeological Inventory Survey for the proposed Hawaiian Memorial Park Expansion project. Additionally, CSH archaeologists consulted Mr. Charlie Ogata, a member of the Queen Emma Hawaiian Civic Club, considered the club’s longstanding *kia‘i* (caretaker) of the Kawa‘ewa‘e Heiau. This included an onsite tour led by Mr. Ogata who pointed out features associated with the historic property. Mr. Ogata’s complete testimony is available in the Cultural Impact Assessment prepared as a companion study to this work (see Gollin et al 2008).

Section 3 Background Research

3.1 Traditional and Historical Background

3.1.1 Mythological and Traditional Accounts

There are several myths and legends associated with Kāne‘ohe. A few stories provide the origin of the name of the *ahupua‘a* of Kāne‘ohe. The word “Kāne” in Kāne‘ohe has been interpreted variously as “husband”, “man”, or as a reference to the god Kāne, the god of creation, while *‘ohe* means “bamboo”. One account attributes the name to a story about a woman who compared her husband’s cruelty to the cutting edge of a bamboo knife (Pukui and Elbert 1986, Clark 2002). Kāne‘ohe may also be derived from *‘ohe*, which is said to be one of the *kinolau* (body forms) of the god Kāne (Abbott 1992:15). Another account is as follows:

> In Kaneohe proper, the people learned a new use for the Ohe…In olden times anyone who did not conform to the way of life lived so industriously by the shore people, was called E-epa, or non-conformist. The E‘epa were not actually “touched in the head”, or lo-lo [crazy], but just different. They liked to wander off by themselves and dwell among the mysteries of the upland forests where they listened to the music of Nature, and often became poets or musicians.
>
> Those upland reaches, all unexplored territory and sacred to the Spirits or Akua of Nature, where referred to as the Wao (upland forest), or places of mystery. In order to keep children from wandering to the uplands, their elders told the little ones, “Do not go up there or the Bamboo Man may keep you. We would mourn your absence in loneliness. Remain at home and learn your useful duties.”
>
> Hano-ihu…longed to explore. Pu‘ili…longed to accompany her playmate, Hano-ihu, when he wandered far. But, being more timid, she contended herself during the boy’s absences and kept his secret of those upland trips he enjoyed.
>
> One sad day, Hano-ihu did not return. The people searched and could find no trace of the disobedient boy. Finally, the villagers decided the boy had died, and they told the other children that the Bamboo Man had taken the boy-wanderer.
>
> Pu‘ili…decided that he was not dead and she must search for him. Acting upon the thought, the little girl followed the direction often taken by the boy and was soon alone in the dark recesses of the forest lands of Wao, the Mysterious.
>
> She saw nothing to fear. Rather, she delighted in the beauty of the forests, the fragrance of the ferns and blossoms growing besides singing rills of sweet waters, and danced along happily to the whistling of the Wind Gods in the tree tops touching the blue sky far above.

> Soon she realized the whistling was not actual the Wind, for it had a bird-like note that repeated itself in a gentle rhythm. Also, she saw the bamboo moving in the breeze and heard how it rattled its branches. She found two lengths of a bamboo branch and, one in each hand, beat time on the two sticks while she followed the plaintive note calls.
>
> Before her…she saw her beloved playmate sitting on the bank. Beside him was a tall, thin man whose eyes watched the boy, while the child blew upon a bamboo length. The man’s lean hands waved to the rhythm of the notes, and the girl went dancing toward the pair, keeping time with her pair of bamboo sticks.
>
> Hano-ihu and the tall man finished their melody, then praised the little Pu‘ili for joining them….She sat with them and learned that the man was Kane‘ohe, the Bamboo Man who, as a child, had followed the lure of Wao and had invented a bamboo flute. Kindly, the old man explained to the children how the art of creativity often is lost unless those inspired do follow the call. He told them, “Now we shall return to the village, for I have answered the call and you two little ones will be musicians like me. In honor of this occasion, I shall name the flute after you, my boy...we shall name the time-keeping sticks for her.”
>
> Gaily, the three went down the forest trail of Wao the Inspiring. They were welcomed with feasting and joy. That is how we have the...Bamboo, instruments today. The Hano-ihu or Nose flute; and the Pu‘ili, or notched Bamboo sticks; and the hula named for these gifts of Kane‘ohe, the Bamboo Man. (Paki 1972:29-30)

Windward O‘ahu is famous for legends of Kamapua‘a; the half man, half pig demigod renown for making mischief and for his masterful escapes from retribution for his chicken and taro thievery as well as romantic escapades. One story centers on Kamapua‘a and the Kawa‘ewa‘e Heiau. Thrum (1906) reports that Kawa‘ewa‘e Heiau was erected in the beginning of the 12th century by the high chief ‘Olopana (Thrum 1906:48) and constructed by *menehune* (legendary race of small people who built structures by night) (Fornander 1878:23). In the version of the story presented by King David Kalakaua (1990), Kamapua‘a, embittered by his father/uncle (depending on which story is being told) the ‘Olopana’s rejection of this hog-child, retreats to the mountains where he attracts a band of like-minded thieves and commences to “harass the estates of Olopana”, stealing ‘Olopana’s pigs, fowls and fruits as well as taking pleasure in breaking his nets, cutting adrift his canoes and robbing his fish-ponds (Kalakaua 1990:143). Enraged by Kamapua‘a’s pillage and acts of rebellion, ‘Olopana orders his capture. After several battles and failed attempts to catch Kamapua‘a, ‘Olopana’s army succeeds in delivering Kamapua‘a to the high chief to the “great joy and relief of the people of Koolau” (p.145). Kalakaua relates the following:

> Olopana had erected a *heiau* at Kaneohe, Lonoaohi officiated as high priest, and thither he resolved to take his rebellious son or nephew, and offer him as a sacrifice to the gods. Hina [Kamapua‘a’s mother] pleaded for the life of Kamapuaa, but Olopana could not be moved. Satisfied that he would listen to no appeals for mercy, she determined to save her son, even at the sacrifice of her

> husband, and to that end secured the assistance of the high priest, through whose treachery to Olopana the life of Kamapuaa was saved.
>
> On the day fixed for the sacrifice Kamapuaa…was taken to the *heiau*, followed by Olopana, who was anxious to witness the ghastly ceremonies, and with his own eyes see that his troublesome enemy was duly slain and his body laid upon the altar. In offering human sacrifices the victim was taken without the walls of the *heiau* and slain with clubs by the assistants of the high-priest. The body was then brought in and placed upon the altar in front of the entrance to the inner court, or sanctuary, when the left eye was removed by the officiating priest, and handed…to the chief who had ordered the sacrifice….
>
> Standing with three or four attendants, at the door of his tabooed retreated…Olopana saw his victim preliminarily led to the place of sacrifice, and a few minutes after motion for the ceremonies to begin. Kamapuaa was taken without the walls of the temple to be slain….Passing beyond the outer wall the party entered a small walled enclosure adjoining, and the executioner raised his club and brought it down upon the head of his victim. Kamapuaa smiled, but did not move. Twice, thrice with mighty sweep the club descended upon the head of Kamaupua‘a, but scarcely bent the bristly hairs upon his crown.
>
> With a semblance of wonder the executioner, whose tender blows would have scarcely maimed a mouse, dropped his club and said:
>
> “Three times have I tried and failed to slay him! The gods refuse the sacrifice!”
>
> “It is so, it is so, it is so!” chimed his companions….
>
> Therefore, instead of slaying Kamapuaa, the assistants, as they had been secretly instructed to do by the high-priest, removed the cords from his limbs, smeared his hair, face and body with the fresh blood of a fowl, and on their shoulders bore him back and placed him upon the altar as if dead.
>
> The high-priest approached the apparently lifeless body, and bent for a moment over the face, as if to remove the left eye; then placing on a wooden tray the eye of a large hog, which had been procured for that purpose, he sent an assistant with it to Olopana, at the same time retiring within the inner court, and leaving by the side of Kamapuaa, and near his right hand, as if by accident, the sharp ivory pahoa, or dagger, with which he had, to all appearance, been operating.
>
> Giving but a single glance at the eye presented to him by the assistant of the high-priest, Olopana passed it to an attendant without the customary semblance of eating it, and approached the altar alone. Kamapuaa did not breathe. His face was streaked with blood, his eyelids were closed, and not a single muscle moved to indicate life.

> Olopana looked at the hated face for a moment, and then turned to leave the *heiau*….As he did so Kamapuaa clutched the dagger besides his hand, and, springing from the altar, drove the blade into the back of Olopana. Again and again he applied the weapon until the chief, with a groan of anguish, fell dead at the feet of his slayer. (Kalakaua 1990:145-146)

Kalakaua goes on to describe how Kamapua‘a is released from custody by the high-priest, and how as the people of the district had, “suffered through his plundering visitations, and hundreds of lives had been sacrificed in his pursuit and final capture, the people rose almost in a body to hunt him down and destroy him” (p.147). Kamapua‘a and his cohorts eventually sail off O‘ahu for the Windward islands in search of refuge.

3.1.2 Pre-Contact Period

In pre-contact times, the *ahupua‘a* of Kāne‘ohe offered fresh water from *mauka* (upland) springs watering extensive agricultural fields and a well developed fishpond system, making it both an agricultural and aquacultural center on O‘ahu (Devaney 1976). Handy and Handy (1972) described Kāne‘ohe as:

> …an area of little hills with many small streams between them. In 1935 it was still one of the most active communities in planting commercial taro. A goodly proportion of its lowland lo‘i, tucked away in pockets flanked and often hidden by low hills or near the town itself, was then still planted in taro by Hawaiians who owned the land and by Orientals who leased land or were hired to cultivate it (Handy and Handy 1972:455).

Pre-contact land use would have consisted mainly of *kalo* (wetland taro) and *kula* (dryland) cultivation of *hala* - pandanus (used for making household furnishings such as mats), *wauke* – paper mulberry (used for making *tapa/kapa* cloth), bananas and sweet potatoes (Handy and Handy 1972:456). Kāne‘ohe Bay, with about two-dozen walled fishponds, was a bountiful source of fish (Devaney et al. 1976:6).

3.1.3 Early Historic Period, 1778-1840

Kāne‘ohe has long been viewed as a “valuable” *ahupua‘a* both in terms of agricultural and fishery productivity. In 1830 the chiefs of Hawai‘i, Maui, and O‘ahu, in a council meeting concerning the “late doings on Oahu”, referred to Kāne‘ohe as the “most valuable part” of the district of Ko‘olaupoko (Kamakau 1992:303). Kāne‘ohe held a unique position in the history of *‘awa* (*Piper methysticum*) cultivation. The relaxant drink prepared from rootstock of the *P. methysticum* plant was regarded as immoral by missionaries who sought to restrict consumption of the “intoxicant” brew. In 1846 obliging lawmakers created licensing laws and set up a system of appointing “*‘awa* agents” to plant and sell *‘awa* on the various islands. The argument for this system was that, although *‘awa* was considered morally hazardous, it had medicinal value. There were 2 *‘awa* agents assigned to O‘ahu; one was William Harbottle who was authorized to grow *‘awa* on 2 acres of land in Kāne‘ohe (Greer 1970:66-67).

Describing the early historical times of Hawaiian *ali‘i* (monarchy) in Kāne‘ohe, Devaney et al. (1976) state:

> …when Kahanahana ruled O‘ahu [circa 1773-1783], he sometimes lived in Kaneohe. After defeating Kahanahana circa 1783, Maui Chief Kahekili and most of his famous warriors lived in Koolaupoko at Kailua, Kaneohe, and Heeia (Fornander 1969:225; Kamakau 1961:138). When Kamahameha I apportioned the conquered O‘ahu lands in 1795 to his warrior chiefs and counselors (Ii 1959:69-70), he retained as his personal property the ahupua‘a of Kaneohe… Much of Kaneohe and all of Kahaluu and Kualoa were inherited as personal lands by Kamehameha’s sons Liholiho and Kauikeaouli, Kamehameha II and III (Indices…1920:27-28). (Devaney et al. 1976:5)

Kamehameha III (Kauikeaouli) presided over the Māhele, the division of lands given to Hawaiian royalty and commoners. Kamehameha III, as mentioned above, had inherited Kāne‘ohe and retained the bulk of the *ahupua‘a* during the Māhele. After his death, his wife, Queen Kalama (Hakaleleponi), retained their portion of Kāne‘ohe (Barrère 1994, Kame‘eleihiwa 1992).

3.1.4 Mid 1800s – The Māhele

The Organic Acts of 1845 and 1846 initiated the process of the Māhele – the division of the Hawaiian lands, which introduced private property into Hawaiian society. In 1848, the crown and the *ali‘i* (chiefly class) received their land titles. The common people received their *kuleana* (individual parcels) in 1850. The Kuleana Act of 1850 allowed for private ownership of lands to “commoners,” the persons or families actually living and working on the land. As a result of the Kuleana Act of 1850, a total of 242 land claims were made for Kāne‘ohe Ahupua‘a, but only a bit more than half of those were awarded (www.waihona.com). The average *kuleana* award was 2.38 acres (Kelly 1976:8). However, these claims were not only for commoners, as chiefs and/or *konohiki* were also awarded lots. The bulk of Kāne‘ohe Ahupua‘a went to Queen Kalama, 11 *konohiki* (chiefs), and 3 non-*konohiki* (privileged awardees who received large parcels of land) (Kelly 1976:7). The primary type of land claimed in Kāne‘ohe was taro land, identified in the claims, testimony, and awards as *lo‘i*, but there was also fishponds and *kula* (dryland crops) as well. No individual *kuleana* (LCA’s) were awarded within the project area as it was a small portion of ahupua‘a and government awards for Kāne‘ohe Ahupua‘a (Figure 5).

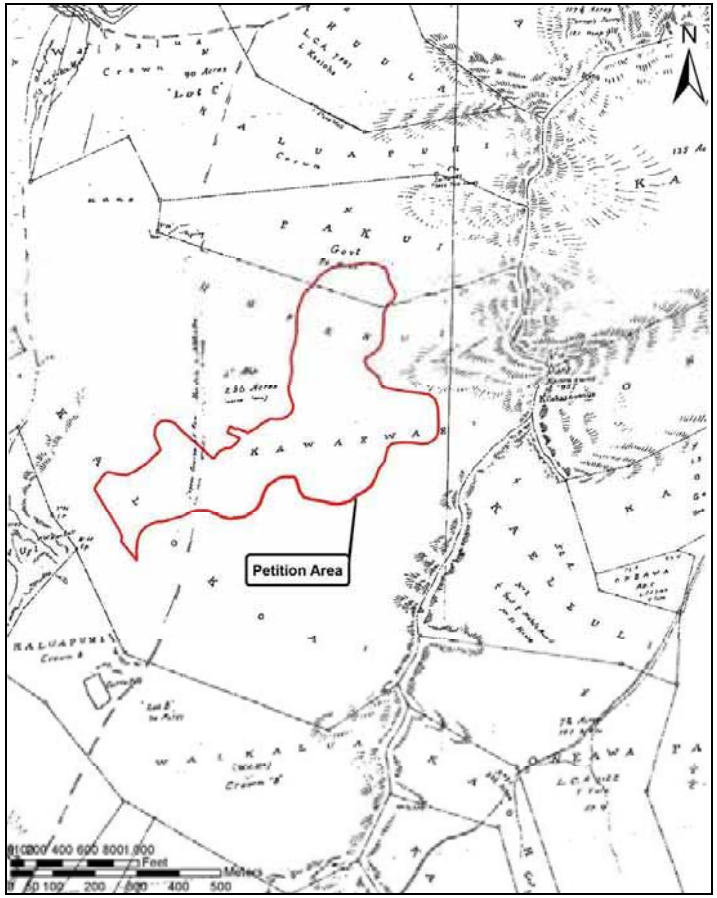


Figure 5. Portion of 1874 Lyons Map of Kāne‘ohe O‘ahu with West Kailua showing locations of LCAs in the vicinity of the petition area.

3.1.5 1860s to 1920, Sugar and Rice

In the 1860s, both commercial sugar cane and rice cultivation began in Kāne‘ohe. One of the earliest sugar plantations on O‘ahu was owned by Charles Coffin Harris, who came to Hawai‘i in 1850 with a plan to practice law. He established the Kaneohe Sugar Plantation Company (c. 1865) on 7,000 acres of Queen Kalama’s land with Harris as partner and manager (Dorrance and Morgan 2000:41). In 1871, C. C. Harris bought Queen Kalama’s Ko‘olaupoko properties from her heir, Charles Kanaina, as well as some land in Honolulu for $22,448. The sale included “…livestock, tool, fishponds, and fishing rights” (Bur. Of Conv. Book 34:53; in Devaney et al. 1976:29). C.C. Harris’s plantation shut down in 1891, when the yield was not enough to support the operation (Dorrance and Morgan 2000:41). Judge C.C. Harris’s daughter and heir, Mrs. David Rice, incorporated the lands as Kaneohe Ranch and converted it to stock farming, to be eventually purchased by James B. Castle in 1907 (Montgomery 1971 in Dorrance and Morgan 2000:42). Harold K.L. Castle, the only child of James B. Castle owned most of the *ahupua‘a* of Kāne‘ohe in the early 1900s (http://www.kaneoheranch.com). Eventually he purchased the remaining land from Harris’s daughter (Henke 1929:62).

Rice cultivation was to eventually supersede taro and dominate the lowlands of Kāne‘ohe. Rice was cultivated mainly by Chinese, who rented or leased the *lo‘i* lands from the Hawaiian landowners. By the late 1880s, virtually the entire floodplain areas of Kāne‘ohe were under rice cultivation. In 1890-92, the Kāne‘ohe Rice Mill was erected and put into production on property adjoining Kāne‘ohe Stream. The mill had a long flume coming to it from further up Kāne‘ohe Stream. It also had a short railway leading to a small landing in Kāne‘ohe Bay, north of Kāne‘ohe Stream.

During the height of rice cultivation (circa 1890-1920), Chinese dominated the business. “To a great extent the rice business, growing and milling was controlled by Chinese *hui* (firms), which recruited laborers from China, handled investment capital from rich absentee landlords, and tallied profits” (Devaney et al. 1976:49).

At the same time rice paddies were displacing the taro lo‘i along the coast, the *kula* (pasture) lands of He‘eia were utilized for grazing of cattle and other livestock. Thrum’s 1905 Hawaiian Annual notes a cattle ranch in He‘eia managed by George W. Rowan.

By the mid-1880s, grazing animals (cattle, sheep, and goats) were having an impact on the land and water of [Kane‘ohe]. Unfenced, the animals ate the crops of the Hawaiian farmers, forcing many to abandon their garden lands [Henry 1993:27].

By the 1920s, rice had gradually declined in importance due to a number of factors. Two of the primary reasons for this decline include the beginning of rice production in California as well as the “annexation of Hawaii by the United States in 1898 resulted in restrictions on the number of Chinese laborers arriving from the Far East.” (Devaney et al. 1976:53). However, rice as well as some taro cultivation continued up to c. 1960.

3.1.6 Ranching

In the mid 19th century, ranching became a major enterprise. Cattle and sheep had been left on O‘ahu by Vancouver in 1793, and the former had multiplied into a large herd by the 1840s (Devaney 1976:70). By the mid 1860s, the cattle were so numerous as to cause environmental

degradation. Kāne‘ohe Ranch was formed in 1876, on lands originally belonging to Queen Kalama. At its peak, the ranch included 12,000 acres and 2,000 head of cattle. Alien grasses and other species, such as pigeon peas, were introduced to the area as cattle fodder (Henke 1929:62). Much of the land modification in the upland and hilly portions of Kāne‘ohe may be the result of heavy cattle grazing over a long period of time.

3.1.7 1890s to Present

The commercial cultivation of pineapple began in the 1890s and the first decade of the 1900s in Kāne‘ohe. From approximately 1910 to 1925, pineapple cultivation was a major industry in this area. In 1911, the company of Libby, McNeill and Libby built a pineapple cannery in He‘eia. At its peak, 2,500 acres were under pineapple cultivation on Windward O‘ahu (Harper 1972) stretching from Kāne‘ohe to Kahalu‘u. A large percentage of this acreage was in the Kāne‘ohe Bay region, including He‘eia. A *heiau*, Kaualauki Heiau in He‘eia, was mostly destroyed by pineapple field clearance during this time – a likely fate of many archaeological sites. In 1919, the Kaneohe Ranch Company and He‘eia Agricultural Co., Ltd. leased 1000 acres of land in He‘eia, Kāne‘ohe, and Kailua, formerly planted in sugar, to the Libby company for a term of 17 years. In 1917, Libby leased an additional 600 acres in He’eia (Libby, McNeill & Libby Ms:2, cited in Kawachi 1990). While the rice fields that covered old taro lands were mainly located near streams and near the coast, the pineapple fields were also grown on the slopes of higher lands, usually on land subleased to individual Japanese farmers:

> Pineapples were planted by individual Chinese and Japanese farmers on moderately sloped hill land where rice and taro could not be grown . . . these areas included the dissected alluvial terraces and the lower slopes and spurs of the Ko‘olau range [Miyagi 1963:1151].

The change to the windward landscape due to pineapple cultivation is illustrated by the following passage:

> At last we reached the foot of the Pali. . . . Joe and I looked over the surrounding hills, but looked in vain for the great areas of guava through which but a few months ago we had fought and cut our way. As far as the eye could reach pineapple had taken the place of the forest of wild guava. The newest industry in Hawaii was beginning even to press upon the cane fields of this side of the island [Alexander 1914:318, cited in Devaney et al. 1976:62].

The pineapple fields were abandoned when Molokai and Lāna‘i pineapple cultivation began to boom, and Libby pulled out of the Ko‘olaupoko enterprise (Kelly 1976:47). The cannery closed in 1923 (Dorrance 1998:95). Most of [the former pineapple] land went to grass, and some of it was used to graze cattle. Many of the small farmers returned to rice cultivation. The area along He‘eia stream mauka of the viaduct continued to produce rice [Kelly 1976:47].

Rice cultivation again extended into former sugar cane lands after the demise of the He‘eia Agricultural Company. It flourished until about 1920, when it could no longer compete with the price of California grown rice (Dorrance 1998:94). Taro made a comeback (ca. 1920s - 1940s) coinciding with the decline in rice; and much of the former lo‘i land was returned to taro production.

The extensive salt marshes of He‘eia inland of the fishpond (loko) were not suitable for cultivation, but fringing them to the southward, flanking both sides of He‘eia Stream from which they are irrigated, lie the vast terraced lowland flats of this ahupua‘a, which were in 1935 still largely planted in commercial taro [Handy and Handy 1972:454-55].

By the end of World War II, ranching was no longer economically viable for the Kaneohe Ranch, and the ranch became primarily a landlord to other farmers (www.kaneoheranch.com). After World War II, residential developments changed the face of Kāne‘ohe Ahupua‘a. The opening of the Wilson Tunnel and the expansion of the Pali Highway in the 1950s and 60s — creating an easier passage from Honolulu thru the Ko‘olaua mountains to windward communities — led the way to a development boom on the windward side of O‘ahu. High tax rates on real estate sales forced many old-time landowners to lease their land to residential developers rather than sell on a fee-simple basis. Kaneohe Ranch at one time leased their land to over 5,000 single family residential lots in Kailua and Kāne‘ohe. The vast majority of the leaseholds were sold to the lessees (www.kaneoheranch.com).

The dairy industry rose to prominence over beef cattle ranching in the post-war years. The shortage of available land due to urban expansion, the shortage of fee simple land, and the high price of land leases forced farmers in the dairy districts near Honolulu (e.g., Koko Head) to relocate to more remote areas of O‘ahu (Durand Jr. 1959:241). In the 1950s Kailua-Kāne‘ohe was an important dairy district of Windward O‘ahu. Dairy farming was dominated by whites (Caucasians) particularly of Portuguese and Spanish ancestry, and secondarily Japanese, farmers (Durand Jr. 1959:235). “Among the names of island dairymen, illustrating the Portuguese-Spanish-Mainland importance…are…Brazil, Carlos, Campos, Costa, Ferreria, Foster, Freitas, Knowles, Medeiros, Moniz, Ornellas, Rapoza, Santos, Toledo, Vause and White” (Durand Jr. 1959:235). However, this period was relatively short-lived as the opening of the Pali route, exorbitant land prices in Honolulu, and more automobiles on O‘ahu contributed to rapid urbanization in Kailua-Kāne‘ohe (Durand Jr. 1959:244-245). Many landowners decided to develop their land for suburban housing and terminated leases with farm leaseholders.

In 1959 Hawai‘i was admitted to the Union making it the 50th state resulting in a construction boom and rapidly growing economy. Hawaiian Memorial Park opened in 1961 with a land area of 6 acres. It has gradually expanded to its current size, 80 acres. The Pikoiloa Subdivision lots, which are to the northwest of the project area were created by subdivision approvals executed in 1964. The Pikoiloa Tract Units 9 and 10 total 280 lots. Around the same time, Pohai Nani was opened in 1964 and is operated by the Evangelical Lutheran Good Samaritan Society, the largest non-profit operator of senior communities in the United States.

3.2 Previous Archaeological Research

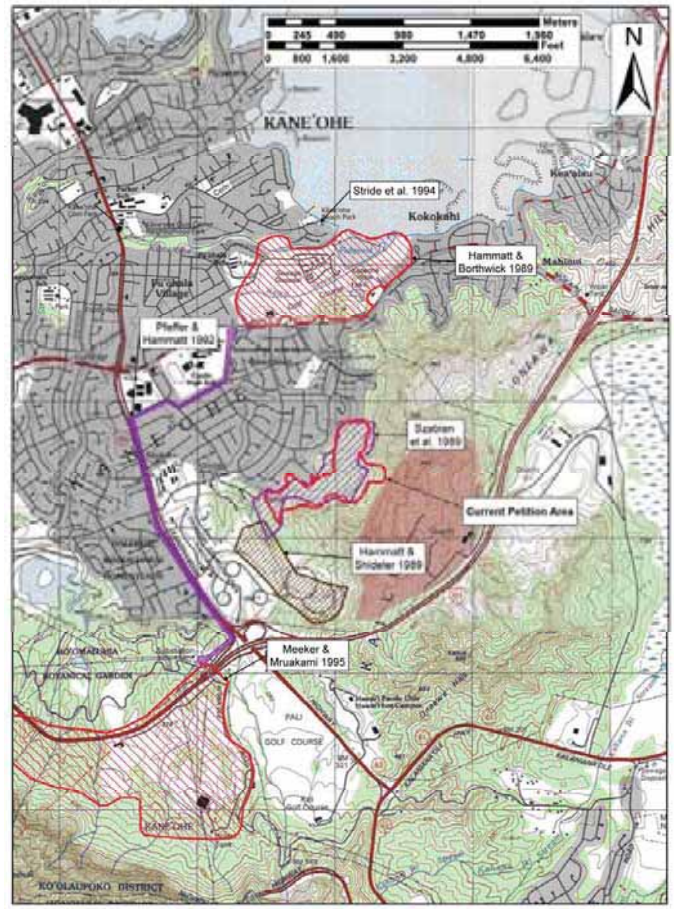
A number of archaeological investigations have been conducted in Kāne‘ohe Ahupua‘a. This section provides a brief overview of the research and findings of previous archaeology in the general area surrounding the present project followed by a more detailed summary. Previous archaeological studies in the vicinity of the current project area are indicated on Figure 6 and are summarized in Table 1.

3.2.1 Previous Studies Adjacent to or Including Portions of the Project Area

3.2.1.1 McAllister

The earliest systematic archaeological coverage of Kāne‘ohe was by J.G. McAllister (1933) who recorded major sites throughout O‘ahu in the early 1930s. McAllister recorded a number of fishponds and other sites in the vicinity of the current project area (Figure 7). The following are brief descriptions of sites near the current project area (McAllister 1933 in Sterling and Summers 1978:210-221):

> Site 349. Waikalua Fishpond, adjacent to Waikalua, Kaneohe. The rebuilding of the pond has been completed. The wall was 1420 feet long of waterworn basalt 3 to 4 feet high but somewhat wider. The pond covers 11 acres.
>
> Site 350. Two ponds, Kailua side of Waikalua. The pond in use is said to be Keana with an area of 3.5 acres. According to Bell, the name of the other is Kalokohanahou. Its wall is broken. Both were built of waterworn basalt. The dirt-filled wall of Keana is wide enough for trees to grow on it.
>
> Site 351. Three adjacent ponds, located off the lands of Mikiola and Mahinui in Kaneohe. The two end ponds were probably built first, the middle pond being added later so as to take advantage of the walls of the other two. The pond on the east is known as Mahinui and that on the west as Mikiola. The name of the middle pond is Kaluoa, according to John Bell, but appears as Kapuu on a map in the Bishop Estate office. The wall of Mikiola is broken.
>
> Site 352. Ahukini Heiau, Keana, Kaneohe. A small structure, 70 by 127 feet, built on the top of an elevation 1200 feet from the sea…The only features remaining are the low walls, unusual because they are built of stones a few inches in size…most of the remains are scattered, for it is very easy for the cattle to disturb the small stones…When the drums at this *heiau* were beaten they could be heard over Kaneohe, but not just on the other side of the low ridge in Kailua.



1998 Kaneohe/Honolulu USGS 7.5' minute quadrange
UTM NAD 83 zone 4N

Figure 6. Portion of US Geological Survey Kāne‘ohe quad map showing locations of previous archaeological studies in the vicinity of the current petition area

Table 1. Previous Archaeological Studies in the Vicinity of Current Project Area

Reference	Type of Investigation	Location	Findings
McAllister 1933	Island-wide survey	Island wide	Identified 9 sites in the vicinity of the current project area, 3 of which were *heiau*
Sterling & Summers 1978	Island-wide survey	Island wide	Section concerning Kāne‘ohe includes legendary references to the naming of Kāne‘ohe and other sites and the descriptions of McAllister’s (1933) sites
Hammatt & Borthwick 1989	Archaeological Survey & Assessment	90-acre Bay View Golf Course Expansion	Documents Waikalua-loko and Waikalua fishponds
Hammatt & Shideler 1989	Archaeological Survey	Veterans Cemetery 90-acres	No significant finds
Szabian et al. 1989	Reconnaissance Survey	N & W facing slope of ridge separating Kailua and Kāne‘ohe	Describes 11 sites with 25 features, four pre-contact, seven post-contact & Kawa‘ewa‘e Heiau
Pfeffer and Hammatt 1992	Archaeological Assessment	Transmission Corridor mostly along Kamehameha Hwy.	No finds
Stride et al. 1994	Inventory Survey & Subsurface Testing	Waikalua Road (TMK 4-5-05: 1,2, 12-14) 3.3 acres at shoreline	No significant finds in eight backhoe trenches
Meeker & Murakami 1995	Archaeological Monitoring and Data Recovery Investigations	Ko‘olau Pali (TMK 4-5-42:1 and 6)	Seventeen sites investigated, of these, four were recommended for preservation. They include one set of dryland agricultural terraces, two open sites with lithic activity, and a single cluster of three stone mounds.

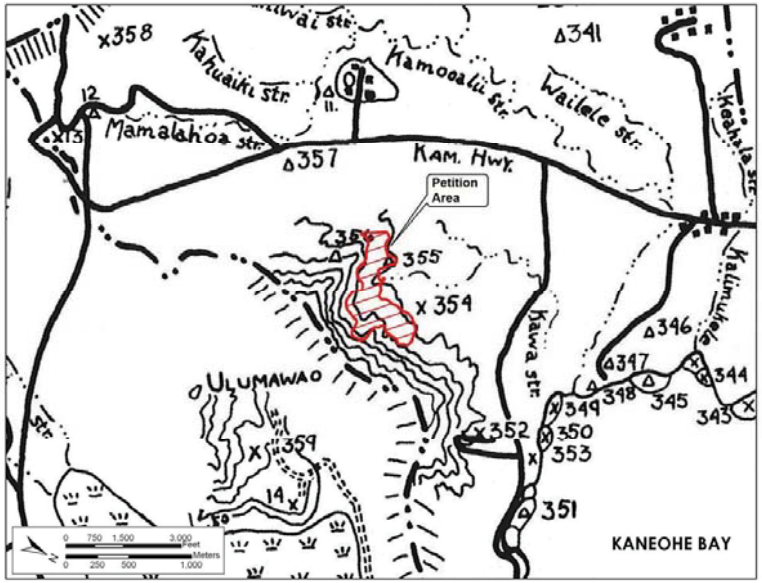


Figure 7. Portion of 1959 Bishop Museum map showing the locations of archaeological sites identified by McAllister (1933) in relation to the current petition area (adapted from Sterling and Summers 1978)

Site 353. A spring on the land known as Keana, called Kinikailua-Manokaneohe, as it is said that the people from both Kailua and Kaneohe died in great numbers from drinking its waters.

Site 354. Kawa‘ewa‘e Heiau, (see SIHP# 50-80-10-354 in Section 4.2)

Site 355. Small round hill, the name of which is not remembered, near the mountain side of Kawa‘ewa‘e Heiau. Said by John Bell to have been the location of a holua. This he saw destroyed when an attempt was made to plant pineapples in this section. Without doubt this is the site of the slide described by Bates in 1853.

Before reaching the mission station at Kaneohe, the road leads through a narrow but fertile ravine, tenanted by a few natives. In leaving the ravine, a low round hill, to the right of the path, is rather conspicuous from a long, narrow depression or channel on its side. It was an indication that one of the favorite games of the old Hawaiians had been played there. This game was called the holua, and was one of their favorite games of chance…

This same site was seen by Briggs in 1881:"Dewight pointed out to me a long narrow depression on some of the hills to be seen from our path, where old Hawaiians used to play one of their favorite games of chance".

Site 356. Puumakani Heiau, Kalapuhi, Waikalua, Kaneohe. This *heiau* was on the ridge facing the Nuuanu Pali, but the stones were removed and used for building a cattle corral farther down the slope. The heiau is said to have been built by Olopana

Site 357. Kamaikola across from the Japanese store at the first bridge beyond the end of Nuuanu Pali descent.

Many generations ago there lived at the foot of the Pali a Hawaiian of questionable habits. His name was Pakuanui and he lived on the land known as Kamaikola. Here he had his grass hut, the rock foundation of which was to be found only a few years ago. In one version of the story his wife used to b stationed at the head of the Pali to signal to her husband when but one or two travelers laden with goods descended the trail. Pakuanui waited in ambush, fell apon them with his spear, disposed of the bodies and appropriated the goods.

According to background research and historic maps, Site 355, the holua slide, was located in the southwestern portion of the project area. Site 354, Kawa‘ewa‘e Heiau borders the northern boundary and Site 356, Puumakani Heiau, was located near the southern boundary of the project area .

3.2.1.2 Szabian et al

From May 25 to June 3, 1989 Szabian et al. conducted an archaeological reconnaissance survey for the proposed Pikoiloa Cemetery. In addition to Kawa’ewa’a Heiau (SIHP -354), listed on the National Register of Historic Places since 1972, 11 sites were recorded with at least 25 associated features. Of these four were interpreted as pre-contact and seven as historic in nature. On the field map provided by Szabian et al. (1989:2) it appears that six of these sites are located within the current petition area (Figure 8). They include SIHP# -4680,- 4681, -4682, -4683, -4684, and 4686. Subsequent to the investigation conducted by Szabian et al. SIHP#’s -4681 and -4682 were determined to be outside the current petition area (Figure 10). In addition SIHP # 50-80-10-4682 was determined to be non-Cultural (see Section 4.1.4). All of the sites previously recorded by Szabian et al are summarized (Table 2).

3.2.2 Background Summary and Predictive Model

Kāne‘ohe Ahupua’a was intensively utilized during the pre-Contact period both as an agricultural and aquacultural center . Additionally, it was one of the primary population centers on O‘ahu (Devaney et al. 1976:6). Kawa‘ewa‘a Heiau, located in the vicinity of the project area, suggests the historical and archaeological importance of the area. Additionally, the oral tradition suggests that the area has had a long important history and was well known to many of the indigenous peoples.

Kāne‘ohe has long been viewed as a valuable *ahupua‘a* both in terms of agricultural and fishery productivity. In 1830 the chiefs of Hawai‘i, Maui, and O‘ahu, in a council meeting concerning the “late doings on Oahu”, referred to Kāne‘ohe as the “most valuable part” of the district of Ko‘olaupoko (Kamakau 1972:303). In the early 1900s, Kāne‘ohe Ranch came to dominate land holdings in the Kailua and Kāne‘ohe area. Included within this acreage is much ranch land, which had been bought, sold, let, and used as ranch land by numerous parties since the mid-1850s. Subsequently, the ranching and farming areas have been replaced by residential subdivisions.

Previous archaeological research has supported these indications with the documentation of Pre-contact ceremonial, habitational, and agricultural remains in the immediate vicinity of the project area (Szabian et al 1989). Additionally, historic background research has placed the Hawaiian Memorial Park Expansion project within an area employed for cattle ranching following indigenous Hawaiian settlement. Thus as a result of background research, expected finds during the archaeological inventory survey of the project area could include additional evidence of indigenous Hawaiian occupation and historic agriculture/ranching.

Table 2. Historic Properties identified in the Szabian et al. 1989 Archaeological Survey

SIHP # (50-80-10-)	# of Features	Formal Site Type	Probable Function	Estimated Age	Description
Historic Properties Located Within the Current Petition Area					
-4680	1	Terrace	Agricultural/Water control	Historic	Historic erosion control and water diversion terrace.
*** -4681**	5	Complex-Enclosures and Terracing	Agricultural/ Habitation	Pre-Contact	A habitation site consisting of several c-shaped structures, a terrace wall and a circular rock feature situated on a north-facing slope. This historic property is located outside of the petition area.
*** -4682**	0	Natural terracing, Platform	Natural	Non-Cultural	This is a series of natural "terraces" formed by lava rocks, which rolled down slope and were caught by exposed bedrock outcrops.
-4683	1	Pit feature	Charcoal kiln	Historic	Consists of a rectangular pit 3.6 m by 2.5 m and some natural terracing. The walls of the pit show evidence of burning, likely the remnants of a charcoal kiln or some similar processing area.
-4684	7	Complex-Enclosure, and Terracing	Habitation	Pre-Contact	Habitation site consisting of several c-shaped structures, a terrace wall, a circular rock feature and several house terraces.
-4686	1	Stone alignment	Boundary marker	Historic	This site consists of two features. Feature A is a rock alignment constructed of boulders running east/west parallel to a large stream cut. Feature B, previously described as a series of stone alignments, appears to have been badly disturbed due to landscaping and rubbish piling.

SIHP # (50-80-10-)	# of Features	Formal Site Type	Probable Function	Estimated Age	Description
Historic Properties Located in the Vicinity of the Current Petition Area					
4676	9	Complex of walls, stepped terracing	Agricultural and habitation	Pre-Contact	A site complex adjacent to KLEI radio tower along a tributary to the Kawa Stream.
4677	2	Wall remnant, earthen mound	Agricultural	Historic	Located adjacent to the Kawa Stream, it consists of a remnant stone wall and a large earthen mound.
4678	2	Wall remnant, earthen mound	Agricultural or habitation	Historic	Located approximately 70 m north of SIHP 4677. Consists of an alignment and a large earthen mound.
4679	1	Wall remnant	Boundary of habitation	Historic ?	Located at the base of the slope below KLEI radio tower and consisting of an L-shaped alignment of weathered basal stones.
4685	2+	Remnant walls, terracing	Habitation/ agricultural	Historic	Located on a ridge between two deep stream cuts consisting of a level terraced area with facing and an undetermined number of possible terrace facings downstream.
* Subsequent to the investigation conducted by Szabian et al. SIHP#'s -4681 and -4682 were determined to be outside the current petition area (Figure 10).					

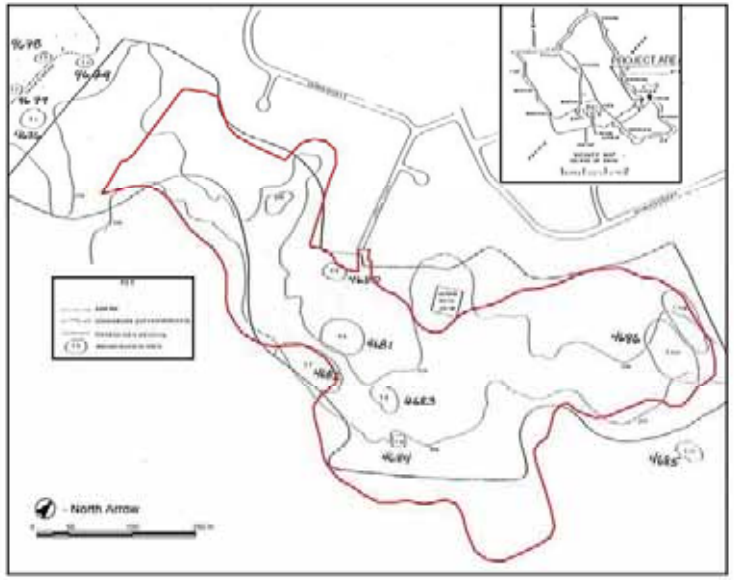


Figure 8. Map showing the current petition area (illustrated in red) in relation to that of Szabian et al (1989) (adapted from Szabian et al 1989:2).

Section 4 Results of Fieldwork

4.1 Survey Findings

The initial project area consisted of approximately 53 acres. Following the pedestrian inspection the boundaries of the Hawaiian Memorial Park Expansion project area were adjusted to include buffer zones for select archaeological resources identified along the periphery of the project area. As a result, an additional 13 acres was added to the project area to account for the lost acreage. The petition area defined for this report is approximately 56.6 acres. A total of 11 historic properties were recorded within or near the current petition area (Figure 9). Of these, one was previously recorded by McAllister (1933), SIHP # 50-80-10-354, and five were previously recorded by Szabian et al (1989), SIHP# s 50-80-10-4680, 50-80-10-4681, 50-80-10-4683, 50-80-10-4684, and 50-80-10-4686. The remaining five are new discoveries; these include SIHP #s 50-80-10-6929, 50-80-10-6930, 50-80-10-6931, 50-80-10-6932, and 50-80-10-6933. Four of the sites (SIHP-354, -4681, -6929 and -6931) are located outside of the current petition area but close enough for consideration. Also, a previously unrecorded feature associated with SIHP# 50-80-10-354 was recorded and a large grinding stone was discovered approximately 40 m (131 ft) south of SIHP # 50-80-10-4684. In addition SIHP # 50-80-10-4682, previously recorded by Szabian et al (1989) was determined to be non-Cultural and is not considered a historic property.

In most instances the historic properties previously recorded by Szabian et al (1989) were found in the general area as shown on their field map with the exception of SIHP #s -4683 and -4684 (Figure 10). We were unable to locate anything resembling the site descriptions in the indicated areas. CSH did however identify sites similar to the descriptions elsewhere within the project area. SIHP# 50-80-10-4683 was relocated approximately 80 m north of the location indicated on the Szabian et al (1989) map. Two sites were located resembling the description of SIHP# 50-80-10-4684, in this case the site closest to the original location plotted by Szabian et al (1989) was given this designation. The other, designated SIHP # 50-80-10-6930 also contains attributes similar to the site description recorded by Szabian et al (1989).

The individual historic properties are detailed in the following sections. The historic properties within the current petition area are presented first followed by the historic properties located outside of the petition area that are close enough for consideration. The previously identified historic properties include the original descriptions along with additional observations made by CSH.

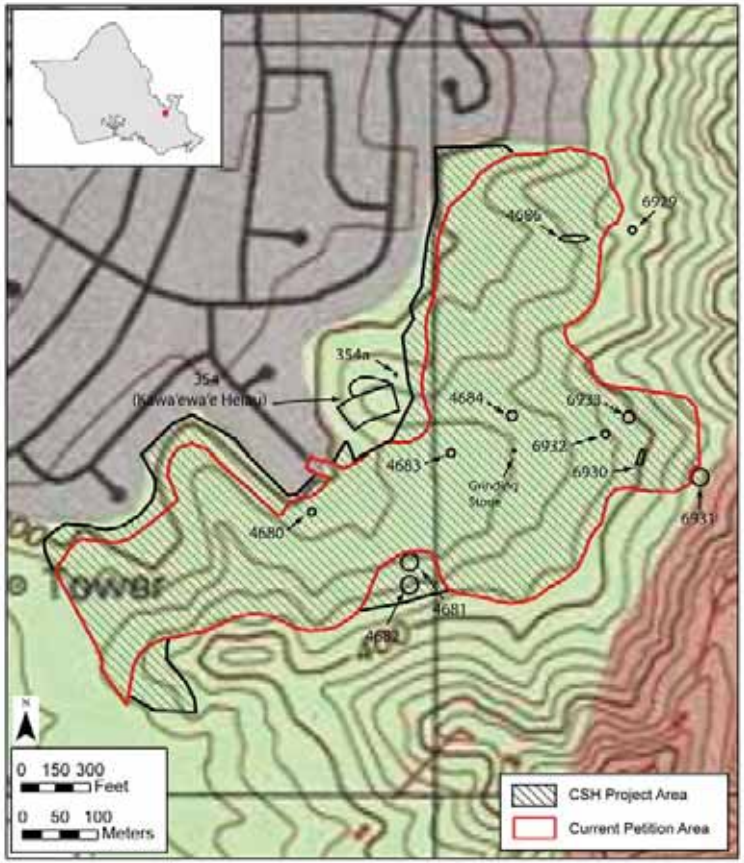


Figure 9. Portion of a USGS map showing all sites within the previous and current project areas.

Table 3. Sites identified within or near the petition area.

SIHP/CSH# (50-80-10)	Formal Site Type	Number of Associated Features	Probable Function	Estimated Age	Description
Historic Properties Located Within the Current Petition Area					
-4680	Terrace	1	Agricultural/ Water control	Historic	Historic erosion control and water diversion terrace.
-4683	Pit feature	1	Charcoal kiln	Historic	Consists of a rectangular pit 3.6 m by 2.5 m and some natural terracing. The walls of the pit show evidence of burning, likely the remnants of a charcoal kiln or some similar processing area.
-4684	Complex-Enclosure, and Terracing	7	Habitation	Pre-contact	Habitation site consisting of several c-shaped structures, a terrace wall, a circular rock feature and several house terraces.
-4686	Stone alignment	1	Boundary marker	Historic	This site consists of two features. Feature A is a rock alignment constructed of boulders running east/west parallel to a large stream cut. Feature B, previously described as a series of stone alignments, appears to have been badly disturbed due to landscaping and rubbish pilling from the Pohai Nani Retirement Community

-6930	Stone enclosure	1	Ceremonial	Pre-contact	This is a rectangular shaped stone enclosure oriented north /south with an irregular notch on the east wall. The dimensions are approximately 25 m n/s by 15 meters e/w.
-6932	Stone storage feature	1	Storage	Historic	This is a storage area dug out beneath a basalt boulder and lined with smaller stones. It is adjacent to an indeterminate drainage.
-6933	Pit feature with associated Stone wall	2	Charcoal kiln	Historic	This is a large circular pit, approximately 4 m in diameter with burned walls, likely the remnants of a charcoal kiln or some similar processing area. It is cut into a natural rise in the topography and includes a faced, two to three course stone wall fronting it on the northeast side.
Historic Properties Located in the Vicinity of the Current Petition Area					
-354	Enclosure, Platforms, Terraces	2+	Ceremonial	Pre-Contact	Kawa‘ewa‘e Heiau, this is on top of a small knoll and consists of one large enclosure 120 by 253 feet with a small terrace on the north side that follows the contours of the land. The walls average about 5 feet in width and 4 to 7 feet in height according to the contours of the land. This historic property is located outside of the project area.
-4681	Complex-Enclosures and Terracing	5	Agricultural/ Habitation	Pre-Contact	A habitation site consisting of several c-shaped structures, a terrace wall and a circular rock feature situated on a north-facing slope. This historic property is located outside of the petition area.

-6929	Quarry	2	Raw material collection	Pre-contact	Located along an intermittent drainage, this site consists of two concentrations of lithic debitage amid an abundance of basalt cobbles. This historic property is located outside of the petition area.
-6931	Stone alignments	2+	Ceremonial	Pre-contact	This is a possible ceremonial area located on a natural knoll between two intermittent drainages with a series of stone alignments on the slope. This historic property is located outside of the petition area.
Previously Recorded Historic Properties Considered Non-Cultural					
-4682	Natural terracing, Platform	0	Natural	Non-cultural	This is a series of natural “terraces” formed by lava rocks, which rolled down slope and were caught by exposed bedrock outcrops.

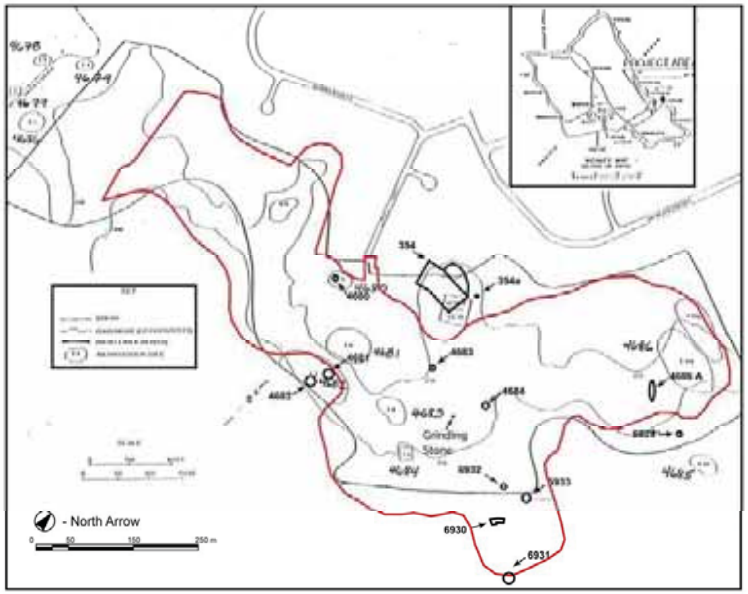


Figure 10. Map showing the current petition area (illustrated in red) and site locations in relation to the Szabian et al field map (adapted from Szabian et al 1989:2)

4.1.1 Historic Properties Located Within The Current Petition Area.

4.1.1.1 SIHP # 50-80-10-4680

FORMAL TYPE:	Terrace
FUNCTION:	Agriculture/water control
AGE:	Historic
# OF FEATURES:	1
DIMENSIONS:	5 meters north/south by 5 meters east/west
CONDITION:	Poor
UTM:	**GPS Point 1** **N**. 2366378 **E**. 625837
DESCRIPTION:	

Szabian et al (1989) described SIHP 50-80-10-4680 as:

> a rock concentration covered with Christmas berry approximately 5 m long and tumbling approximately 6 m down slope" (Szabian et al 1989: 11).

CSH has added the following descriptive attributes to SIHP 50-80-10-4680. It consists of a rock concentration forming a crude terraced structure (Figure 11 to Figure 13). The crude terrace retains a large amount of soil runoff that appears to have buried a portion of the site. The terrace forms the top of the hill and is adjacent to a water-cut ditch that drains into the larger drainage at the base of the hill

SIHP # -4680 is constructed of angular basalt cobbles stacked against a steeply sloping hill. The terrace wall is stacked 5 levels high (maximum height 125 cm) with 20 cm diameter cobbles. A crude alignment of boulders (55 cm diameter) extends east approximately 2 meters from the southeast corner. The southeast end is the best preserved with a poor facing exposed.

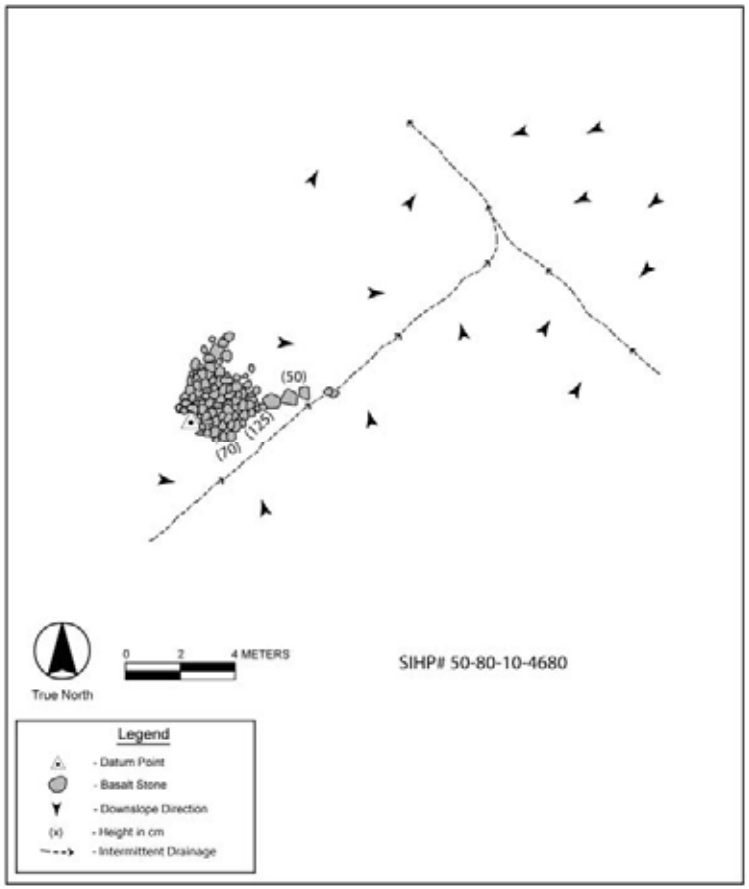


Figure 11. Plan view diagram of SIHP # 50-80-10-4680.

Figure 12. SIHP # 50-80-10-4680, overview of rock mound, view to the west.

Figure 13. SIHP # 50-80-10-4680, close-up of rock mound, view to west.

4.1.1.2 SIHP # 50-80-10-4683

FORMAL TYPE:	Pit feature
FUNCTION:	Charcoal kiln
AGE:	Historic
# OF FEATURES:	1
DIMENSIONS:	5 meters north/south by 5meters east/west
CONDITION:	Poor
UTM:	**GPS Point 1** **N**. 2366455.3 **E**. 626020.7
DESCRIPTION:	

SIHP# 50-80-10-4683 when first observed by Szabian et al (1989) was described as:

> Located on a fairly level area this site is comprised of two features: Feature A is an apparent excavation, rectangular in shape measuring 3.6 m by 2.5 m and approximately 0.7 m deep. Feature B is a series of terraces of undetermined extent (Szabian et al 1989:11)

The area shown on the Szabian field map was devoid of anything resembling the previous description. However during the subsequent survey work a rectangular excavation similar to the description of Feature A was observed approximately 80 m (262 ft) to the north (Figure 14 and Figure 15). The rectangular pit measuring 3.5 m by 2.5 m and 1.5 m deep, resembles a historic charcoal kiln. East of the rectangular pit is concentrated area of large stones and boulders similar to the description for Feature B (Figure 16). Random partial alignments among them may suggest man-made terracing but are most likely natural.

SIHP# 50-80-10-4683 is believed to be a historic site as charcoal production was a widespread industry in Windward O‘ahu during the later part of the 19th and early part of the 20th century. Remnant charcoal kilns have been extensively documented in a number of archaeological investigations conducted in Kāne‘ohe and He‘eia. For a thorough discussion of these types of features the reader is referred to Meeker (1995), Dockall (et al. 2003), and Allen (1987).

The following text from Meeker (1995:98-99) describes the construction and firing techniques of earth-covered pit kilns from developing countries and highlights the similarities between Feature A and documented non-industrial charcoal kilns:

> The earth-covered pit kiln is another traditional method of charcoal making still practiced in the developing countries. Booth (1983:50) describes it as the “equivalent of a mound but below ground level.” In size, it could range from an excavated hole of about 1 or 2 m^3 to a hillside pit measuring 4 m in diameter. Dug into the slope, the side and rear walls of the pit are formed by vertical cuts in the natural earth. Sometimes the walls are reinforced by a brick or stone lining. There

> may be an air vent or flue cut into the rear wall. Emrich (1985:24) further notes that “after loading, the pit is covered with a layer of leaves normally 20 cm thick and on top with a layer of soil of the same thickness.”

SIHP# 50-80-10-4683 is located in a relatively level area currently utilized by unauthorized paintball enthusiasts (Figure 17). Makeshift wooden barricades have been constructed; the area is littered with expended air cartridges and colorful splatter patterns on the surrounding vegetation.

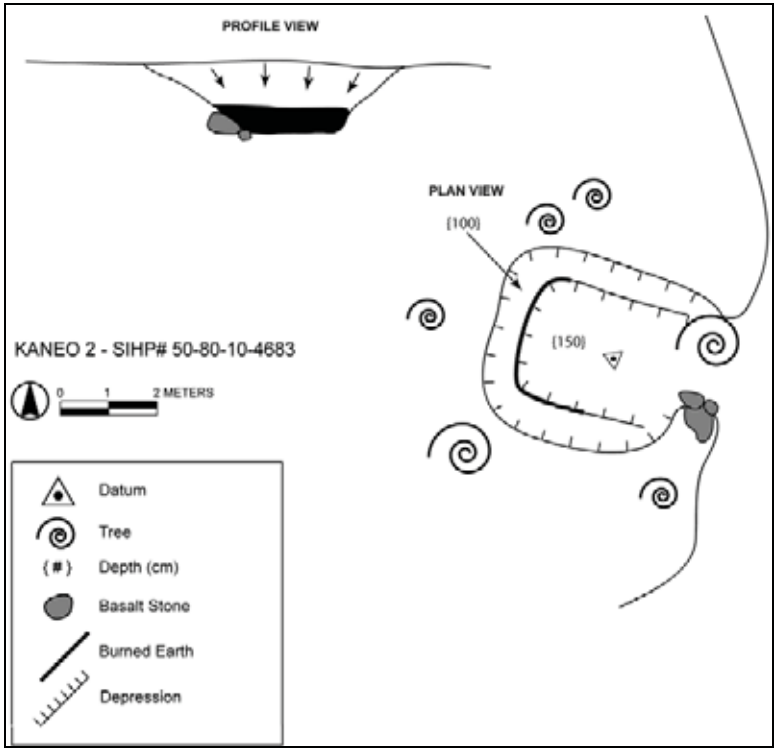


Figure 14. Plan view and profile of SIHP # 50-80-10-4683.

Figure 15. SIHP# 50-80-10-4683, rectangular excavation viewed from the east.

Figure 16. SIHP# 50-80-10-4683, natural terracing viewed from the east.

Figure 17. Picture showing SIHP# 50-80-10-4683 in relation to the unauthorized paintball area.

4.1.1.3 SIHP # 50-80-10-4684

FORMAL TYPE:	Complex- Enclosures & terracing	
FUNCTION:	Habitation	
AGE:	Pre-Contact	
# OF FEATURES:	7	
DIMENSIONS:	33 meters north/south by 56 meters east/west	
CONDITION:	Good	
UTM:	**GPS Point 1**	**N**. 2366505 **E**. 626104.3
	Grinding Stone	**N**. 2366454.4 **E**. 626104.7

DESCRIPTION:

Szabian et al (1989) described this historic property as:

> Located on a small knoll between streambeds, this large multiple terraced structure is topped by a stacked freestanding wall on three sides, with the fourth wall incorporated into the slope. The overall size of the enclosure is approximately 25 by 18 m with walls averaging slightly over 1 m wide and 0.7 m high. The structure is comprised of stacked subangular weathered basalt cobbles and boulders. The facings of the north and west walls are intact, with the lower terrace steps collapsed. The level area within the enclosure appears to be soil filled and no surface features were evident. Possible terrace structures were encountered downslope approximately 20 m to the west.

As mentioned previously, the location depicted on the Szabian field map was devoid of anything resembling the previous description. However during the subsequent survey a site was observed approximately 150 m north that shared similar attributes to the available description.

SIHP# 50-80-10-4684 is a habitation site consisting of several c-shaped structures, a terrace wall, a circular rock feature and several house terraces, seven features in all (Figure 18). To the east, west and south of the complex is a badly disturbed area. The site is situated on a west-facing slope with vegetation consisting of dense canopy of large trees and an understory of laua‘e fern. An intermittent drainage borders the site to the east and south. Two 1x 1 m (3.3 x 3.3 ft.) test units were excavated in order to gather more information as to the function of this site. A detailed summary is available in the following section. Additionally, a large grinding stone was discovered approximately 40 m south of SIHP# 50-80-10-4684.

Feature A is an enclosure consisting of stacked basalt walls, the eastern corner is the highest standing approximately 45 cm above the ground surface. (Figure 19). The north wall measures 7 meters with the disturbed NW corner having little to no height; the west wall measures 4.2 meters, and is badly disturbed with no height. The east collapsed wall measures 7.5 meters by 40 cm high, and the southern wall measures 7 by 3.5 meters. The interior of the enclosure provides a

space of approximately 5 by 7 meters and is mostly soil with scattered rocks. A 1 by 1 meter test unit (TU1) was placed inside Feature A in the eastern corner.

Feature B is a stacked basalt cobble/boulder terrace wall located southwest of Feature A (Figure 20). It measures 19 meters long running at 262 degrees east of north and ranges in height from 0 to 80 cm.

Feature C is a stacked basalt cobble and boulder wall forming an “L” shaped terrace with the long segment measuring 20 meters oriented at 333 degrees and the shorter segment measuring 7 meters oriented at 252 degrees (Figure 21). This feature appears to be mostly collapsed, with the highest portion at 50 cm. It encloses 3 apparent c-shaped features and a possible hearth.

Feature D is a c-shaped feature consisting of basalt boulders and large cobbles (Figure 22). It measures 4 by 3.5 meters and opens to the southwest.

Feature E is a circular rock feature, possibly a hearth, measuring 2.3 meters in diameter and 30 cm in height (Figure 23). It is located near the 3 c-shaped habitation structures (Features D, F and G).

Feature F is a c-shaped feature consisting of basalt boulders and large cobbles. It measures 4 by 4 meters and opens to the southwest (Figure 24). Contiguous to the southwest is Feature C and about 4.5 meters to the northwest is Feature E. A 1 by 1 meter test unit (TU2) was placed in the middle of Feature F.

Feature G is a highly eroded c-shaped feature (damaged from unknown processes) consisting of basalt boulders and large cobbles (Figure 25). It is located about 6 meters NW of Feature F, about 3 meters north of Feature E. Feature G measures approximately 4 meters in diameter and a single course of cobbles/boulders is intermittently present along its circumference.

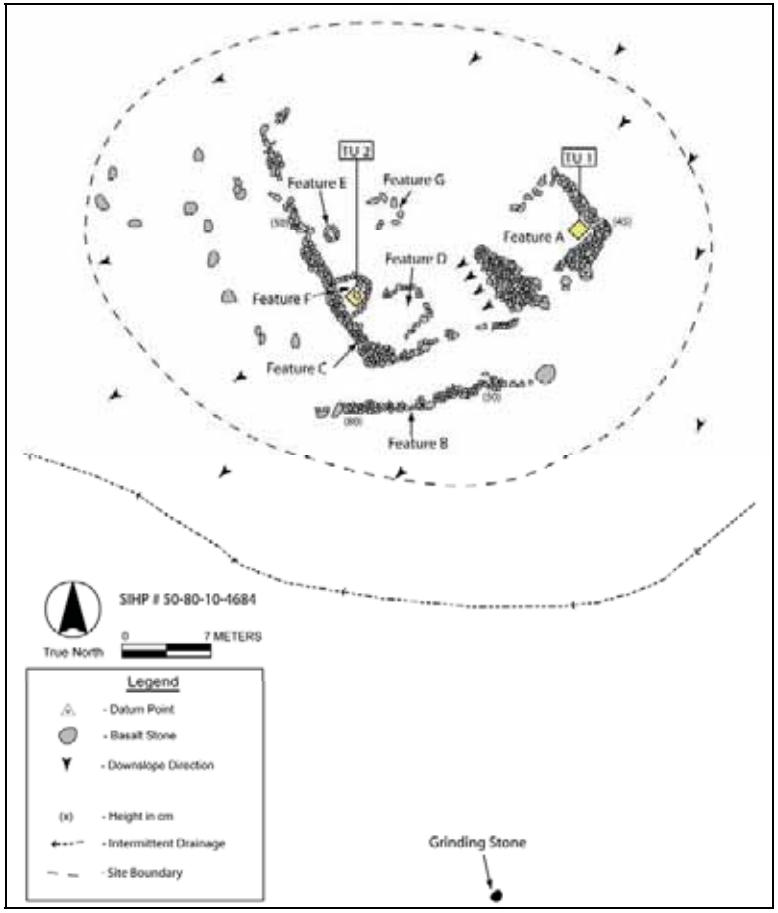


Figure 18. Plan view diagram of SIHP# 50-80-10-4684 showing the location of Test Units 1 &2 as well as a grinding stone discovered south of the site proper.

Figure 19. SIHP# 50-80-10-4684 Feature A, house structure, view to the northeast.

Figure 20. SIHP# 50-80-10-4684 Feature B, basalt cobble/ rock terrace wall, view to the north.

Figure 21. SIHP# 50-80-10-4684 Feature C, basalt boulder and cobble wall, view to the north.

Figure 22. SIHP# 50-80-10-4684 Feature D, c-shaped rock feature, view to the southwest.

Figure 23. SIHP# 50-80-10-4684 Feature E, circular rock feature, possible hearth, view to east.

Figure 24. SIHP# 50-80-10-4684 Feature F, c-shaped rock feature, view to the northeast.

Figure 25. SIHP# 50-80-10-4684 Feature G, c-shaped rock feature.

4.1.1.3.1 Test Excavations Findings

A total of two 1 x 1 m test units were excavated at SIHP# 50-80-10-4684. Test Unit #1, was excavated in the eastern portion of Feature A. Test Unit # 2 was located within Feature F, along the southeastern wall.

4.1.1.3.1.1 Test Unit 1

The test excavation was located in the eastern corner of the enclosure (Figure 26 to Figure 30). The test unit was excavated to a terminal depth of 35 cmbs (13.7 in). A total of three strata were observed, Stratum I was very dark brown, clay loam sediment composed of leaf litter and humus accumulated on and within the basalt stones, mixing with the clay soil below. Stratum II consisted of a dark reddish brown silty clay generally represented soils developed from material filtering down through Feature A's construction. Stratum III was dark red silty clay consisting of saprolite developed from the decomposition of the underlying basalt bedrock. The test excavation terminated at sterile Stratum III sediments.

A total of four artifacts were recovered from the excavation, three basalt flakes and a small piece of brown bottle glass. Two of the basalt flakes were recovered from between 10 and 20 cmbs (4-8 in). The remaining flake and a single piece of brown bottle glass were recovered from 20 to 30 cmbs (8-11.8 in). All artifacts were recovered from Stratum II.

4.1.1.3.1.2 Test Unit 2

The test excavation was placed within Feature F, along the southeastern wall (Figure 31 to Figure 35). The test unit was excavated to a terminal depth of 40 cmbs (15.7 in). The stratigraphy was similar to Test Unit 1. Stratum I was very dark brown, clay loam with greater than fifty percent basalt stone inclusions. Stratum II consisted of a dark reddish brown silty clay and Stratum III was dark red silty clay. The test excavation terminated at sterile Stratum III sediments. No artifacts were recovered from this excavation.

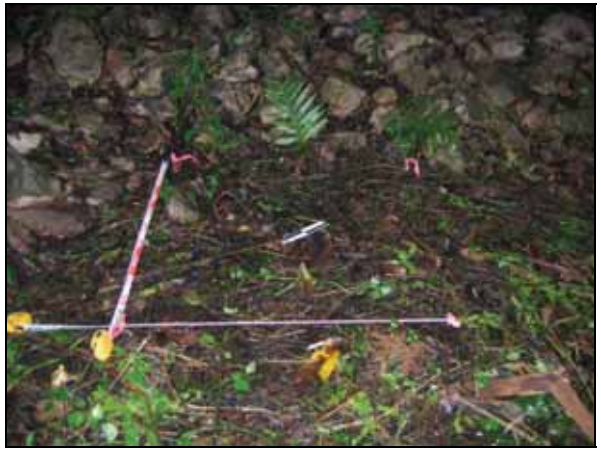


Figure 26. Pre-excavation picture of Test Unit 1.

Figure 27. Post-excavation picture of Test Unit 1.

Figure 28. Picture of the northeast profile, Test Unit 1.

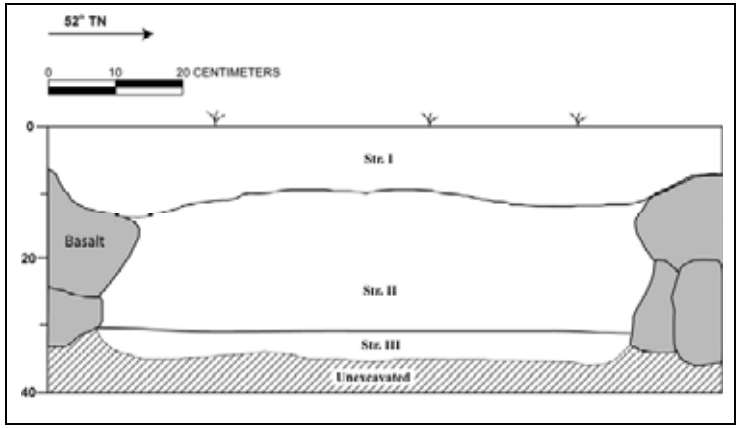


Figure 29. Drawing of the northeast profile, Test Unit 1.

Table 4. Soil description of Test Unit 1.

Stratum I: 0-14 cmbs	7.5 YR 2.5/3 very dark brown clay loam with a strong, fine, blocky structure. Firm moist consistency, slightly plastic with no cementation. Terrestrial origin with an abrupt boundary and smooth topography.
Stratum II: 9-30 cmbs	2.5 YR 3/6 dark red silty clay with a strong, fine, blocky structure. Very firm moist consistency, slightly plastic with no cementation and terrestrial origin.
Stratum III: 30-35 cmbs	2.5 YR 3/6-4/6 dark red silty clay with a very fine and medium subangular blocky structure. Hard dry consistency, plastic and a gradual wavy boundary.

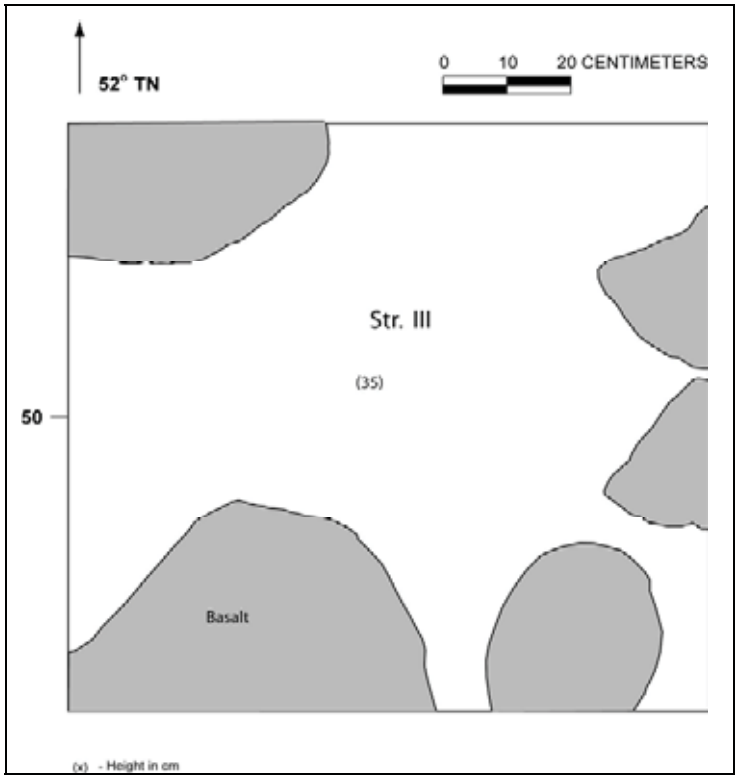


Figure 30. Post excavation plan view of Test Unit 1.

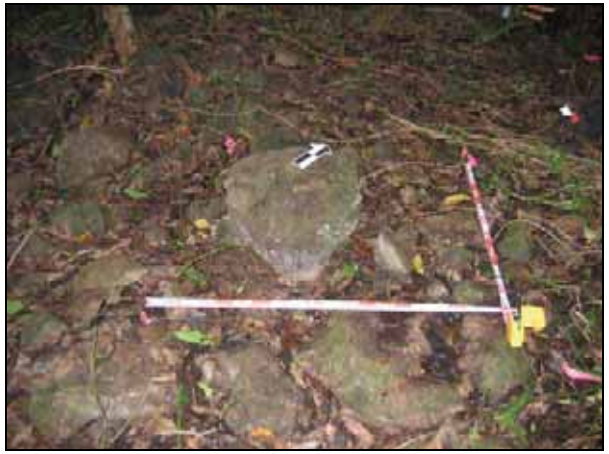


Figure 31. Pre-excavation picture of Test Unit 2.

Figure 32. Post-excavation picture of Test Unit 2

Figure 33. Picture of the southeast profile, Test Unit 2.

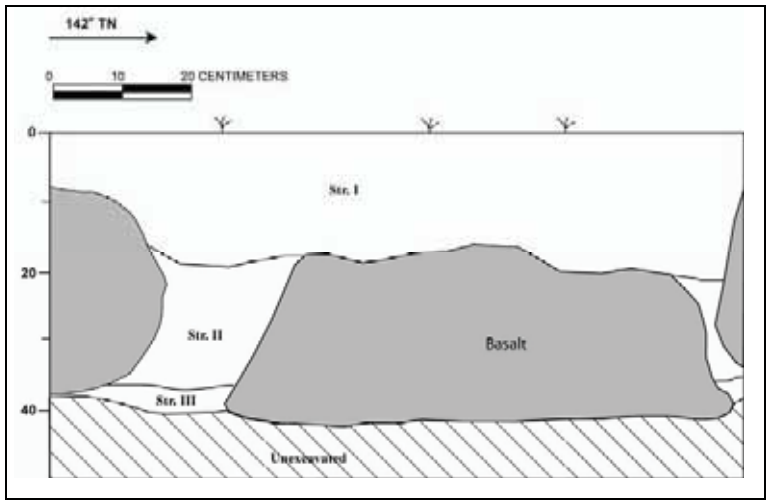


Figure 34. Drawing of the southeast profile, Test Unit 2.

Table 5. Soil description of Test Unit 2.

Stratum I: 0-20 cmbs	7.5 YR 2.5/3 very dark brown clay loam with a strong, fine, blocky structure. Firm moist consistency, slightly plastic with no cementation. Terrestrial origin with an abrupt boundary and smooth topography.
Stratum II: 14-37 cmbs	2.5 YR 3/6 dark red silty clay with a strong, fine, blocky structure. Very firm moist consistency, slightly plastic with no cementation and terrestrial origin.
Stratum III: 35-40 cmbs	2.5 YR 3/6-4/6 dark red silty clay with a very fine and medium subangular blocky structure. Hard dry consistency, plastic and a gradual wavy boundary.

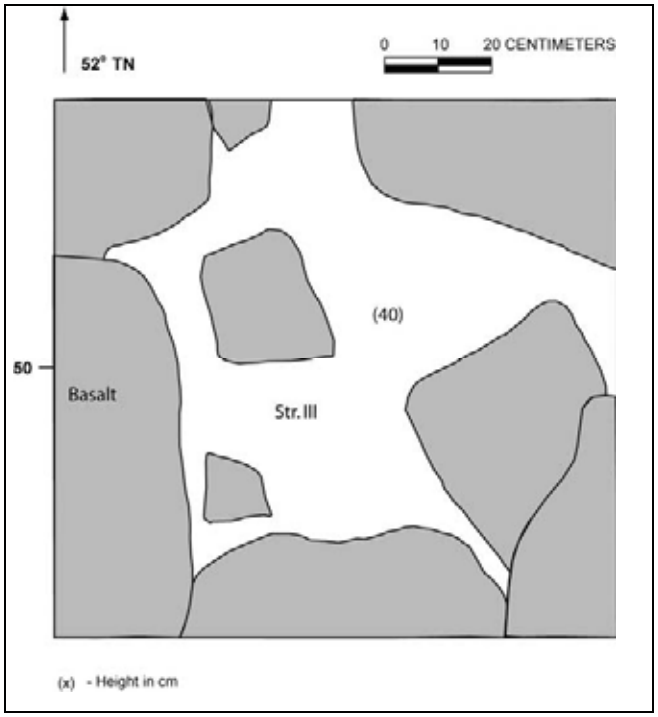


Figure 35. Post-excavation plan view of Test Unit 2

4.1.1.3.2 Grinding Stone

An isolated artifact was discovered approximately 40 m south of Feature B, a large grinding stone (Figure 36 to Figure 38). The stone is 60 x 45 cm (24 x 18 in) with an oval 48 x 33 cm (19 x 13 in) depression approximately 2 cm deep ground into it. No other artifacts or features were observed in the immediate vicinity. It is located in an area with abundant basalt stone and natural terracing.

Figure 36. Picture of the grinding stone oriented northeast.

Figure 37. Picture of the grinding stone oriented northwest.

Figure 38. Picture showing the grinding stone oriented north.

4.1.1.4 SIHP # 50-80-10-4686

FORMAL TYPE:	Stone Alignment
FUNCTION:	Boundary Marker
AGE:	Historic
# OF FEATURES:	2
DIMENSIONS:	50 meters east/west by approx. 1 meter north/south
CONDITION:	Fair
UTM:	**GPS Point 1** **N**. 2366741 **E**. 626185.3
DESCRIPTION:	

SIHP# 50-80-10-4686 consists of two features (Figure 39). The resource was previously identified by Szabian et al (1989) who provide the following description:

> Feature A is located adjacent to a large stream and dominated by a very large mango tree. This feature contains many alignments and an approximately 50.0 m long collapsed wall of angular basalt. There is a modern chicken coop to the north (Szabian et al 1989:13).
>
> Feature B, located adjacent to the Pohai Nani Care Center has a series of alignments and an abandoned modern chicken coop. There are large mango trees in the area and a great deal of discarded historic rubbish (Szabian et al 1989:13).

SIHP# 50-80-10-4686 Feature A is constructed of boulders (approximately 60 cm in diameter) running east/west parallel to a large stream cut (Figure 40). There are several natural alignments running across the slope, which consist of boulders ranging from 60-200 cm in diameter.

SIHP# 50-80-10-4686 Feature B appears to have been badly disturbed due to landscaping and rubbish piling (Figure 41 and Figure 42). The modern chicken coop and large mango trees described by Szabian et al (1989:13) were located. The site probably represents historic to modern use of the area by nearby residents.

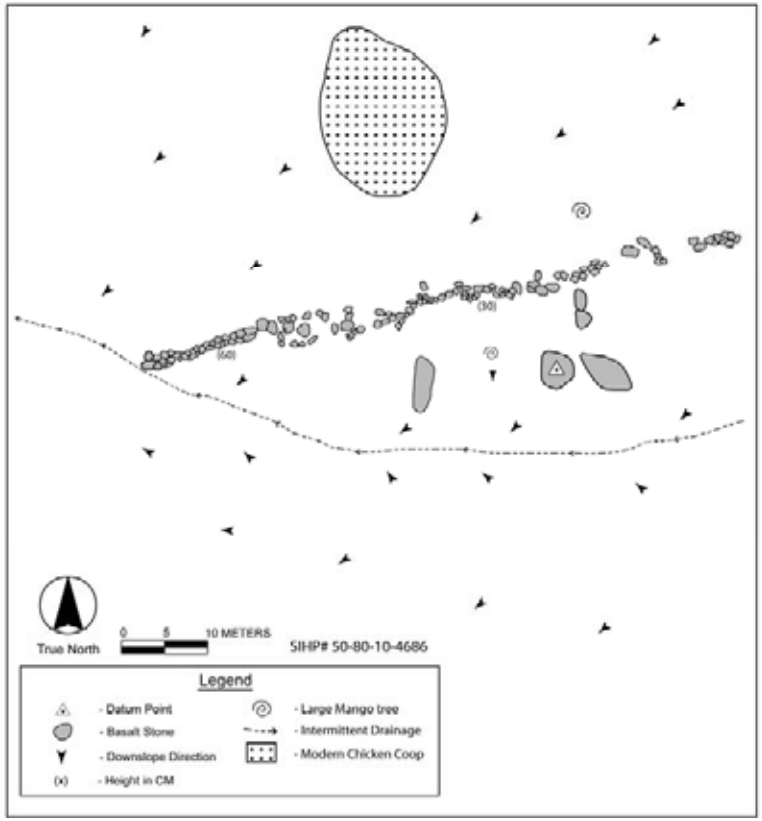


Figure 39. Plan view diagram of SIHP # 50-80-10-4686 Feature A, rock alignment.

Figure 40. SIHP# 50-80-10-4686 Feature A, boulder alignment, view to the southwest

Figure 41. SIHP# 50-80-10-4686 Feature B, disturbed area, view to the south.

Figure 42. SIHP# 50-80-10-4686 Feature B, rubbish area, view to the northwest.

4.1.1.5 SIHP # 50-80-10-6930

FORMAL TYPE:	Stone Enclosure
FUNCTION:	Ceremonial
AGE:	Pre-Contact
# OF FEATURES:	1
DIMENSIONS:	Approximately 22 m north /south and 14 m east/west.
CONDITION:	Good
UTM:	**GPS Point 1** **N**. 2366457.2 **E**. 626281.3
	GPS Point 2 **N**. 2366447.3 **E**. 626275.7
	GPS Point 3 **N**. 2366440.1 **E**. 626275.2
	GPS Point 4 **N**. 2366440.1 **E**. 626266.9
	GPS Point 5 **N**. 2366461.7 **E**. 626275.7

DESCRIPTION:

SIHP# 50-80-10-6930 is a rectangular shaped enclosure with an irregular notch on the east side of the structure that gives it an L shaped appearance (Figure 43). The structure is constructed on the east aspect of a slope with an intermittent drainage immediately to the south and another approximately 20 m (66 ft) to the north. Although trees and erosion have caused some collapse (Figure 44), the integrity of the structure is considered good (Figure 45). West of the notch, inside of the structure there are remnants of a possible paved surface (Figure 46). Several stone tools were observed in the general site vicinity (Figure 47). The effort expended on the construction seems excessive for a habitation and is more consistent with that of a ceremonial structure.

SIHP# 50-80-10-6930 is constructed of stacked basalt cobble/boulders four to five courses high. The enclosure measures approximately 14 m E/W by 22 m N/S with a total area of 256 m², on the outside. The north, south, and west walls are stacked freestanding walls. The eastern wall is built into the slope. The height of the outside walls ranges from approximately 30 cm in the NE corner to 1.54 m in the SW corner. The inside of the structure measures approximately 10.5 m E/W and 15.5 m N/S with a total area of 149 m². The wall height on the inside of the enclosure ranges from 72 cm at the north wall to 96 cm in the SE corner.

There is a commanding view to the north and west of the valley below SIHP# 50-80-10-6930, now dominated by alien/introduced vegetation such as Christmas berry (*Schinus terebinthifolius)*, *he‘e* - octopus tree (*Schefflera actinophylla)*, Java plum (*Syzygium cumini*) and lemon and strawberry guava (*Psidium guajava, Psidium cattleianum*). In the absence of the dense vegetation Kawa‘ewa‘a Heiau would be visible as it is only 320 m (1050 ft) west and over 50 m (164 ft) lower in elevation.

Based on the dimensions and features SIHP# 50-80-10-6930 is more characteristic of a ceremonial structure than a habitation. The interpreted function of this structure can only be inferred. (See summary, Section 5, for detailed discussion).

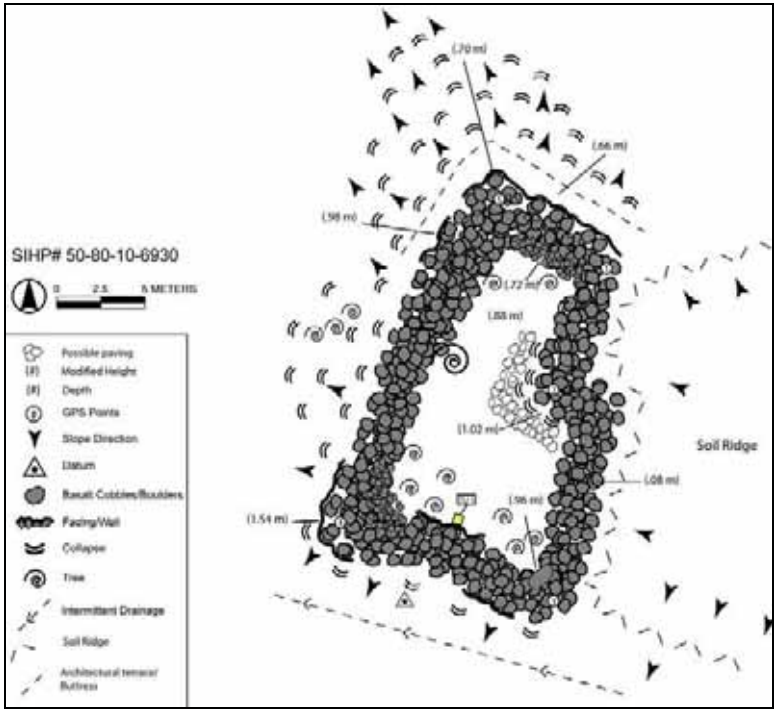


Figure 43.Plan view of SIHP# 50-80-10-6930.

Figure 44. The northwest corner of SIHP# 50-80-10-6930.

Figure 45. A portion of the west wall of SIHP# 50-80-10-6930.

Figure 46. The area west of the notch along the east wall.

Figure 47. An example of the stone tools observed in the general site vicinity.

4.1.1.5.1 Test Excavation Findings

A single exploratory 30 x 30 cm (12 x 12 in) test unit was excavated inside the enclosure against the southern wall to determine its vertical boundary and to obtain a soil profile.

4.1.1.5.1.1 Test Unit 1

Test Unit 1 was excavated to a depth of 37 cmbgs (14.5 in). A total of three strata were observed, Stratum I was dark brown, clay loam sediment composed of leaf litter and humus. Stratum II consisted of a strong brown silty clay and Stratum III was yellow red clay (Figure 48 and Figure 49).The wall of the enclosure continues at least one course, 20 cm (7.9 in) below the ground surface. No artifacts or cultural features were observed during this excavation.

Figure 48. A picture of the south wall of Test Unit 1, SIHP# 50-80-10-6930.

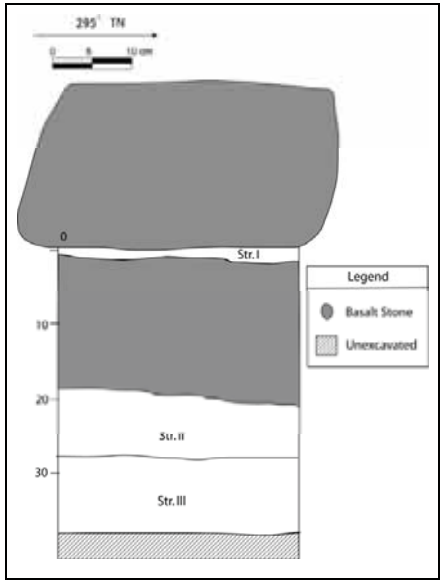


Figure 49. A profile drawing of the south wall of Test Unit 1, SIHP# 50-80-10-6930.

Table 6. Soil description of Test Unit 1.

Stratum I: 0-9 cmbs	7.5 YR 3/2 dark brown clay loam with a moderate, medium, blocky structure. Firm moist consistency, slightly plastic with no cementation. Terrestrial origin with an abrupt boundary and smooth topography.
Stratum II: 9-27 cmbs	7.5 YR 4/6 strong brown clay loam with a moderate, fine, blocky structure. Firm moist consistency, slightly plastic with no cementation and terrestrial origin with an abrupt boundary and smooth topography.
Stratum III: 27-37 cmbs	5 YR 4/6 yellow red clay with a moderate, medium, blocky structure. Hard dry consistency, plastic with no cementation. Terrestrial origin with an abrupt boundary and smooth topography.

4.1.1.6 SIHP # 50-80-10-6932

FORMAL TYPE:	Stone storage feature
FUNCTION:	Storage
AGE:	Historic
# OF FEATURES:	1
DIMENSIONS:	Approximately 4 m north /south and 4 m east/west.
CONDITION:	Good
UTM:	**GPS Point 1** **N**. 2366481.6 **E**. 6262229.2
DESCRIPTION:	

SIHP# 50-80-10-6932 is a possible storage area beneath a boulder (Figure 50 and Figure 51) 5 m southeast of an intermittent drainage. The floor inside is lined with small basalt cobbles and the rear of the inside is blocked off by medium sized basalt cobbles. This site is approximately 33 m southwest of SIHP# 50-80-1-6933, a post-contact charcoal kiln.

A single historic bottle was observed on the east side of the storage feature. The manufacturers mark, A B G M Co., indicates that it was a product of the Adolphus Bush Glass Manufacturing Co circa 1886 to 1928. The beer bottle was produced in Belleville, Illinois between 1886 and 1907 or St. Louis Missouri between 1904 and 1928 (Toulouse 1971:26).

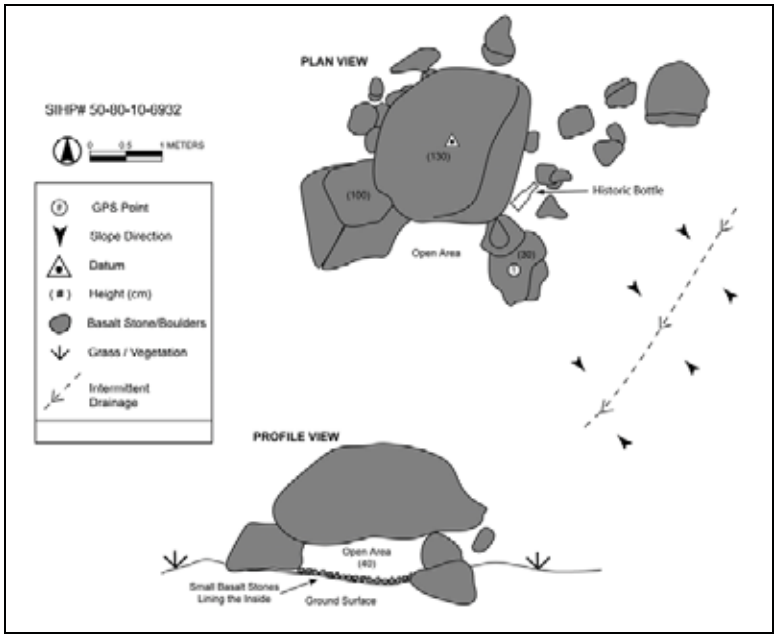


Figure 50. Plan view and profile of SIHP# 50-80-10-6932.

Figure 51. SIHP# 50-80-10-6932 viewed from the south.

4.1.1.7 SIHP # 50-80-10-6933

FORMAL TYPE:	Pit feature with associated stonewall
FUNCTION:	Activity area
AGE:	Historic(uncertain)
# OF FEATURES:	2
DIMENSIONS:	Approximately 8 m north /south and 10 m east/west.
CONDITION:	Fair
UTM:	**GPS Point 1** **N**. 2366507.1 **E**. 626254.1
	GPS Point 2 **N**. 2366503.8 **E**. 626256.3
DESCRIPTION:	

SIHP# 50-80-10-6933 is a large circular pit, approximately 4 m in diameter with burned walls. It is cut into a natural rise in the topography and includes a faced, two to three course stone wall on the northeast side (to). Currently 1.5 m in depth, the maximum depth is unknown at this time as it has been subject to slumping and erosion. Similar to SIHP 4683 this appears to be another historic charcoal kiln.

The following text from Meeker (1995:98-99) describes the construction and firing techniques of earth-covered pit kilns from developing countries and highlights the similarities between SIHP# 50-80-10-6933 and documented non-industrial charcoal kilns:

> The earth-covered pit kiln is another traditional method of charcoal making still practiced in the developing countries. Booth (1983:50) describes it as the "equivalent of a mound but below ground level." In size, it could range from an excavated hole of about 1 or 2 m^3 to a hillside pit measuring 4 m in diameter. Dug into the slope, the side and rear walls of the pit are formed by vertical cuts in the natural earth. Sometimes the walls are reinforced by a brick or stone lining. There may be an air vent or flue cut into the rear wall. Emrich (1985:24) further notes that "after loading, the pit is covered with a layer of leaves normally 20 cm thick and on top with a layer of soil of the same thickness."

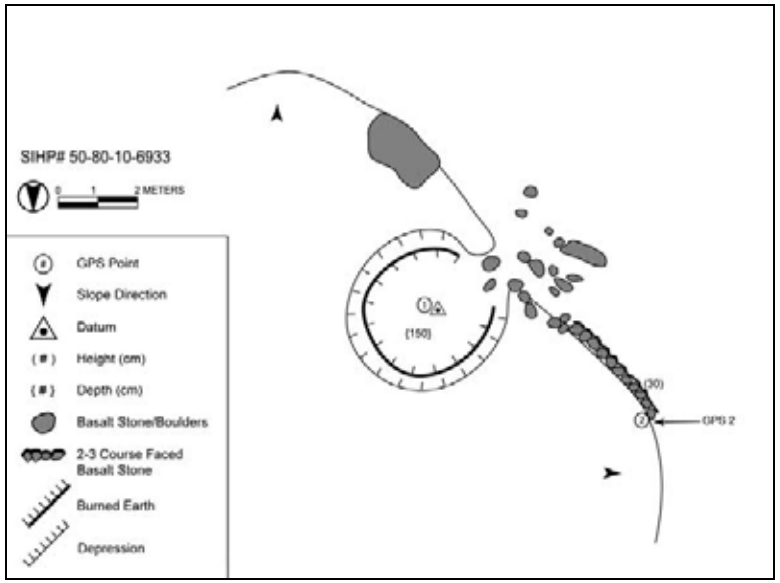


Figure 52. Plan view of SIHP# 50-80-10-6933

Figure 53. SIHP# 50-80-10-6933 faced stone alignment viewed from the east.

Figure 54. SIHP# 50-80-10-6933 pit feature viewed from the east.

4.1.2 Historic Properties Located in the Vicinity of the Current Petition Area.

4.1.2.1 SIHP # 50-80-10-354 (Kawa‘ewa‘e Heiau)

FORMAL TYPE:	Enclosure, platforms, terrace.	
FUNCTION:	Ceremonial	
AGE:	Pre-Contact	
# OF FEATURES:	2+	
DIMENSIONS:	36.5 m N/S by 77 m E/W	
CONDITION:	Good	
UTM:	**SE Corner**	**N**. 2366511.9 **E**. 625951.9
	NE Corner	**N**. 2366547.5 **E**. 625942.1
	S Corner	**N**. 2366485.4 **E**. 625892.4
	W Corner	**N**. 2366516 **E**. 625869.5
	Feature A	**N**. 2366559.3 **E**. 625949.4

DESCRIPTION:

SIHP 50-80-10-354, Kawa‘ewa‘a Heiau (Figure 55), is located approximately 30 m (100 ft) west of the current project area on the Kaneohe side of the ridge that divides Kaneohe and Kailua (Oneawa Hills). It has been on the National Register of Historic Places (NHRP) since 1972. Kawa‘ewa‘a Heiau is a *luakini* type heiau, commissioned by the king and associated with human and animal sacrifice (Malo 1898:159). J. G. McAllister (1933) recorded this site during his survey of the major sites of O‘ahu in the 1930’s noting:

> This is one of the five heiau said by John Bell to have been erected by Olopana. Ahukini, Pahukini, Holomakani, and Puumakani are the other four. It is on top of a small knoll and consists of one large enclosure 120 by 253 feet (35.5 x 77 m) with a small terrace on the north side which follows the contours of the land. As the structure was used as a cattle pen for many years any traces of heiau features have been obliterated, and it is not known where the opening to the heiau was situated. The walls are massive, averaging about 5 feet in width and from 4 to 7 feet in height according to the contours of the land. The inside corners of the wall are rounded; the outside corners appear more angular.
>
> Thrum notes that this heiau was “Built by Olopana about the opening of the 12th century”. It was mentioned as one of the heiaus constructed by the menehunes. Lonoaohi is said to have officiated as high priest.

> This is the heiau to which Olopana had Kamapuaa brought for sacrifice. Through treachery Kamapuaa is said to have killed Olopana and escaped (McAllister 1933:179-180).

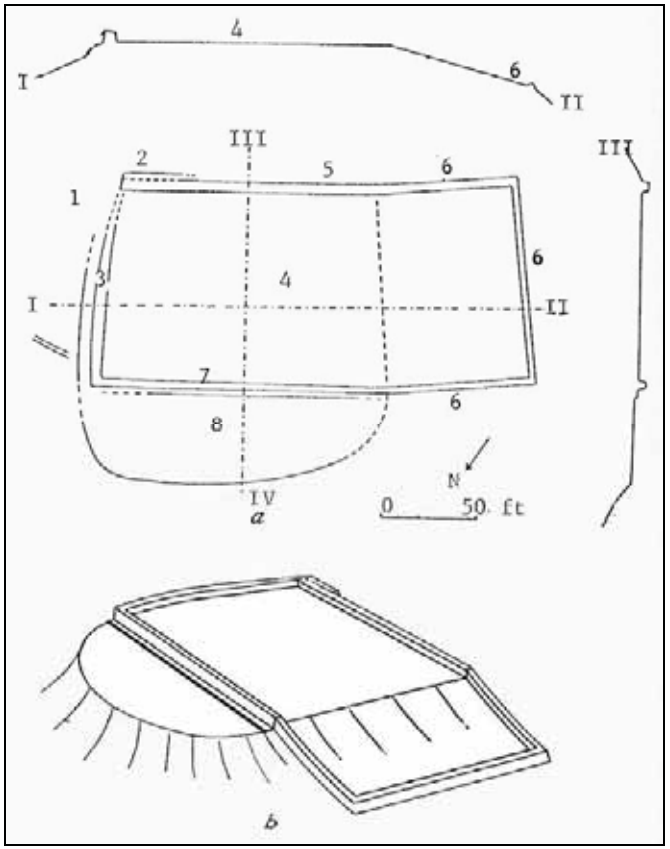


Figure 55. Kawa‘ewa‘e Heiau (adapted from McCallister 1933:180)

A local informant, Mr. Charlie Ogata, member of the Queen Emma Hawaiian Civic Club, mentioned a stone structure outside of the *heiau* at the base of the northern corner (Figure 56). The structure has been designated Feature A. This is rectangular, stacked stone structure that measures approximately 3 m north/south and 6 m east/west (Figure 57). There are three separate sections within the structure. The largest, designated section 1 (Figure 58), is oval in shape and makes up the eastern side measuring approximately 4 m by 2.5 m. Section 2 (Figure 59), more round than oval, is approximately 1.5 m by 2.5 m and makes up the western portion of the feature. Section 3 is a smaller C shaped portion along the southern boundary of Section 1 measuring approximately 1 m by 0.4 m. The function of this structure is indeterminate.

Another concern of Mr. Ogata was the presence of *lua* (burial pits) in the vicinity of Kawa‘ewa‘a Heiau as it is a *luakini* type heiau, commissioned by the king and associated with human and animal sacrifice (Malo 1898:159). The complete testimony of Mr. Ogata is available in the Cultural Impact Assessment (Gollin et al 2008) that accompanies this report.

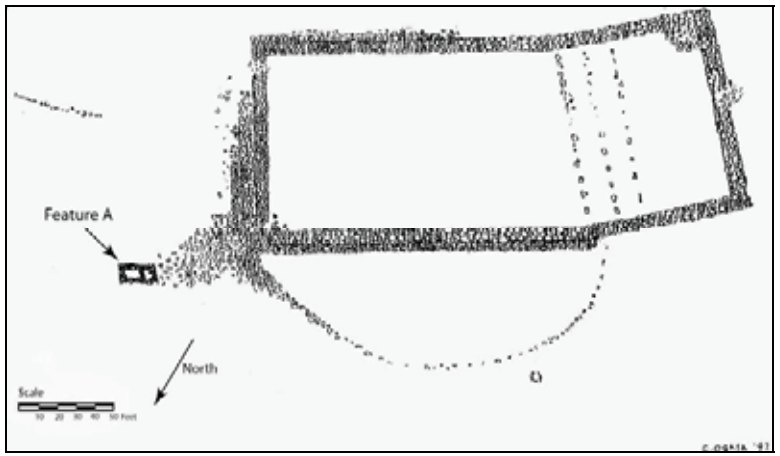


Figure 56 A sketch of Kawa‘ewa‘e Heiau showing the location of Feature A. (provided by Mr. Charlie Ogata)

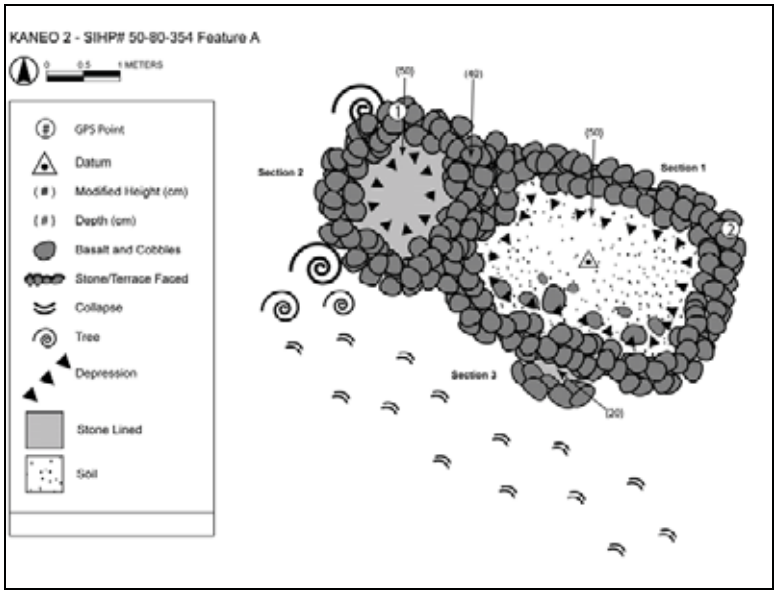


Figure 57. Plan view of SIHP# 50-80-10-354 Feature A.

Figure 58. SIHP# 50-80-10-354 Feature A viewed from the east, showing Section 1.

Figure 59. SIHP# 50-80 10-354 Feature A showing Section 2, from the east.

4.1.2.2 SIHP # 50-80-10-4681

FORMAL TYPE:	Complex – Enclosures & Terracing
FUNCTION:	Habitation/agricultural
AGE:	Pre-Contact
# OF FEATURES:	5
DIMENSIONS:	43 meters north/south by 45 meters east/west
CONDITION:	Fair
UTM:	**GPS Point 1** **N**. 236309 **E**. 625966.3
DESCRIPTION:	

Szabian et al (1989) provide the following description of SIHP# 50-80-10-4681:

> Located in the Lipalu Street drainage area this site is comprised of at least 3 features: Feature A is a depression 3.0 m in diameter and 0.5 m deep. Feature B is a level terraced area approximately 6.0 by 5.0 m with large boulders forming the facing. Feature C is a series of possible terraces upslope of Feature B of indeterminable extent (Szabian, et al 1989: 11).

SIHP# 50-80-10-4681 is located approximately 15m (50 ft) southwest of the current petition area. It is a probable pre-Contact habitation site consisting of several c-shaped structures, a terrace wall and a circular rock feature, five features in all. (Figure 60). The site is situated on a north-facing slope with vegetation consisting of dense canopy, Ti leaf and *laua'e* fern. Although sufficient data was observed to qualify SIHP# 50-80-10-4681 as a site, the vegetation, primarily *hau*, in the area was too dense to definitively establish the site boundaries.

Feature A is a probable c-shaped habitation structure consisting primarily of stacked basalt cobbles (Figure 61). Feature A has experienced some collapse and at one point may have represented two separate rooms sharing a common wall. Feature A measures 7 meters E/W by 5 meters N/S; the south wall is 1 meter wide, the west wall is 35 cm and the east wall is 60 cm.

Feature B is comprised of a ring of 5 large cobbles with a slight opening in the SE end (Figure 62). The ring of stones and soil in the middle of the feature suggests a possible hearth function. Feature B measures 1.5 meters in diameter. Down slope are three to four possible terraced walls located NE of feature A (i.e. Features C and D).

Feature C is a terrace wall consisting of basalt cobbles which measure approximately 35 cm in diameter. The terrace wall is 12.3 m E/W by 1.1 m wide (Figure 63). Some constructed portions have collapsed and the height varies from 30-70 cm.

Feature D is a terrace wall constructed of basalt boulders which measure approximately 50 cm in diameter. The terrace wall is 2-4 courses high but collapsed in several places (Figure 64). The terrace appears to be semi-circular. Feature D is located just down slope from Feature C.

Feature E is a c-shaped feature located about 16 m west of feature C (Figure 65 and Figure 66). Feature E measures approximately 5 m N/S and 3 m E/W with a maximum wall height of approximately 50 cm.

No artifacts or midden were observed at SIHP# 50-80-10-4681, however the possible hearth (Feature B) and the C-shaped structure (Feature E) suggest a temporary habitation with associated agriculture.

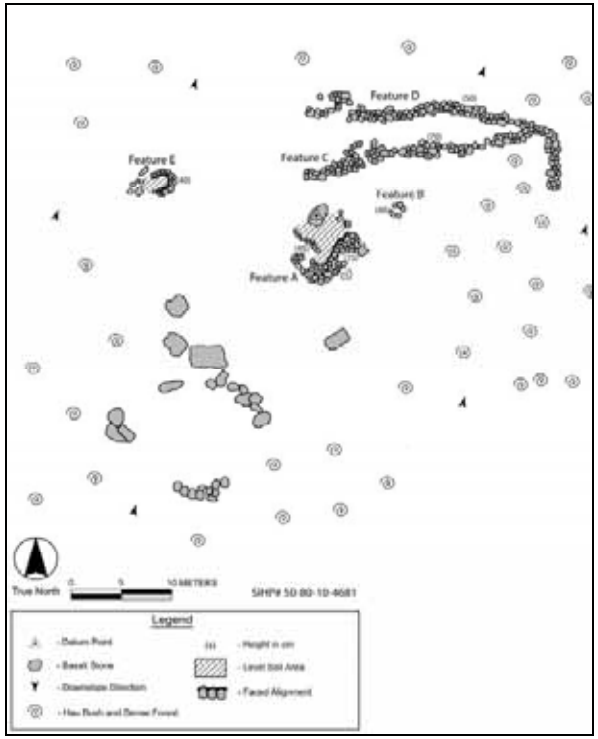


Figure 60. Plan view diagram of SIHP# 50-80-10-4681 enclosures and terracing.

Figure 61. SIHP # 50-80-10-4681 Feature A, overview of c-shaped habitation feature, view to the south.

Figure 62. SIHP # 50-80-10-4681 Feature B, circular rock feature, view to the south.

Figure 63. SIHP # 50-80-10-4681 Feature C, a basalt cobble terrace wall, view to the south.

Figure 64. SIHP # 50-80-10-4681 Feature D, terrace wall, view to the west.

Figure 65. SIHP # 50-80-10-4681 Feature E, overview of c-shaped rock feature, view to the southeast.

Figure 66. SIHP # 50-80-10-4681 Feature E, close-up of wall, view to the southeast.

4.1.2.3 SIHP # 50-80-10-6929

FORMAL TYPE:	Quarry
FUNCTION:	Raw material collection
AGE:	Pre-Contact
# OF FEATURES:	2
DIMENSIONS:	25 m northeast/southwest and 20 m northwest/southeast
CONDITION:	Poor
UTM:	**GPS Point 1** **N**. 2366752 **E**. 626260
DESCRIPTION:	

SIHP# 50-80-10-6929 consists of two concentrations of lithic debitage along an intermittent drainage (Figure 67 and Figure 68) approximately 150 meters (492 ft) southeast of the Pohai Nani Good Samaritan Retirement Community. There is an abundance of basalt cobbles and boulders in this area and many large pieces of debitage (Figure 69) scattered throughout indicative of a raw material procurement area (quarry). A natural dike extends away from the concentrations to the southeast.

The integrity of the site has been impacted by unauthorized artifact collection. There was a significant decrease in artifact density between the time of discovery and documentation, a matter of months, resulting in a dramatic decrease in the research potential of this site.

This site is located approximately 20 m (66 ft) east of the project area at the base of an eastern trending down slope. Although the integrity has been compromised this area should be considered in the event of any land alteration on the slope near the site. Additional areas of raw material procurement were observed to the southeast of SIHP# 50-80-10-6929 but extended too far outside of the current project area for further investigation.

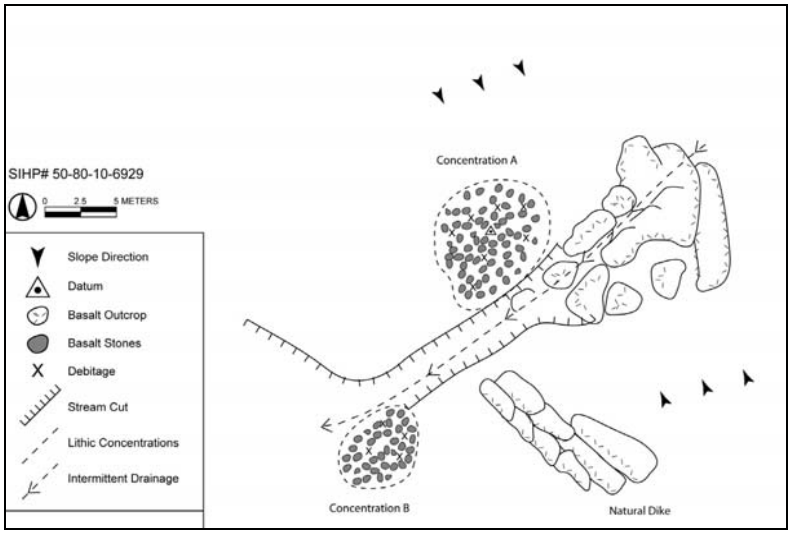


Figure 67. Plan view of SIHP# 50-80-10-6929.

Figure 68. View of Concentration B facing east.

Figure 69. Example of the artifacts observed in the area.

4.1.2.4 SIHP # 50-80-10-6931

FORMAL TYPE:	Stone alignment
FUNCTION:	Ceremonial
AGE:	Pre-Contact
# OF FEATURES:	3+
DIMENSIONS:	55 meters north/south and 40 meters east/west.
CONDITION:	Poor
UTM:	**GPS Point 1** **N**. 2366415.1 **E**. 626356
	GPS Point 2 **N**. 2366433.1 **E**. 626351
DESCRIPTION:	

SIHP# 50-80-10-6931 is located approximately 15m (50 ft) south of the current petition area. This is a possible pre-Contact ceremonial area located on a natural knoll between two intermittent drainages (Figure 70). The site consists of four features (A-D). Features A-C are a series of stone alignments/terraces on the southern slope of the landform. Feature D is a possible ceremonial area atop the landform. Feature A, located at the base of the slope is a single course stone alignment oriented E/W approximately 6 m (20 ft) in length (Figure 71). Feature B based on its location may be a collapsed terrace/alignment the result of natural circumstances. Feature C (Figure 72) is a one to two course stone alignment oriented E/W and approximately 3 m (10 ft) in length. Feature D is a cleared/leveled area atop the landform (Figure 73). There is a basalt boulder at the western boundary of the clearing with *kukui* nut fragments at its base.

SIHP# 50-80-10-6931 is approximately 75 m (246 ft) east of SIHP# 50-80-10-6930 and 25 m (82 ft) upslope. The intermittent drainages that border -6931 to the north and south also border -6930. Clear of the dense, introduced vegetation there would be a commanding view of -6930 and Kawa‘ewa‘a Heiau from Feature D.

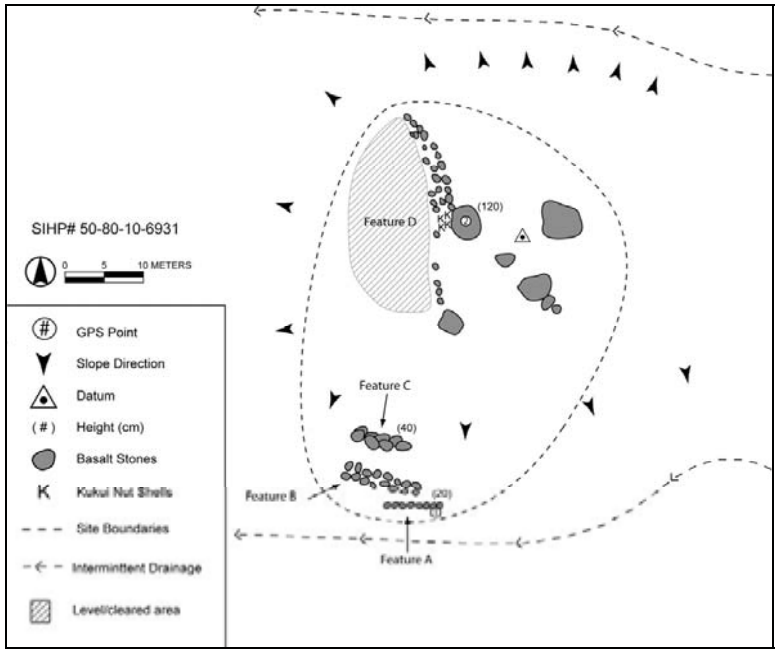


Figure 70. Plan view of SIHP# 50-80-10-6931.

Figure 71. SIHP# 50-80-10-6931, Feature A viewed facing west.

Figure 72. SIHP# 50-80-10-6931, Feature C facing north.

Figure 73. SIHP# 50-80-10-6931, Feature D viewed facing east.

4.1.3 Site 355 (The Holua Slide)

A substantial effort was made to relocate Site 355, the holua slide during the initial survey with little success. Additionally, Hallett H. Hammatt, PhD. visited the project area on July 21, 2007 specifically looking for any remnants or indications of the holua slide stating:

> We walked all the way up to the top most rise where the slide was previously reported. We were spread apart 1 to 20 feet and saw no indication on the land of a former slide such as rock alignments or depressions in the ground. The soil is red clay laterite which is clearly very slippery when wet. The configuration of the hill with alternating steep and more gradual gradients and an evenly shaped contour seems like the ideal symmetrical configuration for a holua. We walked again to the very base of the slope to the ironwood grove following the crest of the slope and again saw no alignments or depressions or ridges in the slope which would indicate the presence of a Holua. I suspect the hill could be used for that purpose in ancient times with the minimum of modification which may explain the absence of any sign of the former slide. I doubt if this slope was used for pineapple cultivation given its steepness but it may have been cleared or modified as part of the plantation activities.

According to Sterling and Sterling (1978:219) J. G. McAllister was also unable to relocate the holua slide in 1933. Adding that John Bell had seen the holua slide destroyed when an attempt was made to plant pineapples in this section.

4.1.4 Previously Recorded Historic Properties Considered Non-Cultural

4.1.4.1 SIHP # 50-80-10-4682

FORMAL TYPE:	Natural
FUNCTION:	Non Cultural
AGE:	
# OF FEATURES:	0
DIMENSIONS:	
CONDITION:	
UTM:	**GPS Point 1** **N**. 2366281 **E**. 626965
DESCRIPTION:	

Szabian et al (1989) provide the following description:

> This site contains two features: Feature A is a possible platform structure formed of large weathered basalt boulders; Feature B is a possible series of terraces of undetermined extent, this area is covered in dense laua‘e fern (Szabian et al 1989:11).

Based on observations made by CSH, SIHP # 50-80-10-4682 is not a cultural site, but a series of natural “terraces” formed by lava rocks, which rolled down slope and were caught by exposed bedrock outcrops (Figure 74 and Figure 75). SIHP # 50-80-10-4682 is located just *mauka* of a thick hau jungle at the base of a steep slope covered with ferns. None of the three natural “terraces” retain a significant amount of soil.

Figure 74. SHIP # 50-80-10-4682 Natural terracing, view to the southeast.

Figure 75. SHIP # 50-80-10-4682 Natural terracing, view to the southwest.

Section 5 Summary and Interpretation

In compliance with and to fulfill applicable Hawai‘i state historic preservation laws, CSH completed an archaeological inventory survey investigation for the proposed Hawaiian Memorial Park expansion. Minimally, the land alteration would include surface grubbing and grading excavations associated with the installation of sub-surface utilities, housing construction and landscaping. The petition area measures approximately 56.6 acres.

In consultation with the Hawai‘i State Historic Preservation Division (SHPD), the inventory survey investigation was designed to fulfill State requirements for an archaeological inventory survey per HAR Chapter 13-13-276 and Chapter 13-13-284.

Kāne‘ohe Ahupua’a was intensively utilized during the pre-Contact period both as an agricultural and aquacultural center. Additionally, it was one of the primary population centers on O‘ahu (Devaney et al. 1976:6). Kawa‘ewa‘a Heiau, located in the vicinity of the project area, suggests the historical and archaeological importance of the area. In the early 1900s, Kāne‘ohe Ranch came to dominate land holdings in the Kailua and Kāne‘ohe area. Included within this acreage were large tracts of ranch land, which had been bought, sold, let, and used as pasture by numerous parties since the mid-1850s. Subsequently, most of the ranching and farming areas have been replaced by residential subdivisions. Previous archaeological research has been consistent with the documentation of Pre-contact and historic ceremonial, habitational, and agricultural remains in the immediate vicinity of the project area (Szabian et al 1989). Expected finds during the archaeological inventory survey of the project area included additional evidence of indigenous Hawaiian occupation and historic agriculture/ranching.

As part of the inventory survey effort CSH conducted systematic inspection of the project area and limited test unit excavations. A total of 11 archaeological sites were observed within or near the current petition area. Six of these were previously recorded, they include SIHP #s 50-80-10-354, 50-80-10-4680, 50-80-10-4681, 50-80-10-4683, 50-80-10-4684 and 50-80-10-4686. The remaining five are new discoveries, SIHP #s 50-80-10-6929, 50-80-10-6930, 50-80-10-6931, 50-80-10-6932, and 50-80-10-6933.

Seven of the historic properties are within the petition area; these include SIHP #s 50-80-10-4680, -4683, -4684, -4686, -6930, -6932, and -6933. Of these, two are considered pre-contact and five are considered historic (Table 7). Four of the sites (SIHP-354 , -4681,-6929 and -6931) are located just outside of the current project area but close enough for consideration.

One of the concerns of knowledgeable community members was the presence of *lua,* or burial pits, associated with Kawa‘ewa‘a Heiau. This was considered throughout the duration of the survey. Although no *lua* were observed there is still a potential for subsurface cultural resources. The historic properties within the petition area will be discussed initially followed by those in those near the petition area.

5.1 Historic Properties Located Within the Current Petition Area

SIHP 50-80-10-4680 is a historic agricultural/water control feature consisting of a rock concentration forming a crude terraced structure. The crude terrace retains a large amount of soil

runoff that appears to have buried a portion of the site. The terrace forms the top of the hill and is adjacent to a water-cut ditch that drains into the larger drainage at the base of the hill

SIHP# 50-80-10-4683 is a historic charcoal kiln. It consists of a rectangular pit measuring 3.5 m (11.5 ft) by 2.5 m (8 ft) with charred walls. Charcoal production was a widespread industry in Windward O‘ahu during the later part of the nineteenth and early part of the twentieth century.

SIHP# 50-80-10-4684 is a pre-Contact habitation site consisting of several c-shaped structures, a terrace wall, a circular rock feature and several house terraces, seven features total. To the east, west and south of the main feature complex is a badly disturbed area with possible terraces. The site is situated on a west-facing slope with vegetation consisting of dense canopy, large trees and laua‘e fern. An intermittent drainage borders the site to the east and south. SIHP# 50-80-10-4684 is approximately 150 m (492 ft) east of Kawa‘ewa‘a Heiau. Additionally, a large grinding stone was discovered approximately 40 m south of SIHP# 50-80-10-4684.

SIHP# 50-80-10-4686 when previously identified by Szabian et al (1989) consisted of two historic features. Feature A is constructed of boulders (approximately 60 cm in diameter) running east/west parallel to a large stream cut. Feature B, a series of alignments, appears to have been badly disturbed due to landscaping and rubbish pilling. The modern chicken coop and large mango trees described by Szabian et al (1989:13) were located; however, a great deal of disturbance has taken place in the area.

SIHP# 50-80-10-6930 is a pre-Contact, rectangular shaped enclosure with an irregular notch on the east side of the structure that gives it an almost L shaped appearance. Measuring approximately 22m north/south and 14 m east/west, it is constructed on the east aspect of a slope with an intermittent drainage immediately to the south and another approximately 20 m (66 ft) to the north. Although trees and erosion have caused some collapse, the integrity of the structure is considered good. West of the notch, inside of the structure there are remnants of a paved surface. Several stone tools were observed in the general site vicinity. The effort expended on the construction seems excessive for a habitation and is more consistent with that of a ceremonial structure. There is a commanding view to the north and west of the valley below SIHP# 50-80-10-6930, now dominated by alien/introduced vegetation such as Christmas berry (*Schinus terebinthifolius)*, *he‘e* - octopus tree (*Schefflera actinophylla)*, Java plum (*Syzygium cumini*) and lemon and strawberry guava (*Psidium guajava, Psidium cattleianum*). In the absence of the dense vegetation Kawa‘ewa‘a Heiau would be visible as it is only 320 m (1050 ft) west and over 50 m (164 ft) lower in elevation.

SIHP# 50-80-10-6932 is a possible storage area beneath a boulder approximately five m southeast of an intermittent drainage. Measuring approximately 4 m north/south and 4 m east /west, the floor inside is lined with small basalt cobbles. This site is approximately 33 m (108 ft) southwest of SIHP# 50-80-1-6933, a post-contact charcoal kiln, and potentially associated with it. A single historic bottle was observed on the east side of the storage feature. The manufacturers mark, A B G M Co., indicates that it was a product of the Adolphus Bush Glass Manufacturing Co circa 1886 to 1928. The beer bottle was produced in Belleville, Illinois between 1886 and 1907 or St. Louis Missouri between 1904 and 1928 (Toulouse 1971:26).

SIHP# 50-80-10-6933 is a large circular pit, approximately 4 m (13 ft) in diameter with burned walls. It is cut into a natural rise in the topography and includes a faced, two to three

course stone wall on the northeast side. The pit is currently 1.5 m (5 ft) in depth, the maximum depth is unknown as it has been subject to slumping and erosion. Similar to SIHP# 50-80-10-4683 this appears to be another historic charcoal kiln.

5.2 Historic Properties Located Near the Current Petition Area

SIHP 50-80-10-354, Kawa‘ewa‘e Heiau , is located approximately 30 m (100 ft) west, outside of the current petition area on the Kaneohe side of the ridge that divides Kaneohe and Kailua (Oneawa Hills). It has been on the National Register of Historic Places (NHRP) since 1972. Kawa‘ewa‘a Heiau is a *luakini* type *heiau.* This type is commissioned by the king and associated with human and animal sacrifice (Malo 1990:159). Kawa‘ewa‘a Heiau is located atop a small knoll and consists of a large enclosure 120 by 253 feet (35.5 x 77 m) with a small terrace on the north side which follows the contours of the land. It is said to have been one of the five *heiau* erected by Olopana in the beginning of the twelfth century and the location of his subsequent demise (McAllister 1933:179-180). Kawa‘ewa‘a Heiau is presently maintained by several concerned groups.

SIHP# 50-80-10-4681 is located approximately 15m (50 ft) southwest of the current petition area. It is a probable pre-Contact habitation site consisting of several c-shaped structures, a terrace wall and a circular rock feature, five features total. The site is situated on a north-facing slope with vegetation consisting of dense canopy, Ti leaf and laua‘e fern. Although sufficient data was observed to qualify SIHP# 50-80-10-4681 as a site, the vegetation, primarily *hau*, in the area was too dense to definitively establish the site boundaries.

SIHP# 50-80-10-6929 is a pre-Contact site consisting of two concentrations of lithic debitage along an intermittent drainage approximately 20 m (66 ft) east of the petition area. There is an abundance of basalt cobbles and boulders in this area and many large pieces of debitage scattered throughout indicative of a raw material procurement area (quarry). A natural dike extends away from the concentrations to the southeast. Although this site is outside of the current project area it should be considered in the event of any land alteration on the slope near the site.

SIHP# 50-80-10-6931 is located approximately 15m (50 ft) south of the current petition area. This is a possible pre-Contact ceremonial area located on a natural knoll between two intermittent drainages. The site consists of four features (A-D). Features A-C are a series of stone alignments/terraces on the southern slope of the landform. Feature D is a possible ceremonial area atop the landform. There is a basalt boulder at the western boundary of Feature D with *kukui* nut fragments at its base. In addition SIHP# 50-80-10-6930 is approximately 75 m (246 ft) east of the enclosure at SIHP# 50-80-10-6930 and 25 m (82 ft) upslope. The intermittent drainages that border -6931 to the north and south also border -6930. Clear of the dense introduced vegetation there would be a commanding view of -6930 and Kawa‘ewa‘a Heiau.

5.3 Discussion

Data collected during this investigation is consistent with expectations based on the background research. Additionally, it has provided further insight to the importance and utilization of this area in pre-Contact and historic times. For instance, the effort expended on the

construction of SIHP# 50-80-10-6930 seems excessive for a habitation and is more consistent with that of a pre-Contact ceremonial structure, possibly a *heiau.*

The general consensus regarding heiau (e.g. Bennett1930, Kolb 1991, and Stokes and Dye 1991) is that they are “extraordinarily diverse” (Kolb 1991:108) and “found in a bewildering variety of forms, sizes, and locations throughout the islands” (Kirch 1985:257).

The 1930 dissertation of W.C. Bennett remains “the most comprehensive survey of *heiau* to date” (Kolb 1991:108) Bennett among others, have attempted to provide diagnostic attributes from which *heiau* could be identified and classified. These include size, uprights, depressions, altar, paving, tiers/terraces, coral, historical reference, location, and function.

Size refers to the surface area (i.e. m.^{2}) of the structure. Initially, W. C. Bennett designated two size classifications for *heiau*, small and large. The dividing line between them was arbitrarily set at 50 feet “though this figure is not absolutely fixed” (Bennett 1930:4). Over the years this has been refined to include three general size ranges, small being less than 200 m.^{2}, “mid-sized” (Kirch 1985:261) ranging from 200 to 400 m.^{2} and large being greater than 400 m.^{2}. Based on these specifications SIHP# 50-80-10-6930, (256 m.^{2}), fits into the mid-size range. In general, mid-size structures and larger have been interpreted as religious structures (Hammatt et al 1997:181).

Attributes including altars and paving, generally refer to internal features of the structures (Hammatt et al 1997:176-177). Altar in this case is employed to describe a slightly elevated or raised stone foundation within the structure. W.C. Bennett designated altars as one of the heiau features focusing primarily on ethnographic evidence related to “*lele*” which he described a “a sort of scaffolding supported by posts on which offerings were laid and left to moulder away” (Bennett 1930:39).

According to David Malo (1903):

> In front of the lele was a pavement of pebbles (or framework) on which offerings were deposited until they were offered up, when they were laid on the lele (Malo 1990:213-214).

The term paving is employed referring to well constructed surface layer(s) of a specific structure. Although a common structural component, paving is suggestive of a “greater construction effort” (Hammatt et al 1997:185). There is possible paving on the inside of SIHP# 50-80-10-6930. It is located along the notch in the east wall amid some collapse. Beyond clearing the vegetation nothing else was disturbed at the site. As there has been a substantial amount of collapse there may be additional, less obvious, associated features inside the enclosure.

Location refers to our perception of prominent placement of specific structures in terms of view planes from and to the particular structures (Hammatt et al 1997:189). The importance of heiau location has been well documented (Bennett 1930:341; Buck 1964:516; Stokes and Dye 1991:21; and Kolb 1991:80-83)

When considering location (Kolb 1991):

> …local topography of a temple was intimately tied to the concept of religious "sanctity". Large heiau were generally situated upon prominent locations such as hill tops, bluffs, or knolls. This higher ground affirms the divine and inaccessible nature of high-ranking ali‘i, while affording an excellent view of the surrounding countryside and coast. Smaller heiau, on the other hand were usually placed within villages, upon mountain slopes, in upland valleys, along the coast, or in any other location that would best serve the people (Bennett 1931:35). Shimizu's (1980) analysis of heiau topography found that heiau on O‘ahu were consistently located on the physiographic divisions between the fertile plains and upland areas rather than on land used for agriculture or residence.
>
> The incorporation of the local topography makes any cursory analysis of heiau form suspect in two ways (Hommon 1987:24-5). First, the placement of heiau architectural elements tends to be influenced more by the contour of the landscape than by the abstract plan imposed upon the site by the architect. This suggests that the location of a heiau played a much more important role in its design than previously thought, and may partially explain the large amount of variability present in heiau form. Each promontory varies in its size, shape, and orientation of natural rock outcrops….
>
> Second, some platforms and terraces that appear to be solid architectural elements are actually masonry veneers, and thus are deceptive as to the amount of labor used in their construction. (Kolb 1991:82-83).

There is a commanding view to the north and west of the valley below SIHP# 50-80-10-6930, now dominated by alien/introduced species such as Christmas berry (*Schinus terebinthifolius)*, *he‘e* - octopus tree (*Schefflera actinophylla)*, Java plum (*Syzygium cumini*) and lemon and strawberry guava (*Psidium guajava, Psidium cattleianum*). In the absence of the dense vegetation Kawa‘ewa‘a Heiau would surely be visible as it is only 320 m (1050 ft) west and over 50 m (164 ft) lower in elevation. There is little to see from the enclosure looking east besides the hill side. It was not clear at the time of the investigation if the notch in the east wall was intentional or a result of the natural topography as it appears to be cut into the hillside.

Based on the dimensions and features SIHP# 50-80-10-6930 the possibility that it is a *heiau* should be considered. The interpreted function of this structure can only be inferred. It has been suggested that *heiau* located inland amid agricultural fields are related to what P.V. Kirch refers to as "a large group of mid-sized temples that included many functional subtypes(such as *māpale, waihau ipu o Lono, Hale o Lono, unu o Lono,* and *heiau Ho‘oūlu‘ai)* all directed to the gods of fertility (especially Lono)"(Kirch 1985:261-261).

The presence of two charcoal kilns, SIHP# 50-80-10 4683 and -6933 are indicative of charcoal production that was a widespread industry in Windward O‘ahu during the later part of the 19th and early part of the 20th century. The majority of the historic properties that remain are located in the rockiest most inaccessible areas suggesting prior land alteration (i.e. pineapple and ranching) in the area.

The current project area has been has been utilized from as early as the twelfth century up until the middle of the twentieth century for a variety of purposes. Kāne‘ohe Ahupua'a was an active area during the pre-Contact period capable of supporting a large population with its abundant natural resources. In post-contact years, Kāne‘ohe was employed for the cultivation of rice, sugar and pineapple, and eventually cattle ranching and dairy farming. Subsequently, the ranching and farming areas were replaced by residential subdivisions. The continuous occupation and utilization of the area is also demonstrated in the archaeological record with the presence of pre-Contact and historic resources.

Section 6 Significance Assessments

Each historic property identified by the current study was evaluated for significance according to the criteria established for the Hawai‘i Register of Historic Places (Table 7). The historic properties within the petition area are addressed initially followed by the historic properties near the petition area. The five criteria are:

A Associated with events that have made an important contribution to the broad patterns of our history;

B Associated with the lives of persons important in our past;

C Embodies the distinctive characteristics of a type, period, or method of construction, represents the work of a master, or possesses high artistic value;

D Have yielded, or is likely to yield information important for research on prehistory or history;

E Have an important value to the native Hawaiian people or to another ethnic group of the state due to associations with cultural practices once carried out, or still carried out, at the property, or due to associations with traditional beliefs, events or oral history accounts – these associations being important to the group’s history and cultural identity.

6.1 Historic Properties Located Within the Current Petition Area

SIHP 50-80-10-4680 is a historic agricultural/water control structure consisting of a rock concentration forming a crude terraced structure. This structure may yield information important for research about the historic utilization of this area. SIHP # 50-80-10-4680 has been evaluated as significant under Criterion D of the Hawai‘i Register of Historic Places.

SIHP# s 50-80-10-4683 and -6933 are historic charcoal kilns. These structures may yield information important for research about the historic utilization of this area. SIHP# s 50-80-10-4683 and -6933 have been evaluated as significant under Criterion D of the Hawai‘i Register of Historic Places.

SIHP# 50-80-10-4684 is a pre-Contact habitation site consisting of several c-shaped structures, a terrace wall, a circular rock feature and several house terraces, seven features total. This historic property has the potential to yield additional information concerning pre-Contact habitations in the *ahupua‘a* of Kāne‘ohe. SIHP # 50-80-10-4684 is evaluated as significant under Criterion D of the Hawai‘i Register of Historic Places.

SIHP# 50-80-10-4686 is a boundary marker constructed of boulders oriented east/west parallel to a large stream cut. This structure has the potential to yield information important for research on historic boundaries in this area. SIHP# s 50-80-10-4686 has been evaluated as significant under Criterion D of the Hawai‘i Register of Historic Places.

SIHP# 50-80-10-6930 is a pre-Contact, rectangular shaped enclosure with an irregular notch on the east side of the structure that gives it an almost L shaped appearance. The effort expended on the construction seems excessive for a habitation and is more consistent with that of a

ceremonial structure. This historic property has the potential to yield additional information concerning pre-Contact ceremonial structures in the *ahupua‘a* of Kāne‘ohe. Additionally, this structure may have an important value to the native Hawaiian people or to another ethnic group of the state due to associations with cultural practices once carried out, or still carried out, at the property. SIHP # 50-80-10-6930 has been evaluated as significant under both Criterion D and E of the Hawai‘i Register of Historic Places.

SIHP# 50-80-10-6932 is a possible storage area beneath a boulder approximately 5 m southeast of an intermittent drainage. Presence of this structure may yield information important for research in determining historic activities within this area. SIHP# s 50-80-10-6932 has been evaluated as significant under Criterion D of the Hawai‘i Register of Historic Places.

6.2 Historic Properties Located Near the Current Petition Area

SIHP 50-80-10-354, Kawa‘ewa‘e Heiau , is located approximately 30 m (100 ft) west, outside of the current project area on the Kaneohe side of the ridge that divides Kaneohe and Kailua (Oneawa Hills). It has been on the National Register of Historic Places (NHRP) since 1972.

SIHP# 50-80-10-4681 is located approximately 15m (50 ft) southwest of the current petition area. It is a probable pre-Contact habitation site consisting of several c-shaped structures, a terrace wall and a circular rock feature, five features total. Although sufficient data was observed to qualify SIHP# 50-80-10-4681 as a site, the vegetation, primarily *hau*, in the area was too dense to definitively establish the site boundaries. This historic property has the potential to yield additional information concerning pre-Contact habitations in the *ahupua‘a* of Kāne‘ohe. SIHP # 50-80-10-4681 has been evaluated as significant under Criterion D of the Hawai‘i Register of Historic Places.

SIHP# 50-80-10-6929 is a pre-Contact site consisting of two concentrations of lithic debitage along an intermittent drainage approximately 20 m (66 ft) east of the petition area. This historic property has the potential to yield additional information concerning pre-Contact resource procurement and stone tool manufacturing in the *ahupua‘a* of Kāne‘ohe. SIHP # 50-80-10-6929 has been evaluated as significant under Criterion D of the Hawai‘i Register of Historic Places.

SIHP# 50-80-10-6931 is located approximately 15m (50 ft) south of the current petition area. This is a possible pre-Contact ceremonial area located on a natural knoll between two intermittent drainages. This historic property has the potential to yield additional information concerning pre-Contact ceremonial areas in the *ahupua‘a* of Kāne‘ohe. Additionally, this historic property may have an important value to the native Hawaiian people or to another ethnic group of the state due to associations with cultural practices once carried out, or still carried out, at the property. SIHP # 50-80-10-6931 has been evaluated as significant under both Criterion D and E of the Hawai‘i Register of Historic Places.

Table 7. Significance assessments for sites located within the project area.

SIHP# (50-80-10)	Formal Site Type	Features	Probable Function	Age	Criteria	Mitigation Recommendation
Historic Properties Located Within the Current Petition Area						
-4680	Terrace	1	Agricultural/water control	Historic	D	No further work
-4683	Pit feature	1	Charcoal Kiln	Historic	D	No further work
-4684	Complex-enclosures and terracing	7	Habitation	Pre-Contact	D	Preservation, in the form of avoidance
-4686	Stone alignment	1	Boundary marker	Historic	D	No further work
-6930	Stone enclosure	1	Ceremonial	Pre-Contact	D, E	Preservation, in the form of avoidance
-6932	Stone storage feature	1	Storage	Historic	D	No further work
-6933	Pit feature with associated stonewall	2	Charcoal kiln	Historic	D	No further work

Historic Properties Located in the Vicinity of the Current Petition Area						
-354	Enclosure, Platforms, Terraces	2+	Ceremonial	Pre-Contact	A, B, C, D, E	Preservation, in the form of avoidance
-4681	Complex-Enclosures and terracing	5	Habitation/ Agricultural	Pre-Contact	D	Preservation, in the form of avoidance
-6929	Quarry	2	Raw Material Collection	Pre-Contact	D	Preservation, in the form of avoidance
-6931	Stone Alignment	2+	Ceremonial	Pre-Contact	D,E	Preservation, in the form of avoidance

Section 7 Project Effect and Mitigation Recommendations

The following project effect discussion and cultural resource management recommendations are intended to facilitate project planning and support the project's required historic preservation consultation. This discussion is based on the results of this archaeological inventory survey investigation and CSH's communication with agents for the project proponents regarding the project's potential impacts to the historic properties described in the Results of Fieldwork section.

7.1 Project Effect

Cultural Surveys Hawai‘i, Inc. (CSH) conducted an archaeological inventory survey of approximately 66-acres of State Conservation land owned by Hawaiian Memorial Life Plan LTD. The initial project area consisted of approximately 53 acres. Following the pedestrian inspection of the project area, the boundaries of the Hawaiian Memorial Park Expansion project area were adjusted to include buffer zones for select archaeological resources identified along the periphery of the project area. As a result, an additional 13 acres was added to the project area to account for the lost acreage. The petition area defined for this report is approximately 56.6 acres

The proposed development associated with the Hawaiian Memorial Park Expansion project includes building roads, mausoleums and some single-family lots on an approximately 4-acre part of the property on land adjacent to the Pohai Nani Retirement Home. Minimally, the land alteration would include surface grubbing and grading excavations associated with the installation of sub-surface utilities, housing construction and landscaping.

7.2 Mitigation Recommendations

To reduce the proposed project's potential adverse effect on significant historic properties, the following mitigation measures are recommended. These recommendations are also summarized in (Table 7). The mitigation measures should be completed prior to any land disturbing activities within the Hawaiian Memorial Park Expansion petition area. No further work is recommended for SIHP # s 50-80-10-4680, -4683, -4686, -6932, and -6933. Preservation, in the form of avoidance is recommended for SIHP # s 50-80-10-4681, -4684, -6929, -6930, and 6931. The historic properties within the petition area are addressed initially followed by the historic properties near the petition area.

7.2.1 Historic Properties Located Within the Current Petition Area

SIHP# s 50-80-10-4680, 4686 and -6932 have been thoroughly documented with written descriptions, photographs, scale drawings, and recorded with GPS survey equipment. No further work is recommended for these as sufficient information regarding location, function, age, and construction methods of these historic properties has been generated by the current inventory survey investigation to mitigate any adverse effect caused by proposed development activities.

SIHP# s 50-80-10-4683 and -6933 are historic charcoal kilns that have been documented with written descriptions, photographs, scale drawings, and accurately located with GPS survey equipment. No further work is recommended for these historic properties as sufficient

information regarding the location, function, age, and construction methods of these historic properties has been generated by the current inventory survey and other investigations (Meeker 1995, Dockall et al. 2003, and Allen 1987), to mitigate any adverse effect caused by proposed development activities.

SIHP# 50-80-10-4684, a pre-Contact habitation site consisting of several c-shaped structures, a terrace wall, a circular rock feature and several house terraces, was documented with written descriptions, photographs, scale drawings, and accurately located with GPS survey equipment. Limited subsurface testing was also conducted within the Features A and F. Preservation, in the form of avoidance and protection, is recommended for the SIHP # 50-80-10-4684. Additionally, a large grinding stone was discovered approximately 40 m south of SIHP# 50-80-10-4684. In the absence of any other cultural material and considering that it is a good example of its type, moving it within the preservation boundary for SIHP# 50-80-10-4684 is recommended.

SIHP# 50-80-10-6930, a pre-Contact enclosure/ceremonial structure was documented with written descriptions, photographs, scale drawings, and recorded with GPS survey equipment. Limited subsurface testing was also conducted within the enclosure. Preservation, in the form of avoidance and protection, is recommended for the SIHP # 50-80-10-6930.

7.2.2 Historic Properties Located Near the Current Petition Area

SIHP 50-80-10-354, Kawa‘ewa‘a Heia, is located approximately 30 m (100 ft) west, outside of the current petition area on the Kaneohe side of the ridge that divides Kaneohe and Kailua (Oneawa Hills). It has been on the National Register of Historic Places (NHRP) since 1972 and is maintained by several concerned groups. The client has established a 100 ft. buffer around this historic property and continues to work with concerned "caretaker" groups.

SIHP# 50-80-10-4681 is located approximately 15m (50 ft) southwest of the current petition area. It is a probable pre-Contact habitation site consisting of several c-shaped structures, a terrace wall and a circular rock feature, five features total. The historic property was documented with written descriptions, photographs, scale drawings, and GPS survey equipment. Although sufficient data was observed to qualify SIHP# 50-80-10-4681 as a site, the vegetation, primarily *hau*, in the area was too dense to definitively establish the site boundaries. Preservation, in the form of avoidance and protection, is recommended for SIHP # 50-80-10-4681 with the understanding that the site boundaries be firmly established prior to interim protection measures.

SIHP# 50-80-10-6929 is a pre-Contact quarry site consisting of two concentrations of lithic debitage along an intermittent drainage approximately 20 m (66 ft) east of the petition area. A natural dike extends away from the concentrations to the southeast. Preservation, in the form of avoidance and protection, is recommended for SIHP # 50-80-10-6929

SIHP# 50-80-10-6931, is located approximately 15m (50 ft) south of the current petition area. This is a possible pre-Contact ceremonial area was documented with written descriptions, photographs, scale drawings, and recorded with GPS survey equipment. Preservation, in the form of avoidance and protection, is recommended for SIHP # 50-80-10-6931.

An archaeological monitoring program is recommended to address the potential of project related excavations impacting subsurface cultural material. Should SHPD require archaeological

monitoring for the Hawaiian Memorial Park Expansion Project, an archaeological monitoring plan, written to fulfill the requirements of Hawai‘i Administrative Rules Chapter 13-279, will need to be reviewed and approved by SHPD prior to any land disturbing activities within the project area.

Additionally, it is recommended that a cultural resource preservation plan be prepared for the proposed Hawaiian Memorial Park Expansion project, in accordance with Hawai‘i Administrative Rules (HAR) 13-277-3, to address buffer zones and protective measures for all historic properties recommended for preservation within and near the petition area. This preservation plan should detail the short and long term preservation measures that will safeguard the historic property during project construction and subsequent use of the petition area.

Section 8 References Cited

Abbott, Isabella A.
1992 *La‘au Lapa‘au Hawai‘i: Traditional Hawaiian Uses of Plants.* Bishop Museum Press, Honolulu, HI.

Alexander H. F.
1914 Cycling Around Oahu. *Mid-Pacific Magazine* (Oct.) 8(4):317-323.

Allen, Jane, Mary Riford, Thecia M. Bennett, Gail Murakami, and Marion Kelly
1987 *Five Upland ‘Ili: Archaeological and Historical Investigations in the Kanē‘ohe Interchange, Interstate Highway H-3, Island of O‘ahu*. Departmental Report Series B7-1. Department. of Anthropology, Bernice P. Bishop Museum, Honolulu.

Barrère, Dorothy B.
1994 *The King’s Maehele: The Awardees and Their Lands.* Compiled by Dorothy B. Barrère, Volcano, HI.

Bennett, Wendell C.
1930 *Hawaiian Heiau, Ph.D. Dissertation,* , University of Chicago, Chicago, IL.

Booth, H. E.
1983 Charcoal in the Asia and Pacific Region – Problems and Possibilities. In *Charcoal Production and Technology*, United Nations Development Programme and Economic and Social Commision for Asia and the Pacific, pp. 23-58. Report on a FAO/ESCAP regional workshop and study tour, Food and Agriculture Organization of the United Nations. Rome.

Borthwick, Douglas F.
1989 *Archaeological Reconnaissance Survey and Literature Search: He‘eia Marsh O; For Proposed Punawai Trunk Sewer.* Cultural Surveys Hawai‘i,. Inc., Kailua, Hawai‘i.

Buck, Peter H. (Te Rangi Hiroa)
1964 *Arts and Crafts of Hawaii II: Houses* , Bernice P. Bishop Museum

Clark, John R.K.
2002 *Hawaii Place Names.* University of Hawai‘i Press, Honolulu, HI.

Clark, Stephan Dane and Mary Riford
1986 *Archaeological Salvage Excavations at Site 50-Oa-G5-101, Waikalua-Loko, Kāne‘ohe, Ko‘olaupoko, O‘ahu Island Hawai‘i* Bishop Museum Dept of Anthropology

Devaney, Dennis, Marion Kelly, Polly Jae Lee, and Lee S. Motteler
1976 *Kāne‘ohe: A History of Change (1778-1950).* Bernice. P. Bishop Museum. The Bess Press, Honolulu.

Dockall, John, Leslie L. Hartzell, Susan A. Lebo, Helen H. Leidemann, Heidi A. Lennstrom, Shannon P. McPherron
2003 *Windward Highway Archaeological Investigations, Inventory Survey, Data Recovery, and Monitoring for Interstate Route H-3 in Kāne‘ohe, O‘ahu.* Department of Anthropology, Bernice P. Bishop Museum, Honolulu.

Dorrance, William H.
1998 *Oahu‘s Hidden History*. Tours into the Past. Mutual Publishing, Honolulu.

Dorrance, William H. and Francis S. Morgan
1999 *Sugar Islands: The 165-Year Story of Sugar in Hawai‘i.* Mutual Publishing, Honolulu, HI.

Durand, Loyal Jr.
2000 *Dairy Industry of the Hawaiian Islands. Economic Geography,* Vol. 35, No. 3:228-246

Emrich, Walter
1985 *Handbook of Charcoal Making, The Traditional and Industrial Methods*. Solar Energy R & D in the European Community, Series E, Volume 7, Energy from Biomass, D. Reidel. Boston.

Foote, Donald E., E. L. Hill, S. Nakamura, and F. Stephens
1972 *Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai and Lanai.* State of Hawaii, U.S. Department of Agriculture, U.S. Government Printing Office, Washington, D.C.

Fornander, Abraham
1878 *An Account of the Polynesian Race: Its Origins and Migrations and the Ancient History of the Hawaiian People to the Times of Kamehameha I.* Volume I, Trubner & Co., Ludgate Hill, London, UK.

1919 *Fornander Collection of Hawaiian Antiquities and Folk-lore.* Volume V, Part III. Memoirs of the Bernice Pauahi Bishop Museum. Bishop Museum Press, Honolulu.

Giambelluca, Thomas W., Michael A. Nullet, and Thomas A. Schroeder
1986 *Ra* Cultural Impact Assessment for the Kāne‘ohe Hawaiian Memorial Park Expansion Area Project, Kāne‘ohe Ahupua‘a, Ko‘olaupoko District, Island of O‘ahu *infall Atlas of Hawai‘i*, Department of Land and Natural Resources, Honolulu.

Gollin, Lisa, Todd D. McCurdy, and Hallett H. Hammatt
2007 *Cultural Impact Assessment for the Kāne‘ohe Hawaiian Memorial Park Expansion Area Project, Kāne‘ohe Ahupua‘a, Ko‘olaupoko District, Island of O‘ahu*. Cultural Surveys Hawaii, Kailua, Hawai‘i

Greer, Richard A.
1970 Honolulu in 1847. *Hawaiian Journal of History,* Vol. 4:59-95.

Hammatt, Hallett H.
1989 *Archaeological Subsurface Reconnaissance of a Residential Property on Kane‘ohe Bay, O‘ahu (44-291A Kane‘ohe Bay Drive, TMK 4-4-7:8, 10)* Cultural Surveys Hawai‘i, Kailua

Hammatt, Hallett H. and David W. Shideler
1989 *Archaeological Survey of a 90-acre Parcel for Proposed Hawai‘i State Veterans Cemetery Kāne‘ohe, O‘ahu,* Cultural Surveys Hawaii, Kailua, HI.

Hammatt, Hallett H., and Douglas F. Borthwick
1989 *Archaeological Survey and Assessment of a 90-Acre Parcel for the Proposed Expansion of the Bay View Golf Course Kāne‘ohe, O‘ahu*. Cultural Surveys Hawai‘i, Kailua, Hawai‘i.

Hammatt, Hallett H., Douglas F. Borthwick, Brian L. Colin, Ian Masterson, Jennifer J Robins, and Helen Wong-Smith
1997 *Archaeological Inventory Survey and Limited Subsurface Testing of a 1,540-Acre Parcel in the Ahupua‘a of Honuaino, Hokukano, Kanaueue, Haleki‘i, Ke‘eke‘e, ‘Ilikahi, Kanakau, Kalakalu, and Onouli, Districts of North and South Kona, Island of Hawai‘i.* Cultural Surveys Hawai‘i, Kailua, Hawai‘i.

Hammatt, Hallett H. and David W. Shideler
1989 *Archaeological Survey of a 90-acre Parcel for Proposed Hawai‘i State Veterans Cemetery Kāne‘ohe, O‘ahu*, Cultural Surveys Hawai‘i, Kailua, HI.

Handy, E. Craighill., and Elizabeth G. Handy
1972 *Native Planters of Hawaii: Their Life, Lore, and Environment.* Bishop Museum Press, Bulletin 233, Honolulu.

Harper, Joseph
1972 Pineapple, A Major Industry in the Area 50 Years Ago. *Ka Lama* 3 (2):3, 8. (Newspaper sponsored by Kahaluu Ecumenical Youth Project (KEY) and Hui Ko‘olau), Kahaluu Printing Co., Kahaluu, Hawai‘i.

Henke, Louis A.
1929 *A Survey of Livestock in Hawaii.* University of Hawai‘i Research Publication No. 5, Honolulu, HI.

‘Ī‘ī, John Papa
1959 Fragments of Hawaiian History (Pukui translation), Bishop Museum Press, Honolulu, HI.

Kalākaua, David
1990 *The Legends and Myths of Hawaii: The Fables and Folk-Lore of a Strange People.* Mutual Publishing, Honolulu, HI.

Kamakau, Samuel M.
1875 He Manawa haowale a nei Keia, a Kaili a pakahawale? *Kuokoa* Nov. 27, 1875. [author listed as S. M. K. Kauakohiakohaola]

1992 *Ruling Chiefs of Hawaii (Revised Edition)*. Kamehameha Schools Press, Honolulu.

Kame‘eleihiwa, Lilikalā
1992 *Native Land and Foreign Desires: Pehea Lā E Pono Ai?* Bishop Museum Press, Honolulu, HI.

Kanahele, George Hu‘eu Sanford
1986 *Pauahi. The Kamehameha Legacy*. Kamehameha Schools Press, Honolulu.

Kelly, Marion
1975 *Lolo I‘a O He‘eia: Heeia Fishpond.* Department of Anthropology, Bishop Museum, Honolulu, HI.

1976 Report 2 Historical Research “The History of the Land of Kaneohe”

Kirch, Patrick V
1985 *Feathered Gods and Fishhooks* , University of Hawai‘i, Honolulu, HI

Kolb, Michael John
1991 *Social Power, Chiefly Authority, and Ceremonial Architecture, in an Island Polity, Maui, Hawai‘i* , University of California at Los Angeles, Los Angeles, CA.

Koolau.net
2007 *Kawa Stream Description.* Electronic Document, accessed October 17, 2007, http://www.pixi.com/~isd/index.html.

Lyons, C.J.
1876 Kāne‘ohe, O‘ahu, with West Kailua, Map Surveyed in 1874 by C.J. Lyons, RM+ 585, Scale 1:6000

McAllister, J. Gilbert
1933 *Archaeology of O‘ahu*. Bernice P. Bishop Museum, Bulletin 104, Honolulu.

Malo, David
1990 *"Hawaiian Antiquities (Moolelo Hawaii)", Translated from the Hawaiian by Nathaniel B. Emerson, 1898, Bishop Museum Special Publication, No. 2, 2nd edition* , Bishop Museum Press, Honolulu, HI.

Mccurdy, Todd D and Hallett H. Hammatt
2007 Archaeological Inventory Survey for the Hawaiian Memorial Park Expansion, Kāne‘ohe Ahupua‘a, Ko‘olaupoko District, Island of O‘ahu, Cultural Surveys Hawai‘i, Kailua, Hawai‘i.

Meeker, Virgil and Gail M. Murakami
1995 *From Fire Pits to Charcoal Kilns: Resource Procurement and Land Use in the Upland Kāne‘ohe Catchment* International Archaeological Research Institute

Miyagi, Michichiro
1963 *Land Use in Waiahole Valley, Oahu.* M.A. thesis, University of Hawaii. Copy in Hawaiian and Pacific Collection, Sinclair Library, Honolulu.

Paki, Pilahi
1972 *Legends of Hawaii: Oahu's Yesterday.* Victoria Publications, Honolulu.

Pukui, M.K., and S. H. Elbert
1986 Hawaiian Dictionary. University of Hawai‘i Press, Honolulu.

Pukui, Mary K., Samuel H. Elbert and Esther Mookini
1974 Place Names of Hawaii, University of Hawai‘i Press, Honolulu, HI.

Soil Survey of the State of Hawaii
2007 *Soil Survey of Oahu*. Electronic document, accessed October 17, 2007, http://www.ctahr.hawaii.edu/soilsurvey/soils.htm,.

Sterling, Elspeth P., and C. C. Summers
1976 *Sites of O‘ahu.* Department of Anthropology, Bernice P. Bishop Museum, Honolulu.

Stokes, John F. G., and Tom Dye
1991 *Heiau of the Island of Hawai‘i: A Historic Survey of Naïve Hawaiian Temple Sites,* Bishop Museum Press, Honolulu.

Stride, Mark, Douglas Borthwick, Victoria S. Creed and Hallett H. Hammatt
1994 *Inventory Survey and Subsurface Testing at Waikalua Road, Kaneohe Bay, O‘ahu 3.2 Acres (TMK 4-5-05:1,2,12,13 & 14)* Cultural Surveys Hawai‘i, Kailua

Szabian, John , J. Landrum and Paul L. Cleghorn
1989 *A Reconnaissance Survey of the Proposed Pikoiloa Cemetery, Kāne‘ohe, O‘ahu Island, TMK 4-5-33:1-2*

Thrum, Thos. G.
1905 List of Principal Stock and Sheep Ranches throughout the Islands. *Thrum’s Hawaiian Almanac and Annual* for 1905:42.

1907 Heiaus and Heiau sites throughout the Hawaiian Islands. *Thrum’s Hawaiian Annual* for 1907:36-48.

1915 Completing Oahu’s Heiau Search. *Thrum’s Hawaiian Annual for 1916*, Honolulu.

Ticktin, Tamara, A. Nāmaka Whitehead and Hō‘ala Fraiola
2006 Traditional Gathering of Native *Hula* Plants in Alien-Invaded Hawaiian Forests: Adaptive Practices, Impacts on Alien Invasive Species and Conservation Implications. *Environmental Conservation* 33(3):185-194.

Toulous, Julian Harrison
1971 *Bottle Makers and Their Marks.* Thomas Nelson Inc, Camdem, New Jersey.

Waihona ‘Aina
1998 Mahele data base, waihona.com